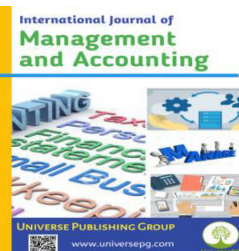




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Analysis of Structural Break in the Profitability of Bangladesh's Non-banking Financial Institutions Due to Covid-19

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Abstract

The study analyzed the possible existence of a structural break in a regression model for the profitability of Bangladesh's non-banking financial institutions (NBFIs) due to Covid-19. For this study, a regression model was first specified based on existing literature on the determinants of NBFI profitability. Then, three separate multiple regression analyses were done; first on the complete dataset, then on the pre-pandemic dataset and finally on the post-pandemic dataset. After that, Chow test was done to determine the existence of a structural break. The results from the Chow test revealed that there was indeed a change in how the independent variables affected NBFI profitability following the pandemic. More specifically, the regression analyses revealed that variables such as loan ratio, non-performing loan ratio, deposit ratio and net interest margin, that had no statistically significant impact on profitability before Covid-19 started to significantly impact profitability after Covid-19. Moreover, the capital adequacy ratio, which had a significantly negative impact on profitability before the pandemic started to have a significantly positive impact after the pandemic. Possible explanations for these findings include falling interest rates and rising economic and financial uncertainties that accompanied the pandemic.

Keywords: NBFIs, Profitability, Structural break, Regression, Chow test, Covid-19, P and andemic.

1. Introduction

The financial sector is a crucial component of a country's economy. It acts as a primary intermediary between lenders and borrowers and facilitates economic activities across various sectors. As a result, any sort of failure in this sector can spread to other non-financial sectors (Tarashev *et al.*, 2009). In the financial sector of Bangladesh, the non-bank financial institutions (NBFIs) play a crucial role. As of December 2023, there were 35 NBFIs, with over 440 billion Bangladeshi Taka (BDT) worth of deposits in over 400,000 accounts and loans and advances worth over 730 billion BDT disbursed to over 200,000 accounts (Paul, 2024).

With such promising figures, NBFIs undoubtedly have the potential to take Bangladesh's financial sector forward. It is, therefore, crucial for NBFIs to be highly profitable. The profitability of a NBFI portrays its managerial efficiency and long-term sustainability (Bangladesh Bank, 2021). No analysis of NBFI profitability, however, is fruitful without first examining its determinants. The determinants of NBFI profitability in Bangladesh tend to be multifaceted in nature, involving a combination of both firm-specific and external factors. Navigating these determinants effectively requires NBFIs to be adaptable, innovative, and proactive in their

strategic planning and risk management. By understanding and responding to these determinants, NBFIs can enhance their resilience and contribute more robustly to the financial system of Bangladesh. This study, however, focuses only on firm-specific variables as they are easier for individual firms to manipulate. It first specifies a regression model consisting of firm-specific independent variables based on existing literature. Then it carries out three separate regression analyses: once on the entire 5-year dataset, then on the pre-pandemic dataset and finally on the post-pandemic dataset. Finally, it does a Chow test to determine the existence of a structural break in the regression model.

2. Review of Literature

Studies on the profitability of NBFIs have been relatively scant. Prior to the study by (Sufian & Parman, 2009), very few papers existed on the subject. They took data from 20 Malaysian non-commercial bank financial institutions (NCBFIs) from 2000 to 2004. They then used least squares methods of random effects, fixed effects, and ordinary least square models to examine the determinants of NCBFI profitability. They found out that large NCBFIs with low loans intensity, high operational expenses and high level of capitalization had high profitability. One of the first studies on the profitability of Bangladeshi NBFIs was done by (Rahman & Farah, 2012). In their regression analysis, they used net profit as the dependent variable and current asset, financial expense, long-term liability, interest income, and operating revenue as independent variables. They concluded from their findings that the liquidity conditions and operating efficiency of NBFIs significantly affected the firms' profitability.

Years later, (Imtiaz *et al.*, 2019) used firm size, capital adequacy ratio, loan ratio, non-performing loan ratio, deposit ratio, net interest margin, non-interest income margin and cost to income ratio as dependant variables to evaluate profitability. For their analysis, they selected 12 Bangladeshi NBFIs based on their data availability and market share. They found out that capital adequacy ratio, non-performing loan ratio and deposit ratio had significantly negative impacts on probability while net interest margin had a significantly positive impact. (Shahriar *et al.*, 2021) studied the effects of firm-specific factors on the profitability of Bangla-

deshi NBFIs. Taking data from 16 NBFIs from 2010 to 2019, he then used both Ordinary Least Square Estimation and Fixed Effects Model to obtain results. Variables like total liabilities to shareholders' equity, total liabilities to total assets, operating costs to total assets and total deposits to total assets were found to significantly impact profitability under both models. Meanwhile, loan, leases and advances to total assets and size significantly affected profitability only under Ordinary Least Square Estimation while operating cost to total income and total deposits to total liabilities significantly affected profitability only under the Fixed Income Model (Ndifor CN *et al.*, 2023).

(Khan, 2023) analysed the effects of organization's size, capital adequacy ratio, non-performing loan ratio, liquidity ratio, age, and leverage on profitability. He took data from 22 Bangladeshi NBFIs from 2012-2021. He used both ROE and ROA as proxies for profitability. He found out that size and capital adequacy ratio had significant positive impacts while liquidity had a significant negative impact on both ROE and ROA. The significant positive impact of capital adequacy ratio contradicted the findings in the (Imtiaz *et al.*, 2019) study where the capital adequacy ratio was shown to have a negative impact. Age, meanwhile, had a significantly negative impact on ROA but no significant impact on ROE. Even fewer studies have highlighted the impact of Covid-19 on NBFIs. One such study was by (Waliszewski, 2020). From his study involving the Polish non-bank loan market, he found out that value of loan sales fell after the Covid-19 pandemic. He attributed that to a decline in demand for loans during the pandemic. A similar study was also done on the effects of Covid-19 on NBFIs in Ghana by (Peprah, 2021). He noticed a decline in the values of savings and a deterioration in loan portfolios. The latter led to a reduction in interest income. (Chow, 1960) proposed a test that could be used to confirm whether the sets of coefficients in two separate linear regressions could be considered equal. Today, that test is widely known as the Chow Test.

Rationale of the study

Several studies have been done on the determinants of NBFIs profitability, both in and out of Bangladesh. However, there is currently no study that directly addresses whether NBFIs profitability data during or

after Covid-19 can be explained by same sets of determinants as data before Covid-19. Therefore, this study seeks to determine the existence of structural breaks in the dataset by using the Chow Test.

Limitation of the study

One major limitation of the study is that the regression model specified for the study only includes firm-specific independent variables. It does not include external variables that could potentially impact NBFi profitability.

3. Methodology

This study first analyzed prior relevant literature and then applied their models to determine the profitability of NBFIs in Bangladesh. The relationships between dependent and independent variables were estimated using a multiple regression analysis. Results of the multiple regression analysis were first obtained for the combined dataset and then separately for the datasets before and after Covid. The Chow test was then done to determine whether there was a structural break in the multiple regression models.

Data Source

Data for this study were collected exclusively from secondary sources. Data were gathered from published annual reports of NBFIs from the 5-year period of 2018-2022. Out of the 35 NBFIs currently operating in Bangladesh, only 20 of them were selected as yearly data were available for them throughout the period. Other NBFIs, which did not have data throughout the entirety of the period, were rejected.

Regression Model Specification

Several studies found that determinants like capital adequacy ratio, deposit ratio, operating cost to asset ratio, leverage ratio, liquidity ratio, loan ratio, net interest margin, non-performing loan ratio and size had significant impacts on NBFi profitability (Imtiaz *et al.*, 2019; Shahriar *et al.*, 2021; Khan, 2023). Based on these findings, this study has specified the following multiple regression model:

$$ROE_{jk} = \beta_0 + \beta_1 FS_{jk} + \beta_2 CAR_{jk} + \beta_3 LR_{jk} + \beta_4 NPLR_{jk} + \beta_5 DR_{jk} + \beta_6 NIM_{jk} + \beta_7 LEV_{jk} + \beta_8 LIC_{jk} + \beta_9 OCA_{jk} + \epsilon_i \dots \dots \dots (1)$$

Where,

- ROE_{jk} = Return on Equity,
- FS_{jk} = Firm Size,
- CAR_k = Capital Adequacy Ratio,
- LR_{jk} = Loan Ratio,
- NPLR_{jk} = Non-performing Loan Ratio,
- DR_{jk} = Deposit Ratio,
- NIM_{jk} = Net Interest Margin,
- LEV_{jk} = Leverage Ratio,
- OCA_{jk} = Operating Cost to Asset Ratio

In the equation above, j = 1, 2, ..., 20, representing the number of NBFIs analyzed and k = 1, 2, ..., 5, the number of years in the 5-year period from 2018 to 2022. ε_i is the error term that is assumed to be normally distributed.

In several studies including this one, ROE has been the chosen proxy for profitability. It is the ratio of profit after tax to total shareholders' equity. The independent variables, meanwhile, have been measured as follows:

- The natural logarithm of total assets for firm size.
- Total equity divided by total assets for capital adequacy ratio.
- Total loans divided by total assets for loan ratio.
- Total non-performing loans divided by total loans for non-performing loan ratio.
- Total deposits divided by total assets for deposit ratio.
- Net interest income divided by total assets for net interest margin.
- Total liabilities divided by total shareholders' equity for leverage ratio.
- Total operating costs divided by total assets for operating cost to asset ratio.

Three separate regression analyses were done for the sake of this study. The first analysis was done for the combined dataset. The second analysis was for data from the pre-pandemic period (2018-19). The third and final analysis was for data from the post-pandemic period (2020-22).

Chow Test Analysis

The Chow test is a test that determines the existence of structural breaks in a regression model. It is used to determine whether the estimated coefficients of one dataset are equal to those of another dataset. In regression analysis, it is often used to test whether independent variables have different effects on

different subgroups of a population. The Chow test statistic follows the F-distribution with (N - 2k) degrees of freedom, where N is combined number of observations in both groups and k is the total number of parameters. It is calculated as shown in equation (2):

$$F = \frac{\frac{RSS_C - RSS_B - RSS_A}{k}}{\frac{RSS_A + RSS_B}{N - 2k}} \dots\dots\dots (2)$$

Where,

RSS_C = Sum of squared residuals from combined data,

RSS_B = Sum of squared residuals from data before event, and

RSS_A = Sum of squared residuals from data after event

The Chow test was used in this study to determine whether or not the chosen determinants had the

same effects on NBF1 profitability both before and after Covid-19. The following hypotheses were formulated:

H₀: There was no structural break in the regression model

H_A: There was a structural break in the regression model

4. Results and Discussion

Multiple regression analyses results

The results of the multiple regression analysis for the complete dataset from 2018 to 2022 are shown in **Table 1**. From the table, it can be observed that R² was 0.901. This means that the independent variables in this model were able to explain 90.1% of the variations in ROE. The F-statistics in the table below is also very high, at 102.953. It is thus significant at the 5% level. This means that the regression model provides a good fit.

Table 1: Multiple regression analysis results for complete dataset (2018-2022).

Regression Output	
Multiple R	0.949
R Square	0.901
Adjusted R Square	0.892
Standard Error	0.215
Observations	100

	df	SS	MS	F	Significance F
Regression	8	37.970	4.746	102.953	0.000
Residual	91	4.195	0.046		
Total	99	42.165			
	Coefficients	Standard Error	t Stat	P-value	
Intercept	-5.732	0.872	-6.573	0.000	
FS	0.222	0.031	7.129	0.000	
CAR	0.400	0.186	2.151	0.034	
LR	1.133	0.293	3.866	0.000	
NPLR	-0.761	0.176	-4.326	0.000	
DR	0.385	0.128	3.014	0.003	
NIM	-3.692	1.044	-3.535	0.001	
LEV	-0.077	0.003	-27.198	0.000	
OCA	3.438	2.419	1.421	0.159	

An examination of the t-statistics reveals that all variables except operating cost to asset ratio (OCA) are statistically significant at 5% level. The t-statistic of OCA contradicted the finding by (Shahriar *et al.*, 2021) where the operating cost to total asset ratio was found to have a significantly negative impact at the 1% level.

What was also interesting was that the coefficients of the deposit ratio and the net-interest margin

variables, though statistically significant, were positive and negative respectively. Those were contradictory to the findings in the (Imtiaz *et al.*, 2019) study where the deposit ratio appeared to have a negative impact while the net-interest margin appeared to have a positive impact. The next multiple regression analysis was on the pre-pandemic dataset, from 2018 to 2019. The results of that analysis are shown in **Table 2**. R² in the table

below is 0.954, which means that the independent variables better explained the variations in ROE in the pre-pandemic period than in the whole period.

The F-statistic was 80.179 and was thus significant at the 5% level.

Table 2: Multiple regression analysis results for pre-pandemic dataset (2018-2019).

Regression Output					
Multiple R			0.977		
R ²			0.954		
Adjusted R ²			0.942		
Standard Error			0.177		
Observations			40		
	df	SS	MS	F	Significance F
Regression	8	20.207	2.526	80.179	0.000
Residual	31	0.977	0.032		
Total	39	21.184			

	Coefficients	Standard Error	t Stat	P-value
Intercept	-3.140	1.130	-2.779	0.009
FS	0.165	0.042	3.946	0.000
CAR	-0.930	0.309	-3.008	0.005
LR	-0.209	0.452	-0.463	0.647
NPLR	0.138	0.383	0.361	0.721
DR	0.179	0.177	1.012	0.319
NIM	3.530	1.770	1.994	0.055
LEV	-0.082	0.004	-22.059	0.000
OCA	0.640	3.949	0.162	0.872

In case of the individual variables, however, only size, capital adequacy ratio and leverage ratio were found to have statistically significant effects on ROE at the 5% level. Moreover, the coefficient of the capital adequacy ratio was negative despite being significant. This contradicts the previous

multiple regression analysis for the complete dataset where CAR had a significantly positive impact on profitability. The final multiple regression analysis was on the post-pandemic dataset, from 2020 to 2022. The results of that analysis are shown in **Table 3**.

Table 3: Multiple regression analysis results for post-pandemic dataset (2020-2022).

Regression Output					
Multiple R			0.944		
R ²			0.892		
Adjusted R ²			0.875		
Standard Error			0.205		
Observations			60		
	df	SS	MS	F	Significance F
Regression	8	17.660	2.208	52.506	0.000
Residual	51	2.144	0.042		
Total	59	19.805			
	Coefficients	Standard Error	t Stat	P-value	
Intercept	-7.275	1.095	-6.646	0.000	
FS	0.269	0.039	6.952	0.000	
CAR	0.789	0.215	3.669	0.001	
LR	1.579	0.355	4.450	0.000	
NPLR	-0.730	0.209	-3.496	0.001	
DR	0.390	0.159	2.454	0.018	

NIM	-5.388	1.338	-4.026	0.000
LEV	-0.077	0.005	-16.955	0.000
OCA	4.993	2.790	1.789	0.080

R² in the table above is 0.892, which means that the independent variables only explained 89.2% of the variations in ROE. It was less than the R² figures in both the pre-pandemic period and in the whole period. The F-statistic was 52.506 which meant that it was significant at the 5% level. The variables, meanwhile, all had statistically significant impacts on ROE with the exception of OCA at 5% level. Like in the case of the first regression analysis, non-performing loan ratio, net-interest margin and leverage ratio had negative coefficients while the remaining variables all had positive coefficients.

Chow test analysis results

After the multiple regression analyses, a Chow test was done to evaluate the presence of any structural break. The results of the Chow test are shown in **Table 4**.

Table 4: Chow Test Analysis Results.

Results	
RSS _C	4.195
RSS _B	0.977
RSS _A	2.144
k	9
N	100
F	3.135
Significance F	0.003

In the table above, it can be seen that the F-value for the Chow test was 3.135, which is significant at the 5% level. Thus, the null hypothesis that there was no structural break in the regression model can be rejected.

Interpretations of the results

A careful analysis of the chow test results shows that the residual sum of squares (RSS) from pre-pandemic profitability data was much lower than the RSS from combined and post-pandemic data. That resulted in the F-statistic being high, thus confirming the existence of a structural break. The low RSS is even more baffling given the fact that the pre-pandemic dataset had fewer significant independent variables than the post-pandemic dataset. Variables like loan ratio, non-performing loan ratio, deposit ratio and net interest margin that were found to significantly impact post-pandemic

profitability had no significant effects on pre-pandemic profitability. This potentially reflects increased unpredictability of NBFi profitability following the pandemic. It could explain, why despite having more significant variables, the regression model could still not explain post-pandemic data fluctuations as well as it could explain pre-pandemic data fluctuations. The increase in the number of significant variables, meanwhile, might be largely explained by the fall in interest rates that accompanied the pandemic (The Business Standard, 2020).

As interest rates fell, NBFIs were earning less from their investments in bonds and other securities. As a result, they became more dependant on interests from unclassified loans for their profits. That could explain the positive impact of loan ratio and the negative impact of non-performing loan ratio on post-pandemic profitability. The negative impact of net interest margin could be explained by the fact that any increase in NBFi net interest income was being more than offset by a decline in income from securities investments.

Any increase in net interest income was only making the situation worse. The positive impact of deposit ratio might be attributed to the fall in deposit rates. NBFIs were paying depositors at lower interest rates. Another interesting finding was that the capital adequacy ratio (CAR), which had a significantly negative impact on pre-pandemic profitability, had a significantly positive impact on post-pandemic profitability. The negative impact on pre-pandemic profitability could be attributed to the missed opportunities for investment that NBFIs with high CAR would have to bear. During the pandemic, however, as there was economic uncertainty, NBFIs with higher CAR would be in a better position to retain financial stability and continue operations.

5. Conclusion

Even though prior studies had been done on factors that could determine NBFi profitability, no quantitative study was done on the impact of Covid-19 on profitability. Given the economic uncertainties associated with the coronavirus pandemic, this study examined the existence of structural breaks in the

relationship between profitability and its determinants. Secondary data was first obtained from the annual reports of 20 NBFIs from 2018 to 2022. The data was then separated to produce a pre-pandemic dataset from 2018 to 2019 and a post-pandemic dataset from 2020 to 2022. Afterwards, a regression model consisting of firm-specific independent variables was specified based on existing literature. That regression model was then run three times: first using the complete dataset, then using the pre-pandemic dataset and finally using the post-pandemic dataset. Regression analysis of the post-pandemic dataset revealed that the post-pandemic dataset, despite having more significant variables, could not be explained as well as the pre-pandemic dataset with the same model. Variables like loan ratio, non-performing-loan ratio, deposit ratio and net interest margin that had no significant impact on pre-pandemic profitability were found to significantly affect post-pandemic profitability. Loan ratio and deposit ratio had positive effects while non-performing loan ratio and net interest margin had negative impacts. Moreover, capital adequacy ratio had a significantly negative impact on pre-pandemic profitability but a positive impact on post-pandemic profitability. The Chow test was run after the regression analyses which revealed that there was indeed a significant structural break in the regression model. The structural break and the changes in how several independent variables affected profitability were assumed to be caused by increased uncertainty and lower interest rates following the pandemic. This study, thus, aims to provide NBFIs managers on how profitability could be affected by sudden unforeseen events similar to the Covid-19 pandemic.

6. Author Contributions

The authors hold themselves jointly responsible for the conceptualization of the study, collection and analysis of data, and interpretation of the results.

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8. Conflicts of Interest

The authors have declared no potential conflicts of interest with respect to their research work.

9. References

- 1) Bangladesh Bank. (2021). BB Annual Report 2020-2021. *Bangladesh Bank*.
- 2) Chow, G. C. (1960). Tests of equality between sets of coefficients in two linear regressions. *Econometrica*, **28**(3), 591-605. <https://doi.org/10.2307/1910133>
- 3) Imtiaz, M. F., Mahmud, K., & Faisal, M. S. (2019). The determinants of profitability of non-bank financial institutions in Bangladesh. *Inter J. of Economics and Finance*, **11**(6), 25-32. <https://doi.org/10.5539/ijef.v11n6p25>
- 4) Khan, M. M. (2023). Factors influencing the profitability of Non-Bank Financial Institutions in Bangladesh: A Statistical Analysis. *The Seybold Report*.
- 5) Khandoker, M. S., Raul, R. K., & Rahman, S. M. (2013). Determinants of profitability of Non-Bank Financial Institutions' in a developing country: Evidence from Bangladesh. *Inter J. of Management Sciences and Business Research*, **2**(4), 31-42. https://papers.ssrn.com/sol3/Delivery.cfm?abstract_id=2711155
- 6) Ndifor CN, Musonda N, and Rizkallahi S. (2023). The effect of cashflow visibility on the willingness of financial institutions finance SMEs in Cameroon, *Int. J. Manag. Account.*, **5**(5), 89-98. <https://doi.org/10.34104/ijma.023.0089098>
- 7) Paul, P. (2024). Non-Bank Financial Institutions in Bangladesh: Unsung Financial Heroes. *Star Business*.
- 8) Peprah, J. A. (2021). Disruptions and the protracted effects of the COVID-19 lockdown in the non-bank financial institution sector in Ghana. *Enterprise Development & Micro-finance*, **32**(1), 78-92.
- 9) Rahman, S., & Farah, T. (2012). Non-Bank Financial Institutions' Profitability Indicators: Evidence from Bangladesh. *Inter J. of Applied Research in Business Administration and Economics*, **1**(1), 26-32.
- 10) Shahriar, A. H., Alam, M. J., & Islam, M. N. (2021). Does Non-bank Specific Factors Affect Profitability? Evidence from Non-bank Financial Institutions in Bangladesh. *Research J. of Finance and Accounting*, **12**(20), 46-54.
- 11) Sufian, F., & Parman, S. (2009). Specialization and other determinants of non-commercial bank

- financial institutions' profitability: Empirical evidence from Malaysia. *Studies in Economics and Finance*, **26**(2), 113-128.
- 12) Tarashev, N., Borio, C., & Tsatsaronis, K. (2009). The systemic importance of financial institutions. *BIS Quarterly Review*.
- 13) The Business Standard. (2020). NBFIs lose deposits worth Tk380cr amid pandemic. *The Business Standard*.
- 14) Waliszewski, K. (2020). The impact of the COVID-19 pandemic on the non-bank loan market in Poland. *Financial Sciences. Nauki o Finansach*, **25**(4), 66-74.

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