







“Should income be diversified? A dynamic panel data analysis of Nepalese depository financial institutions”

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SHOULD INCOME BE DIVERSIFIED? A DYNAMIC PANEL DATA ANALYSIS OF NEPALESE DEPOSITORY FINANCIAL INSTITUTIONS

Abstract

This study analyzes the possible impact of diversity in non-interest income on Nepalese Depository Financial Institutions (DFIs) performance. The study examines variables such as service fees, dividends on equity instruments, and the non-interest revenue ratio to total operational income as endogenous factors. The ROE serves as the key profitability indicator. Additionally, the study explores the impact of control variables on the performance of financial institutions, such as the cost-to-income ratio, the equity-to-total assets ratio, and the ratio of non-performing loans to total loans. Secondary data from fiscal year 2015/16 to 2021/22 are utilized for analysis, employing correlation and regression analyses to assess the relationships between variables. Based on the Hausman Specification test, this study uses a Dynamic Analysis of Panel Data approach, adopting a Random effects regression model. The findings indicate that dividends from equity instruments ($\beta = -0.565^*$) adversely affect profitability. At the same time, service fees and non-interest revenue as a proportion of overall operating revenue show no significant impact. Control factors like the cost-to-income ratios ($\beta = -0.432^{**}$) and the equity-to-total assets ($\beta = -94.101^{**}$) adversely affect profitability. The study suggests that income diversification may not be beneficial, urging Nepalese DFIs to prioritize interest income and consider alternative investment opportunities. Reducing the cost-to-income ratios and equity-to-total assets is recommended for enhancing profitability.

Keywords

investment, non-interest revenue, diversification, service fees, dividends, equity, profitability

JEL Classification

G12, G15, G21

INTRODUCTION

The financial sector is a cornerstone of any country's economic progress, and within it, a stable and prosperous banking industry is crucial for the growth of business and the economy as a whole (Arif & Nauman Anees, 2012; Karki et al., 2021). Traditionally, commercial banks have relied on net interest income from deposit collection and loan issuance as their primary revenue sources (Craigwell & Maxwell, 2006). However, lessons learned from the 2008 financial crisis emphasized the need for diversifying income sources to mitigate future risks (Prajapati & Shah, 2019). This shift is crucial to minimize over-reliance on interest revenue and to enhance overall financial stability (Antao & Karnik, 2022). Non-interest income (NII), which is defined as income from sources other than interest payments (Antao & Karnik, 2022), has gained prominence as interest margins narrow and banks seek revenue diversification (Heffernan, 2005). This strategic transformation is evident in the banking sector's transition from traditional lending activities to more fee-based services (Ghimire et al., 2023; Kumari, 2018). The banking landscape has evolved by intro-

ducing various services, from credit cards to solvency certificates, creating a paradigm shift toward diversification (Andrzejuk, 2017). For instance, commercial banks charge multiple fees, such as non-sufficient cash, overdraft, and wire transfer fees (Dahal, 2022). The focus of international banks has changed from conventional to non-conventional revenue sources, aiming to boost profitability with enhanced earnings per share and dividend payout to their shareholders amidst intense competition, which leads to improved stock market performance (Karki, 2018). Deregulation, globalization, and technological advancements have been key drivers behind this shift (Craigwell & Maxwell, 2006; Dahal et al., 2020). Non-interest income now constitutes a substantial portion of operating revenue for US commercial banks (DeYoung & Rice, 2004).

Nepal's financial sector has undergone rapid structural changes since Nepal Bank Ltd. was founded in 1937 (Baral, 2007). The evolving landscape has highlighted Nepalese DFIs' need to adopt diversified income strategies. These institutions must consider how non-interest revenues affect profitability amid mergers, acquisitions, and heightened competition. Recent economic challenges have magnified the importance of diversification, including the COVID-19 pandemic, which disrupted economic activities and led to a decline in Nepal's Gross Domestic Product growth rate by 9.03% (World Bank). The economic downturn has prompted DFIs to reevaluate their revenue strategies. Furthermore, the regulatory requirement for Banks and Financial Institutions (BFIs) to maintain high credit-to-deposit ratios as part of economic stimulus efforts, coupled with challenges in retail loan processing under interest rate fluctuations and a liquidity crunch, emphasizes the importance of diversification (Bhandari et al., 2021).

The heavy reliance on interest income significantly affects BFIs' profitability trends and intensifies competitive pressures on margins. This has led researchers like Singh (2021) to emphasize the possible advantages of revenue diversification for bank stability. The reduction in the spread rate by Nepal Rastra Bank and the growing percentage of non-interest revenues highlights the shift towards non-traditional revenue sources (Dahal, 2022). In this rapidly evolving Nepalese financial market characterized by mergers, economic challenges, and competition, understanding the dynamics of revenue diversification and its impact on DFI performance becomes imperative.

1. LITERATURE REVIEW

Valverde and Fernandez (2007) extensively examined the correlation between bank margins and specialty across seven European countries. Their study, from 1994 to 2001, revealed that market share and profitability improved significantly when European banks diversified into new business areas. This assertion supports the study by Chiorazzo et al. (2008), which examined the non-interest revenue and risk-adjusted returns of Italian banks over ten years. Their findings demonstrated a correlation between non-interest income and financial performance, suggesting that increased non-interest income leads to enhanced profits per unit of risk.

The dynamics of US credit unions were studied by Goddard et al. (2008) and revealed that heightened dependence on non-interest income positively correlates with enhanced profitability. Moreover, their

research highlighted that a diversified revenue portfolio reduces the volatility of returns. Hong (2011) focused on the commercial banking sector in China and found a strong correlation between ROE and the non-interest revenue-to-business-income ratio. This underscored the pivotal role of non-interest revenue diversification in improving commercial banks' operational efficiency. Pennathur et al. (2012) analyzed how different ownership structures influence the earnings and risk profiles of Indian financial institutions. Their comprehensive study from 2001 to 2009 demonstrated that larger banks benefit significantly from higher non-interest income, whereas smaller banks exhibit more limited gains. Gurbuz et al. (2013) extended their analysis to the Turkish banking sector over six years and found that diversified revenue led to a better risk-adjusted performance.

The study by Doumpos et al. (2016) encompassed a worldwide view, exploring how revenue diversity

affected the overall financial strength of banks in varying economic settings. Their research showcased the potential advantages of income diversification, especially for banks operating in underdeveloped nations, which are more resilient in financial crises. This theme persisted in the Li et al. (2021) investigation during their analysis of the COVID-19 epidemic. Their findings suggested a link between non-interest incomes and banks' crisis-related performance. Al-Slehat and Altameemi (2021) delved into bank size and non-interest revenue's interaction with sustainable growth rates. Their research unearthed a nonlinear relationship between these factors, contributing to a nuanced understanding of how bank size influences the sustainable growth rate. Furthermore, Uddin et al. (2021) extensively explored Bangladeshi banks, highlighting a significant relationship between income diversity and banking profitability. This study emphasizes that increased income diversification in bank activities contributes to enhanced profitability.

Within the context of Nepal, Shah et al. (2018) aimed to explore the non-interest revenue elements that influence the profitability of Nepalese joint venture banks. Their study identified that various non-interest revenue streams, like service charges, exchange incomes, and renewal fees, significantly impact profitability. Nepali (2018) further enriched this understanding by analyzing the risk-reward ratio for commercial banks. Risk-adjusted returns increased with non-interest revenue, foreign ownership, and bank size. Dhungel (2019) extended the exploration of non-interest income's impact to encompass bank size, loan ratios, and equity ratios. This comprehensive study demonstrated non-interest income's significance in boosting bank profitability while minimizing risk. Prajapati and Shah (2019) broadened the scope to include A and B-class financial institutions. They found that risk-adjusted returns are highly influenced by non-interest revenue, revenue diversification, and bank size. The study by Ojha (2020) investigated the factors influencing interest rate determination for Nepalese finance companies. Their research showcased the complex interplay between deposit interest rates, loan interest rates, and inflation rates in shaping financial stability in an open and liber-

al market where private and public sector banks contest each other (Bhandari et al., 2021; Pant et al., 2022). Dahal (2022) enriched the discourse by scrutinizing interest and fee-based income contributions to Nepalese banks' profitability. The results highlighted the substantial role of interest revenue in driving bank performance.

The literature review provides insights into key factors linked with income diversity influencing the profitability of financial institutions. The return on equity (ROE) ratio is an important performance metric that denotes the percentage of net profit to shareholders' equity and is a fundamental metric of an institution's financial well-being (Shah et al., 2018). It is widely assumed that a company's effective utilization of investments for growth is reflected in its ROE, a metric susceptible to various independent and control variables. Service fees, which include costs associated with account transactions, appear as a potential factor with significant implications for the profitability of financial institutions. Extensive research indicates a strong, positive association between service fees and financial performance, meaning that greater service prices correspond to higher profitability. Furthermore, dividends derived from stock instruments across various sectors favor a firm's profitability. This emphasizes the significance of income earned from such investments as a contributing component to the overall profitability of a financial institution.

Another important determinant is the Non-interest revenue to Total Operating revenue ratio, which reveals the importance of non-interest revenue in a bank's business model. Prior research by Hong (2011) and Kozak and Wierzbowska (2022) indicates a correlation between this ratio and Return on Equity (ROE). The ratio of Non-performing loans (NPL) to Total Loans, on the other hand, reflects the level of credit asset security within banks and provides a more dynamic relationship. However, Bhattarai (2016) provides a counterargument, suggesting that non-performing loan ratios have a positive influence on return on equity in Nepalese banks, contrary to the findings of research like Chiorazzo et al. (2008) and Doumpos et al. (2016). The discrepancy emphasizes the

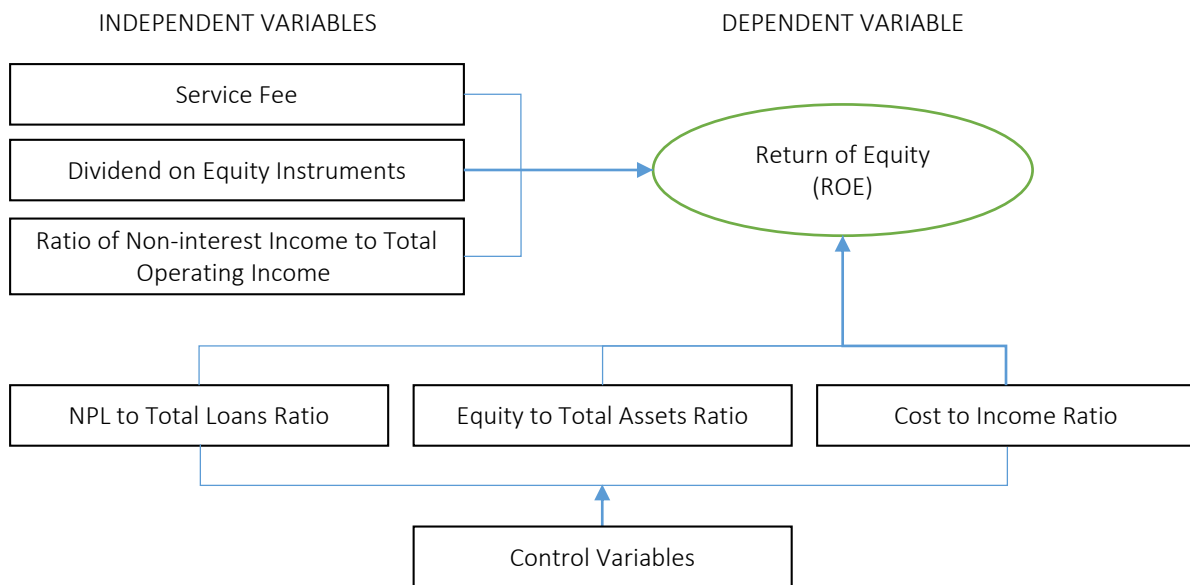


Figure 1. Conceptual framework

complexities of this relationship, demanding additional investigation. Another notable variable is the Equity to Total Assets Ratio, which serves as a metric of financial leverage. According to Prajapati and Shah (2019), this ratio positively links to profitability in the Nepalese context. Nepali (2018), on the other hand, shows contradictory findings, highlighting the necessity for a further examination of this association. Finally, the Cost to Income Ratio, which reflects the effectiveness of cost-cutting initiatives within banks, is significant. According to Sun et al. (2017) and Uddin et al. (2021), this ratio is inversely related to bank profitability, highlighting the importance of cost management efficiency. However, the appearance of contradictory conclusions in the literature emphasizes the complex dynamics governing these relationships. In this context, this research examines how endogenous and exogenous variables influence the financial performance of Depository Financial Institutions (DFIs), guided by the conceptual framework illustrated in Figure 1.

Based on the literature review, the following hypotheses can be developed.

- H_1 : Service fees significantly impact the performance of DFIs.
- H_2 : Dividends on equity instruments significantly impact the performance of DFIs.

H_3 : Non-interest income to total operating income significantly impacts the profitability of DFIs.

H_4 : NPL to total loan ratios have a significantly positive relationship with the performance of DFIs.

H_5 : Equity to Total Assets ratio significantly impacts the profitability of DFIs.

H_6 : Cost-to-income ratio significantly impacts the profitability of DFIs.

2. METHODOLOGY

This study utilizes a quantitative research methodology, combining descriptive and causal-comparative approaches. It focuses on how non-interest revenue impacts the profitability of Nepal's DFIs, comprising commercial banks, finance companies, and development banks. The study's sample spans seven years, from 2015 to 2022, encompassing various financial institutions. The sample consists of 10 DFIs, resulting in 70 observations. Purposive sampling, a non-probability sampling method, was used to choose the sample companies. Two criteria guided the selection process: first, the availability of consistent data over seven years, and second, the accessibility of data relevant to the study variables. The selected sample institutions are illustrated in Table 1.

Table 1. Sample DFIs

SN.	Commercial banks
1.	Rastriya Banijya Bank (RBB)
2.	Global IME Bank (GBIME)
3.	Nabil Bank (NABIL)
4.	NIC Asia Bank (NICA)
5.	Machhapuchchhre Bank (MBL)
Development banks	
6.	Muktinath Bikas Bank (MNBBL)
7.	Garima Bikas Bank (GBBL)
8.	Jyoti Bikas Bank (JBBL)
Finance companies	
9.	Pokhara Finance (PFL)
10.	Guheswori Merchant Banking & Finance (GMFL)

The analysis employed secondary data from the NRB's website and publications. Descriptive and inferential statistics were applied to the analysis. The data were summarized and understood utilizing descriptive statistics like standard deviations and means. To assess the impact of independent variables (Service Fee, Dividend on equity instruments, and proportion of non-interest incomes) on the dependent variable (ROE), multiple regression and dynamic panel data analysis were employed that helped in testing the hypothesis and deriving inferential insights. Given the longitudinal nature of the data, panel data analysis was used to uncover trends over time. This approach was deemed suitable due to the study's focus on ten DFIs over seven years. The analysis was conducted using STATA 14.2, employing Pooled OLS, Fixed, and Random Effects regression models as estimation techniques.

Pooled OLS Model: This model, employing ordinary least squares regression, served as a baseline comparison. Based on Karki (2018), the model is represented by the following equation:

$$ROE_{it} = \alpha_0 + \beta_1 SF_{it} + \beta_2 DIV_{it} + \beta_3 NONII_{it} + \beta_4 NPL_{it} + \beta_5 EQUITY_{it} + \beta_6 CIR_{it} + \mu_i + \varepsilon_{it}, \quad (1)$$

where ROE_{it} is the dependent variable representing ROE for institution i in year t . Independent variables are represented by SF_{it} (Service Fee), DIV_{it} (Dividend on equity instruments), and $NONII_{it}$ (Ratio of non-interest revenue to total operating income). Control variables include NPL_{it} (proportion of non-performing loans), $EQUITY_{it}$ (proportion of equity to total assets), and CIR_{it} (Cost-to-Income Ratio). α_0 is the regression constant, and

β_1 to β_6 are the regression coefficients. μ_i represents the time-invariant error, and ε_{it} is the idiosyncratic error.

One-Way Fixed Effect Regression Model (FEM): This model was chosen to elucidate how individual DFIs' specific characteristics might impact their profitability. This model allowed for a correlation between the explanatory and explained variables. It was designed to address potential intercept variations across institutions due to their different non-interest revenue sources (Schmidheiny, 2022). The equation for the one-way FEM was as follows:

$$ROE_{it} = \alpha + \beta_{1t} \ln SF_{it} + \beta_{2t} \ln DIV_{it} + \beta_{3t} NONII_{it} + \beta_{4t} NPL_{it} + \beta_{5t} EQUITY_{it} + \beta_{6t} CIR_{it} + \sum_{i=1}^9 \delta_i \beta_i + \sum_{t=1}^6 \delta_t T_t \varepsilon_{it}. \quad (2)$$

The term $\sum_{i=1}^9 \delta_i \beta_i$ represented the individual-spe-

cific effects, capturing the distinct attributes of each institution. This model allowed researchers to assess how institution-specific traits interacted with various income sources to affect profitability.

Two-Way FEM: It extended the insights from the one-way FEM by incorporating individual and time-specific effects. This model aimed to capture how personal attributes and temporal trends influenced DFIs' profitability (Schmidheiny, 2022). The equation for the two-way FEM was:

$$ROE_{it} = \alpha + \beta_{1t} \ln SF_{it} + \beta_{2t} \ln DIV_{it} + \beta_{3t} NONII_{it} + \beta_{4t} NPL_{it} + \beta_{5t} EQUITY_{it} + \beta_{6t} CIR_{it} + \sum_{i=1}^9 \delta_i \beta_i + \sum_{t=1}^6 \delta_t T_t \varepsilon_{it}. \quad (3)$$

Here $\delta_t T_t$ represented the time dummy variable, which accounted for the influence of temporal trends on profitability. Including both unit-specific and time-specific effects provided a more in-depth comprehension of the variables shaping the performance of DFIs' over time.

Random Effects Regression Model (REM): The study utilized the REM further to analyze the

link between non-interest incomes and a bank's performance while accounting for potential confounding factors (due to the inclusion of many dummy variables). This model considered individual-specific effects uncorrelated with the explanatory variables, thereby mitigating the impact of omitted variable bias (Schmidheiny, 2022). The equation for the random effects model was:

$$ROE_{it} = \alpha + \beta_{1t} \ln SF_{it} + \beta_{2t} \ln DIV_{it} + \beta_{3t} NONII_{it} + \beta_{4t} NPL_{it} + \beta_{5t} EQUITY_{it} + \beta_{6t} CIR_{it} + \delta_t T_t + \delta_i \beta_i + \omega_{it} \quad (4)$$

The term $\omega_{it} = \varepsilon_{it} + u_{it}$ represented the total residual, accounting for idiosyncratic errors and individual differences in intercept values. This model aimed to uncover underlying relationships between non-interest income and profitability by considering random effects while addressing potential endogeneity issues.

Hausman Specification Test: This test determined the appropriate model by evaluating the trade-off between fixed and random effects. A p-value larger than 0.05 would result in the null hypothesis being accepted, indicating that the REM was more appropriate. Conversely, a p-value smaller than 0.05 implies that the FEM is better.

Breusch and Pagan Lagrange Heteroscedasticity Test: If the Fixed Effect Model was deemed appropriate, this test was used to assess whether heteroscedasticity was present in the dataset. A p-value greater than 0.05 would suggest homoscedasticity.

Breusch and Pagan Lagrange Multiplier Test: If the REM was favored, this test determined whether the Pooled OLS or Random Effects Model was more suitable. A p-value lesser than 0.05 would indicate that the Random Effects Model was preferable.

3. RESULTS

This section illustrates and interprets the outcomes of various data analysis methods, comprising descriptive tests, correlation, and panel data analysis. Table 2 showcases the descriptive statistics for the year from 2015 to 2022. It provides insights into the study variables' maximum values, minimum values, means, and standard deviations.

The dependent variable, ROE, exhibited a mean of 14.85% and a standard deviation of 5.14%. Over the sample period, DFIs displayed a range of 4.7% to 27.38% in ROE. Likewise, the service fee variable had an average value of Rs. 118 million, with a standard deviation of Rs. 96.1 million. The dividend on equity instruments averaged Rs. 34.8 million, with a standard deviation of Rs. 58.8 million.

Table 3 displays the results of the correlation analysis. The study employed "Bivariate Pearson Correlation" coefficients reaching values ± 1 . When the value is -1 , the two items move in opposite directions. Similarly, the $+1$ value implies a perfectly positive correlation, suggesting that two items exhibit precise parallel movement.

The results illustrated in Table 3 reveal significant correlations among the studied variables. The service fee and ROE exhibited a significant positive correlation at a 99% confidence level (indicated by **). This supports prior studies that have suggested a positive link between the banking sector's service fees and profitability (DeYoung & Rice, 2004; Shah et al., 2018). Similarly, the dividend on equity instruments and service fees, both components of non-interest income, displayed a significant positive correlation. This finding aligns with the notion that diversified sources of non-interest income, including dividends, can enhance profitability for DFIs (Shah et al., 2018).

Table 2. Descriptive statistics

Variable	Mean	Std. Dev.	Min	Max
Return on Equity	14.85	5.14	4.7	27.38
Service Fee (in a million)	118	96.1	15.7	460
Dividend on Equity Instruments (in millions)	34.8	58.8	0.035	268
The ratio of NII to Total Operating Income	22.10	7	11	53
NPL to Total Loans Ratio	1.04	1.07	0	4.75
Equity to Total Asset Ratio	11	4	6	11
Cost to Income Ratio	42.29	7.72	24.08	58.41

Table 3. Correlation matrix

	ROE	LnSF	LnDIV	NONII	NPL	EQUITY	CIR
ROE	1						
LnSF	0.3511**	1					
LnDIV	0.2835*	0.3729**	1				
NONII	0.1263	-0.0221	0.2235	1			
NPL	0.2661*	0.1568	0.0865	-0.3304**	1		
EQUITY	-0.4453**	-0.5733**	-0.5106**	0.0438	-0.1987	1	
CIR	-0.2745*	0.1013	0.0708	-0.2533*	0.0831	-0.5056**	1

Note: ** One percent level of significance. * Five percent level of significance.

Additionally, a negative correlation exists between the ratios of non-interest revenue to non-performing loans (NPL). This unexpected result contradicts the conventional assumption that non-interest revenue is related to improved performance. It suggests that higher levels of NPL might offset the positive effect of non-interest revenue on profitability (Sun et al., 2017). Further, the ratio of equity to total assets showed substantial negative correlations with three research variables: ROE, service fee, and dividend on equity instruments. This outcome underscores the complex relationship between equity ratios and various elements of financial performance, which has been observed in prior research (Nepali, 2018; Ngoc Nguyen, 2019).

Likewise, the cost-to-income ratio demonstrated a significantly negative correlation with the equity-to-total assets ratio at a 1% significance level. This result favors previous studies highlighting the impact of operating expenses on an institution's equity position and overall financial performance (Doumpos et al., 2016; Uddin et al., 2021).

Another noteworthy observation is the negatively significant correlation between the ratios of cost-to-income and non-interest revenue to total operating revenue at the 95% confidence level. This finding underscores the potential trade-off between controlling costs and generating non-interest revenue, as noted in prior research (Sun et al., 2017; Uddin et al., 2021).

The panel data analysis performed in this study aimed to explore the interactions between the dependent and various independent variables. Table 4 summarizes the findings derived from the Pooled OLS, FEM, and REMs.

The Pooled OLS regression model revealed an R-squared value of 57.51 percent, indicating that the independent variables explain approximately 57.51% of its variability in the defined variable. Furthermore, the significant F-value suggests an excellent overall fit of the model. Similarly, the Fixed Effects regression model yielded a significant F-value and an R-squared value of 46.24 percent. In the Random Effects

Table 4. Regression analysis

Pooled OLS regression model						
ROE	Coef.	Std. Err.	t	P>t	[95% Conf. Interval]	
LnSF	-0.280	0.603	-0.46	0.644	-1.4845	0.9243
LnDIV	-0.284	0.259	-1.10	0.277	-0.8003	0.2331
NONII	6.102	7.153	0.85	0.397	-8.1917	20.3961
NPL	0.954	0.427	2.23	0.029	0.0997	1.8084
EQUITY	-102.006	16.403	-6.22	0.000	-134.7847	-69.2276
CIR	-0.454	0.697	-6.51	0.000	-0.5932	-0.3147
_cons	53.078	14.276	3.72	0.000	24.5485	81.6069
F(7, 62) 14.21						
Prob>F 0.0000						
R-squared 0.5751						
Adj. R-squared 0.5346						

Table 4 (cont.). Regression analysis

Fixed effects regression model						
ROE	Coef.	Std. Err.	t	P>t	[95% Conf. Interval]	
LnSF	-0.271	0.697	-0.39	0.699	-1.6681	1.12670
LnDIV	-0.780	0.318	-2.45	0.018	-1.4178	-0.1417
NONII	3.568	7.394	0.48	0.631	-11.2565	18.3933
NPL	0.223	1.073	0.21	0.836	-1.9275	2.3731
EQUITY	-80.657	25.215	-3.20	0.002	-131.2106	-30.1039
CIR	-0.386	0.088	-4.40	0.000	-0.5621	-0.2101
_cons	56.783	16.360	3.47	0.001	23.9828	89.5824
R sq. (within)			0.3963			
R sq. (Between)			0.5922			
R sq. (overall)			0.4624			
F(6,54)			5.91			
Prob> F			0.0001			
Random effects regression model						
ROE	Coef.	Std. Err.	z	P>z	[95% Conf. Interval]	
LnSF	-0.2241177	0.6220514	-0.36	0.719	-1.443316	0.9950807
LnDIV	-0.5645552	0.2811099	-2.01	0.045	-1.11552	-0.01359
NONII	3.681356	6.977676	0.53	0.598	-9.994637	17.35735
NPL	0.7107085	0.6537488	1.09	0.277	-0.5706156	1.992033
EQUITY	-94.10087	19.74824	-4.77	0.000	-132.8067	-55.39504
CIR	-0.4321305	0.0752109	-5.75	0.000	-0.5795412	-0.284719
_cons	55.4782	14.49592	3.83	0.000	27.06673	83.88967
R sq. (within)			0.3812			
R sq. (Between)			0.7498			
R sq. (overall)			0.5552			
Wald chi2(6)			49.37			
Prob>chi2			0.000			

regression model, the R-squared value was 55.52 percent, with a p-value of 0.000 (<0.05), affirming the model's appropriateness and good fit.

Diagnostic Test: Diagnostic tests were carried out to identify the best model and ensure the reliability and quality of the data used for analysis. Mainly, they were conducted to assess multicollinearity, model selection, and heteroscedasticity, as detailed below:

Variance Inflation Factor (VIF) Test: This test, as illustrated in Table 5, examined the occurrence of multicollinearity among the endogenous and control variables. The findings indicate that all variables showed VIF values below 10. The mean VIF value of 1.66, well below the threshold of 2, suggests that no significant multicollinearity exists in the model. This implies that the study variables are not strongly associated, confirming the suitability of the dataset for analysis.

Table 5. Variance inflation factor

Variable	VIF	1/VIF
LnSf	1.62	0.6170
LnDIV	1.54	0.6485
NONII	1.31	0.7632
NPL to Total Loans ratio	1.19	0.8409
Equity to total asset ratio	2.70	0.3706
CIR	1.63	0.6150
Mean VIF	1.66	

Hausman Specification Test: The Hausman Specification Test, detailed in Table 6, was employed to determine the suitable regression model between the FEM and the REM. The result, with a chi-square value of 4.03 and a p-value of 0.6723, shows that the null hypothesis – Random Effects Model is suitable – is accepted. This result supports the choice of the REM for the analysis.

Table 6. Hausman specification test

Chi-Square Value	P value
4.03	0.6723

Breusch & Pagan Lagrangian Multiplier Test: This test, illustrated in Table 7, was utilized to choose between the REM and the Pooled OLS Model. With a p-value of 0.0468 and a level of significance of 5%, the research hypothesis is accepted, indicating that the REM Model is the appropriate regression model for this study.

Table 7. Breausch-Pagan Lagrangian multiplier test

Chi-Square Value	P value
2.81	0.0468

Heteroscedasticity Tests: Heteroscedasticity, or unequal variance of residuals, was examined using the Breausch-Pagan/Cook-Weisberg test, as presented in Table 8. The test, with an F-statistic 2.89 and a p-value of 0.089, suggests the acceptance of the null hypothesis. This recommends that the residuals' variance remains consistent across the range of measured values, confirming the homoscedasticity of the data.

Table 8. Heteroscedasticity tests

Breusch-Pagan/ Cook-Weisberg test for heteroskedasticity	
H0: Constant Variance	
Variables: fitted values of ROE	
F(1, 68)	2.89
Prob>F	0.089

After conducting the Hausman test and Breusch & Pagan test, the Random Effects regression model emerged as the appropriate choice for making inferences. This model's usage was justified due to its strong alignment with the study's data.

Analyzing the specific regression coefficients of the Random Effects Model in Table 4, it is ob-

served that the service fee (LnSF), a component of non-interest income, displayed a regression coefficient of -0.224 with a non-significant p-value of 0.719 (>0.05). This indicates a negative but non-significant impact of the service fee on ROE. This finding is at odds with prior research that generally suggested a positive association between service fees and profitability (DeYoung & Rice, 2004; Shah et al., 2018).

Examining another facet of non-interest revenue, the dividend on equity instruments (LnDIV) exhibited a negatively significant effect on ROE with a p-value of 0.045 (<0.05). This result contradicts conventional understanding, possibly attributed to the disruptive impacts of COVID-19 on the economy. The pandemic-induced economic downturn might have led DFIs to favor safer investments, adversely affecting the impact of dividends on equity instruments on ROE.

Furthermore, the regression coefficient for the ratio of non-interest income to total operating income (NONII) was 3.681, with a p-value of 0.598. The statistically insignificant p-value suggests that the proportion of non-interest incomes possess a positive but insignificant influence on the performance of Nepalese DFIs. This finding supports the assumption that non-interest income and profitability are positively correlated (Shah et al., 2018).

Regarding the control variables, the non-performing loan to total loan ratio (NPL) displayed a positive but insignificant impact on ROE, with a regression coefficient of 0.711 and a p-value of 0.277 (>0.05). In contrast, the equity-to-total assets ratio (EQUITY) demonstrated a negatively significant effect on the profitability of Nepalese DFIs, with a p-value of 0.000 (<0.05). The regression coefficient of the cost-to-income ratio (CIR) was -0.432, and its p-value was 0.000 (<0.05), suggesting a negatively significant impact on ROE.

Table 9. Summary of hypothesis testing

Hypotheses	P-value	Remarks
H1: Service fees significantly impact the performance of DFIs.	0.719	Rejected
H2: Dividends on equity instruments significantly impact the performance of DFIs.	0.045	Accepted
H3: Non-interest income to total operating income significantly impacts the profitability of DFIs.	0.598	Rejected
H4: NPL to total loan ratios have a significantly positive relationship with the performance of DFIs.	0.277	Rejected
H5: Equity to Total Assets ratio significantly impacts the profitability of DFIs.	0.000	Accepted
H6: Cost-to-income ratio significantly impacts the profitability of DFIs.	0.000	Accepted

It is evident from the coefficients that the equity to total assets ratio exhibits the highest negative significance on ROE, followed by the dividend on equity instruments. These outcomes illustrate the complex interplay of various factors in influencing the profitability of DFIs, highlighting the need for an in-depth understanding of these relationships.

4. DISCUSSION

The study's primary finding highlights that non-interest revenue generally has an insignificant effect on the profitability of Nepalese DFIs. This contrasts with the results of Shah et al. (2018), who discovered a significantly positive relationship between non-interest revenues and the profitability of joint venture banks in Nepal. However, this inconsistency might be attributed to the inclusion of finance companies and development banks in this study, whereas Shah et al. (2018) focused solely on joint venture commercial banks. The diverse range of service fees among these institutions might explain the misalignment. Furthermore, the ratio of non-interest incomes to total operating incomes possessed a positive and non-significant impact on ROE. This result aligns with previous studies by Andrezejuk (2017), Antao and Karnik (2022), Goddard et al. (2008), Sun et al. (2017), and Tolangga and Ulpah (2019). These results suggest that a more significant proportion of non-interest

incomes in total operating incomes can potentially boost the overall performance of Nepalese DFIs.

In contrast, the sole independent variable with a significant impact on ROE was dividend on equity instruments, which exhibited a negative and significant impact. This finding contradicts Shah et al. (2018), who identified a positively significant relationship between dividend income and the performance of joint venture banks in Nepal. The variance in findings could be due to the severe economic penalties of the COVID-19 epidemic. The pandemic-induced economic slowdown prompted DFIs to invest in lower-yield securities, thus diminishing the positive effect of dividend income. This study also confirmed that the non-performing loan to total loan ratio had a positive and insignificant influence on ROE, consistent with Bhattarai's (2017) study.

Additionally, the equity to total assets ratio has a significant impact on ROE, aligning with Prajapati and Shah (2019). Consequently, Nepalese DFIs should consider the equity to total assets ratios as a determinant of ROE. The significantly negative effect of the cost-to-income ratio on ROE resonates with prior research by Doumpos et al. (2016), Sun et al. (2017), and Uddin et al. (2021). This emphasizes the importance of minimizing operating expenses and enhancing operating income for improved financial performance.

CONCLUSION

This study demonstrates that while non-interest income components, such as dividends on equity instruments and control variables, including cost-to-income ratio and equity-to-total assets ratio, significantly impact the ROE of Nepalese depository financial institutions (DFIs), other variables, such as service fee, non-interest incomes to total operating incomes ratios, and non-performing loan to total loan ratios do not. These findings hold valuable implications for decision-makers within Nepalese financial institutions, offering insights into income diversification strategies. The study highlights the need for developing a sustainable profit transformation model within the Nepalese banking system to reduce over-reliance on interest income and enhance income diversification, which is particularly crucial during financial crises.

AUTHOR CONTRIBUTIONS

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