Impact of Bank-specific Variables on Profitability: An Empirical Study on the Banking Sector of Bangladesh

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Resumen

Este artículo analiza el impacto de algunas variables específicas de los bancos sobre la rentabilidad del sector bancario en Bangladesh. Tomando datos anuales de 1997 a 2019, este estudio analiza el impacto de la capitalización, la morosidad y el costo en la rentabilidad. En este análisis de series de tiempo, primero se llevan a cabo pruebas aumentadas de Dickey-Fuller de estacionariedad y pruebas de cointegración de Johansen y luego se aplica la metodología apropiada del modelo de corrección de errores vectoriales para examinar la relación. Para la variable de capitalización, donde ambos tipos de relación son posibles, se observa que afectó negativamente a la rentabilidad. De acuerdo con la expectativa, se encuentra que el costo afecta negativamente la rentabilidad y es significativo. Para préstamos en mora, se encuentra una relación negativa pero insignificante. Finalmente, se realizan algunas pruebas de diagnóstico para verificar la robustez del modelo. La implicación de política de este documento es que los bancos deben reducir sus gastos y continuar monitoreando los préstamos en mora. Además, los bancos deben tener cuidado con la relación capital-activos por encima de un cierto umbral.

Abstract

This paper analyses the impact of some bank-specific variables on the profitability of the banking sector in Bangladesh. Taking annual data for 1997 to 2019, this study analyses the impact of capitalization, non-performing loans, and cost on profitability. In this time-series analysis, augmented Dickey-Fuller tests of stationarity and Johansen cointegration tests are conducted first and then the appropriate methodology of vector error correction model is applied to examine the relationship. For the capitalization variable, where both types of relationships are possible, it is observed that it affected profitability negatively. According to expectation, it is found that cost negatively affects the profitability and is significant. For non-performing loans, a negative but insignificant relationship is found. Finally, some diagnostic tests are carried out to verify the robustness of the model. The policy implication of this paper is that banks should reduce its expense and continue to monitor non-performing loans. Moreover, banks should be careful about the capital-assets ratio above a certain threshold level.

1. INTRODUCTION

The banking sector is very important for the economic development of a country. It has both direct and indirect contributions to the development of a country. This sector contributes directly to the GDP while it has many diversified impacts on the economy of a country indirectly through various transmission channels. For example, in Bangladesh, the direct contribution of this sector to GDP was 3 percent in 2018-19 (Bangladesh Economic Review, 2019).

It has, however, an even bigger indirect impact on growth and development of Bangladesh. For example, it plays a key role in financial intermediation through channeling savings to investment. In addition to increasing investment, the banking sector also plays a key role in resource allocation (Beck and Rahman, 2006). Through this, it also plays a key role in creating employment. Another crucial indirect impact of the banking sector is on environment. It can play a major role in greening the financial system of the country by implementing various green policies and regulatory measures (Khairunnessa et al., 2021).

Apart from these direct roles, several indirect roles of the banking sector have been noted. For example, it is observed that it has significant though indirect impact on environmental sustainability through lending and investment on activities related to pollution (Schmidheiny and Zorraquin, 1998; Scholten, 2009). Therefore, it is crucial that this sector perform well and continue to contribute for the welfare of the people. Nevertheless, this sector has to go through turbulent times due to various economic and non-economic reasons.

One of the major turbulence that this sector faced in the last couple of decades was the financial recession of 2008-09. Another problem of the banking sector was related to liquidity. While the banking sector in Bangladesh generally had excess liquidity, it faced liquidity crunch a couple of years back. Recently the banking sector is having excess liquidity problem. High amount of non-performing loans over the years also remains as a major concern. While governance and management issues are mentioned as major reasons for problems related to liquidity and NPL, the lack of investment demand due to the Covid 19 pandemic is surely playing a key role in the current situation. All these turbulences can also lead towards lack of trust in the banking sector. Hence, it is crucially important for the banking sector to perform better and therefore identify the variables and their relationships with bank performance.

One of the main indicators of bank performance is profitability, which can be affected by many factors. This paper analyses the impact of some of the bank-specific variables for the banking sector in Bangladesh.

This paper is organized as follows: Section 2 presents a brief review of the literature. Data, variables, and methodology are discussed in Section 3. Estimated results are presented in Section 4 while the paper concludes with some policy implications in the final section.

2. LITERATURE REVIEW

Measuring bank performance has been a major area of research. There are mainly two indicators of bank performance: profitability and risk (Rose, 2002). In this paper, the profitability aspect is examined with the help of some bank-specific variables.

2.1. The dependent variable

When profitability is analyzed, the following two measures of profitability, returns on assets (ROA) and returns on equity (ROE), are commonly used. Although ROE has been used by many studies (e.g. Yuksel et el., 2018; Goddard et al., 2004; Hossain and Ahamed, 2015; Matin, 2017), ROA is deemed as the simplest measure of bank profitability, reflecting the capability of a bank to generate profits from its asset management functions. Therefore, it is frequently used as the key ratio for evaluation of bank profitability in the literature (e.g. Molyneux and Thornton, 1992; Golin, 2001; Claessens and Laeven, 2004; Mamatzakis and Bermpei, 2016; Hossain and Ahamed, 2015; Kohlscheen et al., 2018; Matin, 2017). According to Islam and Rana (2017), ROA is also an indicator of managerial efficiency. Moreover, it reflects the ability of a company to generate profits from its assets. According to the Global Financial Stability Report of International Monetary Fund (2009), to improve profitability, banks should focus on managing their asset quality along with determinants of profitability. Similarly, Demirguc-Kunt (1989) and Barr and Siems (1994) have also stated that asset quality is a major predictor of insolvency.

2.2. Explanatory variables

Among the explanatory variables of profitability, capitalization, non-performing loans and expenditure or cost are used widely to examine their impact on profitability (e.g. Molyneux and Thornton, 1992; Abreu and Mendes, 2001; Staikouras and Wood, 2004; Saeed, 2014; Nisar, 2015; Djalilov and Piesse, 2016; Tan et al., 2017). Therefore, in this study, these three bank-specific variables are used to examine how they affect profitability.

2.2.1. Capitalization

Capitalization or capital-adequacy ratio shows capital amount of the bank in comparison with its risks. The effect of capital adequacy ratio on the profitability of the banks is uncertain. Some studies found a negative relationship between these two variables because a higher amount of capital can lead to lower amount of credit (Buchory 2015). Another reason for the inverse relationship can be that lower capitalization is associated with greater risk taking (Lloyd-Williams et al., 1994).

On the other hand, some other studies have a different opinion. According to them, a high capital adequacy ratio can improve the image of the bank and thus can positively contribute to profitability (Abreu and Mendes 2001; Djalilov and Piesse 2016; Molyneux and Thornton 1992; Saeed 2014). Moreover, higher capitalization can reduce risk of the banks, enable to invest in riskier operations and increase profitability (Ahamed, 2012;

Staikouras and Wood, 2004). Higher capital can also decrease the expected costs of financial distress (Berger, 1995).

2.2.2. Non-performing loans

The non-performing loans ratio has also been extensively used as one of the explanatory variables of earning in many earlier studies. Ariyadasa et al. (2016) observed a negative relationship between NPL and earning for Sri Lanka using a vector error correction model (VECM). Similar relation was obtained by Nisar (2015) for Pakistan. Such results were also obtained by Tan et al. (2017) and Djalilov and Piesse (2016) when they applied the Generalised Method of Moments (GMM) approach. This negative impact could be due to problematic debts (Ombaba, 2013). Vinh (2016) also used GMM and obtained a similar relation on 34 Vietnamese commercial banks profitabilities between 2005 and 2015. Again, same was observed for the Korean banking sector (Banker et al., 2010). For the Japanese commercial banks' performance for the period from 1993 to 1996, Altunbas et al. (2000) reported a negative relationship. In a study on EU countries for the period between 2003-2011, Roman and Tomulease (2013) also found that NPL had significant negative influence on profitability. Similar observations were made by other studies (e.g. Hanna, 2016; Kingu et al., 2018; Opoku et al., 2016).

2.2.3. Expenditure-income ratio

A number of studies have concluded that control of cost or expenditure is one of the primary determinants of bank profitability (e.g. Staikouras and Wood, 2004). This is also termed as expense management or cost management in different studies. Efficient use of labor is a key determinant of relative profitability and staff expense is expected to be negatively related to bank earning. Bourke (1989) found that the level of staff expenses appears to have a negative impact on banks ROA. Brock and Rojas (2000) and Al-Haschimi (2007) observed, respectively for Latin American and Sub-Saharan African (SSA) economies, that unless banks manage to transfer their costs to the lenders, operating expenses are expected to have a negative effect on the profitability.

Conversely, Molyneux and Thornton (1992), Athanasoglou, et al. (2008), and Ramadan et al. (2011) observed a positive relationship between better quality management and profitability. Molyneux (1993), in another study, found a positive relationship between staff expenses and total profits. According to the author, high profits earned by firms in a regulated industry may be appropriated in the form of higher payroll expenditures. Similar relationship was also found by another study on Bangladesh (Matin, 2017). Therefore, although there are mixed findings but still the expense variable is generally expected to have a negative relationship with profitability.

It may be noted that although this variable could look to duplicate the information contained in the dependent variable as it is an approximation of the bank's expected profitability this variable is used as it also measures the aspect of cost efficiency or management quality. The lower the ratio, the higher will be the cost efficiency or management quality. Therefore, a possible negative relationship implies that the higher the inefficiency in management of cost or expense, the lower will be the profitability of banks.

3. DATA, VARIABLES AND METHODOLOGY

This section is divided into three parts. In the first part, data period of this study is discussed. Variable's measurements are narrated in the following section. Finally, the methodology is briefly described.

3.1. Data

In this time series study, annual data of banks were taken for 1997 to 2019 from various issues of annual reports published by Bangladesh Bank, the central bank of Bangladesh. These are described in Figure 1.

Figure 1: Returns on assets, capital-assets ratio, non-performing loans (NPL) to total loan ratio and expenditure-income ratio of the banking sector in Bangladesh (1997-2019)
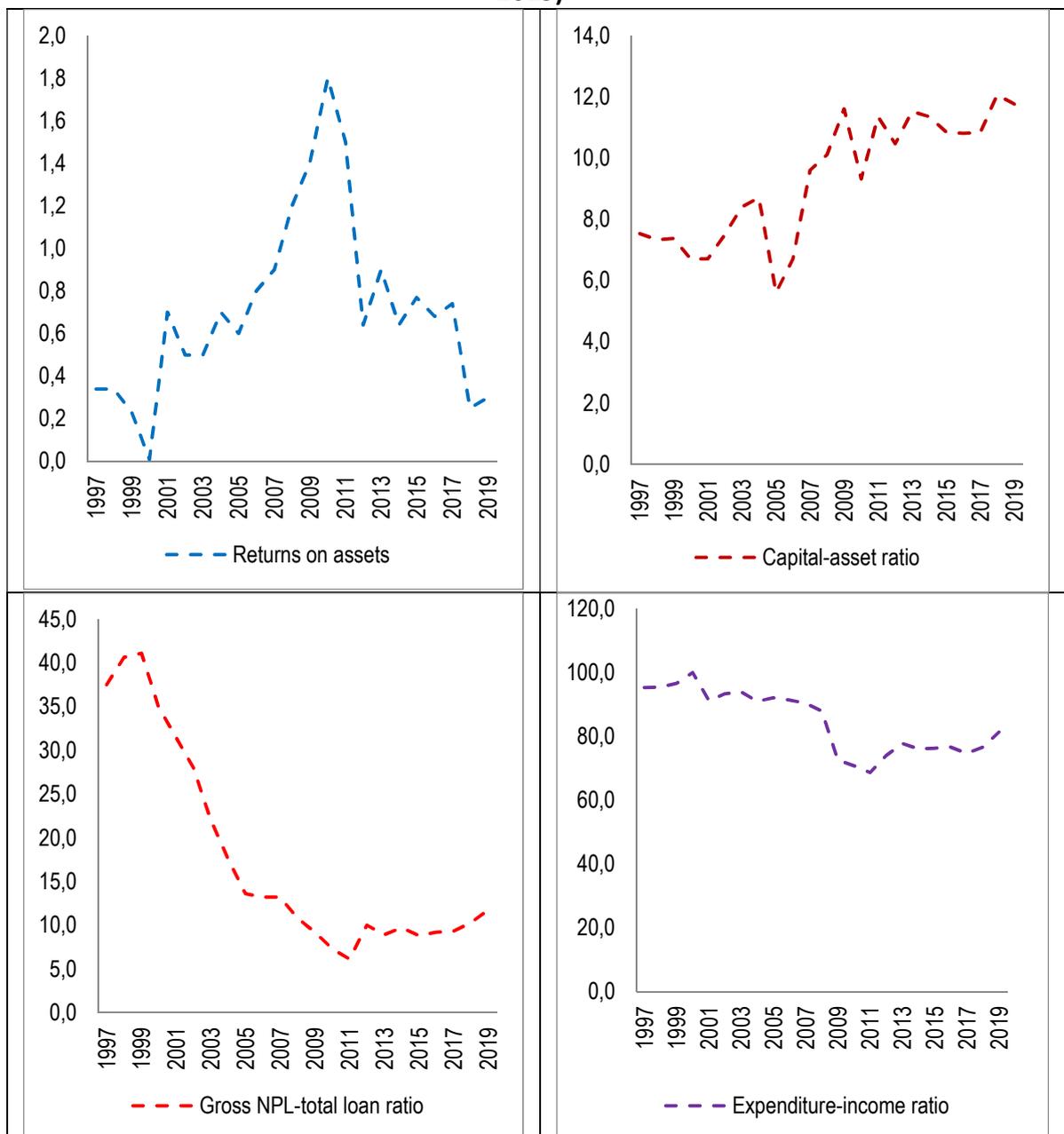
Source: Bangladesh Bank Annual Report, various issues.

In Figure 1, returns on assets, capital-assets ratio, gross NPL to total loan ratio and expenditure-income ratio of the banking sector in Bangladesh are provided for the period 1997 to 2019. Profitability reached its peak around 2009 and then started to fall. It steadied from 2012 to 2017 but then experienced another decrease after that.

The capital-asset ratio experienced a general increasing trend during the study period. Conversely, the gross NPL-total loan ratio experienced a generally decreasing trend till 2011. From 2012, it became steady around 10 percent. The expenditure-income ratio can be divided into two parts: in the first part it hovered around 100 percent for the first 10 years of study and then fell to around 80 percent and stayed around that for the remaining years of this study.

3.2. Variables

The dependent variable of this study is profitability, which is measured by returns on assets (RoA). Three bank-specific variables that are found to affect profitability of banks are taken as the explanatory variables. These are capitalization, non-performing loans and operating cost. Capitalization is generally measured by capital-assets ratio. The non-performing loans variable is measured by gross NPL as a ratio of total loans or net NPL as a ratio of total loans. In this study, gross NPL as a ratio of total loans is taken to measure NPL variable. While the operating cost can be estimated differently, the measure of expense to income ratio is used in this study. All three explanatory variables are taken in natural logarithm form.

Table 1: Expected relationship with the dependent variable

Name of the explanatory variable	Possible relationship
Capital-asset ratio	Ambiguous
Non-performing loan	Negative
Expenditure-income ratio	Negative

Possible relationship of the explanatory variables with the dependent variable is given above. It can be observed that while the relationship between capitalization and profitability is uncertain, the other two explanatory variables are expected to have a negative relationship with profitability. Therefore, the possible model for estimation will be as follows:

$$ROA_t = \alpha_0 - \beta_1 CAPASS_t - \beta_2 NPL_t - \beta_3 EXPINC_t + \varepsilon_t \qquad (1)$$

where, *ROA* = returns on assets;
 CAPASS = natural log of capital-assets ratio;
 NPL = natural log of gross non-performing loans to total loan ratio;
 EXPINC = natural log of expenditure-income ratio.

3.3. Methodology

In this time-series analysis, augmented Dickey-Fuller (ADF) tests of stationarity and Johansen cointegration tests were conducted first and then the appropriate methodology of VECM was applied to examine the relationship among the variables.

The first step in testing the relationship among time series variables is to test for stationarity. As most of the variables are nonstationary, hence it is important to test for stationarity. There are various tests of stationarity, among which the Dickey-Fuller test is the most common one (Dickey and Fuller, 1979, 1981). If the variables are non-stationary, then they are differenced to see if they become stationary or not. Results from the VECM models using non-stationarity variables will be spurious (Granger and Newbold, 1974).

To have a stable and long-run relationship among variables, the variables need to be cointegrated. To check this, various tests of cointegration can be used (Engle and Granger, 1987; Johansen, 1988; Johansen and Juselius, 1990; Pesaran et al., 2001). These tests check for the presence of potential long-run relationship between the variables (Andrei and Andrei, 2015). Here, the error-correction term represents the long-run adjustment mechanism.

If no cointegration relationship is present among the variables, then the Granger test (Granger, 1969) should be applied for a short-run analysis. But if there is cointegrated relationship among the variables, then both short- and long-run can be examined applying the VECM model. Moreover, in case of cointegrated variables, the short-run coefficients of the VECM model can reflect causality (Gupta and Singh, 2016).

Finally, it is also crucial to check the robustness of the models. Such a model should be free from the problems of autocorrelation and heteroscedasticity while the errors should be normally distributed. Therefore, the tests of autocorrelation, heteroscedasticity and normality are applied to check these aspects.

It should be mentioned that checking for stationarity or applying unit root test for time series variables followed by test of cointegration and causality is very common. Among many, some of these are briefly stated below. In their study on the relationship between oil prices and Indian stock market, Tarak et al. (2014) also applied this methodology. Stoica et al. (2014) examined the relationship between policy rate and stock prices for Bulgaria and Latvia using the VECM model. Andrei and Andrei (2015) used similar methodology to test relationship among the macroeconomic variables for Romania.

In a separate study on the banking sector in Sri Lanka, Ariyadasa et al. (2016) applied VECM to analyse the relationship between NPL and earning. Gupta and Singh (2016), in their study on BRICS nations, used VECM to examine the causal nexus between economic growth and foreign direct investment. Zou (2018) also applied VECM model to analyse the relationship between carbon emissions, GDP, and international crude oil prices for the US economy. In another study on the Turkish economy, Sahin (2019) also applied a similar methodology.

4. EMPIRICAL ESTIMATES

According to the standard practice, there are three main steps. Firstly, all the variables are tested for stationarity. Since all the variables are found to be integrated of order 1, therefore test of cointegration is conducted to see if any long-run relationship exists among them. When it is observed that the variables are cointegrated, then the appropriate model of VECM is applied to estimate the long-run relationship of the dependent variable with the explanatory variables.

4.1. Tests of stationarity

For the dependent variable, ROA, the stationarity test shows that the variable is not stationary at level but becomes stationary after first difference. The same is true for all the explanatory variables.

Table 2: Augmented Dickey-Fuller test

Variable	t-Statistic	Prob.*	Test critical values
			5% level
ROA	−1.777020	0.3812	−3.004861
ΔROA	−5.171407	0.0005	−3.012363
CAPASS	−1.464506	0.5313	−3.012363
ΔCAPASS	−4.250322	0.0045	−3.040391
NPL	−1.463891	0.5316	−3.012363
ΔNPL	−4.043193	0.0061	−3.020686
EXPINC	−1.126467	0.6851	−3.012363
ΔEXPINC	−3.991262	0.0068	−3.020686

*MacKinnon (1996) one-sided p-values.

4.2. Test of cointegration

As all the variables are integrated of order 1, hence Johansen test of cointegration is applied to see if there is any cointegrated relationship. The results of the cointegration tests are reported in Table 3.

The optimum lag length is found to be one, which is obtained by using Akaike Information Criterion. Critical values are taken from Osterwald-Lenum (1992). From the table below, it can be observed from the both the trace and the maximum eigen value tests that the null hypothesis of no cointegration is rejected. The results also show that at least one cointegrating equation exists among the variables.

Table 3: Cointegration test

Hypotheses		Statistic	Critical value 5%	Prob.
Null	Alternative			
Trace test				
None		67.15956	47.85613	0.0003
At most 1		26.00797	29.79707	0.1285
Maximum eigenvalue test				
r = 0	*r = 1*	41.15160	27.58434	0.0005
r <= 1	*r = 2*	13.50083	21.13162	0.4073

4.3. Application of VECM

After the stationarity and cointegration tests, the VECM is applied as the variables are integrated of order 1 and there is a long-run relationship between them. The result is provided below:

$$ROA = 55.047 - 4.969\ CAPASS - 0.272\ NPL - 9.632\ EXPINC \qquad (2)$$
$$(0.478)\qquad(0.189)\qquad(1.231)$$

For the capitalization variable, where both types of relationships are possible, it is observed that it affected profitability negatively. Possible explanation for this can be that although higher amount of capitalization reduces risk, but it also reduces the amount of loanable funds and hence earnings of banks. According to expectation, it is found that the expenditure variable negatively affects profitability. For both capitalization and expenditure variable, there is a significant relationship. For the NPL variable, although the relationship is found to be negative in line with the expectation but is insignificant. However, insignificant negative relationships of NPL on profitability are also observed in some earlier studies (e. g. Hossain and Ahamed, 2015; Matin, 2017).

To verify the robustness of the models, diagnostic checking of the estimated models has been carried out. This is to check for autocorrelation, normality, and heteroscedasticity. The findings are reported in Table 4 below.

Table 4: Diagnostic tests

Diagnostic tests	Statistic	*p*-value
Serial Correlation LM Tests	13.96	0.60
Jarque-Bera (Joint)	8.81	0.36
Heteroskedasticity Tests	95.74	0.60

From the results above, there is no autocorrelation and heteroscedasticity problems. Moreover, the model also passes the Jarque-Bera normality test, indicating the error is normally distributed in this model.

4.4. Robustness check

It should be reported that the similar procedure of estimation was carried out for another profitability measure of returns on equity (ROE). Similar result was obtained for this measure of profitability which further strengthens the finding of this paper. The result is not reported for the sake of brevity.

5. CONCLUSION AND POLICY IMPLICATION

In this time series study of the banking sector in Bangladesh for 1997 to 2019, it is observed that bank-specific factors generally influence its profitability. Among the three explanatory variables, previous studies obtained mixed results for the capital-assets ratio variable. There is a debate about whether higher capital ratio is beneficial for banks. According to the standards established in the Basel accords, a minimum percentage of capital is required. However, there is also an argument that a higher capitalization of banks can lead to lower profitability and fragility. For the banking sector of Bangladesh, the observed negative relationship could imply that although capital-assets ratio is important for the strength of banks, it should not be over the required amount as this can impact earning negatively. Therefore, capitalization according to the Basel accords should be maintained. But at the same time, excess capitalization over the minimum requirement should be avoided to evade problems like lower profitability.

For the expenditure-income ratio, the relationship is negative and significant as expected. This implies that banks should be careful in controlling its costs as it can affect the earning of banks adversely. Although the gross NPL-total loan ratio coefficient is found to be negative as per expectation, it is not found to be significant. This may mean that despite of the problems related to NPL, the banking sector in Bangladesh has performed reasonably well and was able to sideline the impact of NPL in a successful way.

As stated at the beginning of this paper, the banking sector of Bangladesh has both direct and indirect contributions on its economy. However, this sector also faces various difficulties which ultimately affect various performance indicators. Therefore, it is crucially important to identify the bank-specific factors as they can be relatively easily controlled. Hence, this study focused on the impact of the bank-specific factors on profitability.

The above findings can be helpful for the policy makers. Firstly, while it is important to maintain a reasonable capital-adequacy ratio (CAR), it should also be remembered that CAR should not increase much after a threshold level. The CAR according to Basel agreements can be a guideline in this regard. Secondly, as NPL is observed to have a negative relationship with profitability, therefore careful observation should be continued to reduce bad loans. However, since the coefficient is insignificant, more attention can be given to other significant factors. Finally, management efficiency and adequacy have an inverse relationship with ROA, it is crucial to control the expense-income ratio to increase the earning and thus the performance of banks.

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