IMPACT OF INTEREST RATE, EXCHANGE RATE, AND INFLATION ON COMMERCIAL BANKS' PERFORMANCE

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Abstract

This study aims to measure the impact of interest rates, exchange rates, and inflation on the performance of commercial banks in Albania, using monthly data from December 2015 to May 2022 obtained from the Bank of Albania and the Institute of Statistics of Albania (INSTAT). The multiple regression model measures the relationship between the dependent variable (*ROA*) and independent variables (*inflation*, *interest rate*, and *exchange rate*). The estimation results reveal that the interest rate variability has a high impact on the financial factor *ROA*. In contrast, the variability of the exchange rate harms it. The effect of variable nominal effective exchange rate (*NEER*) on *ROA* is low, and inflation negatively influences it. The model has resulted within all the criteria related to the regression analysis but with a low importance level. The important conclusion of this study is that the combination of variables, inflation, exchange rate, and interest rate, does not measure the impact of inflation on the performance of commercial banks. Other micro and macroeconomic factors can measure this impact.

Keywords: Inflation, Interest Rate, Exchange Rate, Commercial Bank Performance, Albania, ROA

Authors' individual contribution: Conceptualization — F.M.; Methodology — F.M. and M.H.; Formal Analysis — M.H.; Writing — Original Draft —F.M.; Writing — Review & Editing — F.M. and M.H.

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1. INTRODUCTION

This paper aims to measure the impact of interest rates, exchange rates, and inflation on the performance of commercial banks in Albania. This study is an interesting and timely topic for Albania, especially after the situation created by COVID-19, the November 2019 earthquake, and the War in Ukraine. Despite these events, the projection for three main macroeconomic indicators, gross domestic product (GDP), exchange rate, and interest rate, is good. Albania's GDP growth rate for 2021 was 8.54%, a 12.03% increase from 2020 (Albania's GDP growth rate for 2020 was -3.48%). For the year 2022, the economy was projected to grow by 3.7%, and around 2% in 2023 (International Monetary Fund [IMF], 2022). During 2022, the exchange rate of the lek has been stable. The immediate interest rate risk in the banking sector has decreased during the same period (to the level of 4%). It remains significantly below the upper limit determined by the regulatory framework (20%). Even though exposure of Albania to war in Ukraine is limited, with twin deficits and high

government debt, the Albanian banking sector, both in terms of its performance and resilience, is being tested. All these events have impacted positively or negatively on GDP growth, exchange rates, and inflation. Therefore, the present economic and financial situation raises the question of how Albanian banks will cope with these developments.

The Bank of Albania evaluates the situation of the banking sector's operations as stable for the first half of the year 2022, and risks have remained at restrained levels. The banking sector in Albania represents most of the financial sector, which in Albania mostly consists of banks that account for nearly 90% of the total financial sector assets, and there are no changes until June 2022. Shares of non-bank financial institutions, investment funds, pension funds, etc., are negligible. The banking sector represents 89%, non-bank financial institutions (NBFI) 3.9%, insurance companies 2.3%, pension funds 0.2%, savings and loan associations 0.7%, and investment funds 3.9%, of the financial sector (Bank of Albania, 2020). The capital structure continues to be dominated by a foreign one. The end of 2021, represented nearly 75.12% of the paid-up capital of the banking system. seems to have a decrease of about 0.92 percentage points compared to the end of 2020. The top four countries of origin of foreign banks operating in Albania are Turkey 27.24% of assets, Austria 18.6%, Italy 12.64%, and Hungary 7.27%. To understand the health of the financial system and its recent trends, the focus should be on commercial banks. At the end of 2021, 12 banks were operating in Albania, and most had nonresident ownership. Profitability indicators, return on average assets (RoAA), and return on average equity (RoAE), respectively, increased compared with 2020. At the end of 2021, RoAA stood at 1.31% while RoAE stood at 12.89% from 1.10% and 10.41%, respectively, at the end of 2020 (Bank of Albania, 2021).

In the second half of 2022, credit quality marked a slight decline. This process is related to the developments that followed the start of Russia's war against Ukraine. The high energy costs brought a slowdown in the economy and a decrease in the income of businesses and families. Of course, this situation can harm the bank's loan portfolio quality. The medium-term loan (7.7%), business loan (6.2%), as well as loan in lek (5.9%), keep the highest values of the ratio of problem loans at the end of June 2022. Banks have continued to create provisions (reserves) for problem loans, but their level has been controlled. These values fell to 63% from 68%, which was the level recorded a year ago (Bank of Albania, 2022).

Inflation has increased significantly after the start of the war in Ukraine. The annual inflation rate in Albania slowed to 7.9% in November of 2022 from 8.3% in the previous month. The effect of inflation on the economy is of different types. Inflation reduces purchasing power if fewer goods and services are bought for the same amount of money. Inflation has different impacts on various sectors of the economy; in some has a negative effect and in others a positive one. Inflation undermines the actual value of money in financial instruments. Fixed-rate borrowers benefit from rising inflation as real interest rates fall. Despite the positive impact of several factors, unpredictable inflation harms the economy as a whole. It makes markets inefficient and undermines the forecasts and long-term budget plans of various companies. Inflation shifts focus from productivity because it affects the income sources that come from products and services, i.e., profit (Taylor, 2008). Another effect of inflation is the increase in uncertainty by discouraging investments and savings, while the hidden effect is the increase in taxes. Hyperinflation affects the restriction of currency use by influencing the acceleration of inflation (Bulkley, 1981). This affects the functioning of the economy by influencing the supply of goods and services, but hyperinflation can move local currencies in and out of the country. Inflation also affects labor market efficiency, influencing firms' wages and compensation schemes. As inflation increases, labor demand declines, and real wages fall. Inflation decreases real wages and keeps nominal wages constant. With moderate inflation, the labor market moves faster toward equilibrium (Tobin, 1972). Inflation is used to control the supply of funds by influencing the setting of discount rates, the interest rates banks borrow from central banks, and the operation of open markets linked with central bank interventions in bond markets, which means that it is one of the main tools. If the economy is in decline and the nominal interest rates are low, banks cannot lower these rates any further.

The monetary policy of the Bank of Albania has been oriented toward promoting the monetary market for liquidity, which proves to be sufficient to prevent the destabilization of the commercial and consumer credit market. In most prices, the current increase in inflation is not influenced by internal factors. Demand remains below its pre-crisis trend. The economy is experiencing a series of supply shocks that lead to increased inflation and reduced demand. The pandemic brought about a mismatch between demand and supply, particularly in energy and international commodity prices, but with uneven effects across sectors. The data show that bad inflation is still dominant in the euro area. Before the war in Ukraine, nominal household income had not recovered from its pre-pandemic trend, and households were saving more of their income than before the pandemic. Consumer spending and investment remain well below their pre-crisis trends. About 60% of inflation in January was driven by energy, of which the eurozone is a net importer. This situation is a consequence of the recent extraordinary increases in oil and gas prices. The increase in the cost of energy has increased even more after the Russian aggression in Ukraine. Inflation is being affected by the global shift in consumer spending, as the pandemic has disrupted production.

Inflation indicators need to be considered to measure commercial banks' performance. Effective bank performance indicators are interest margin, interest-free margin, pre-tax profit, and net profit. The profit margin depends on the bank's profitability and shows them how to handle interest rates and asset and liability structures. Financial analysis indicators are the primary way to assess a bank's profitability, based on an analysis of the actual values calculated on the coefficients and a comparison of reference levels, a comparison of bank coefficients with competing banks, and

an assessment of the dynamics of the coefficients. The main indicators to measure bank performance are return on assets (ROA), return on equity (ROE), and net interest margin (NIM). ROA is a measure of the bank's net rate of return after tax on an asset; ROE shows the amount of net income that an asset unit brings to a bank; NIM is the bank's ability to generate income, but various interest income as a percentage of net worth.

The important conclusion of this study is that the combination of variables, *inflation*, *exchange rate*, and *interest rate*, does not measure the impact of inflation on the performance of commercial banks.

The paper is structured as follows. Section 1 introduces the theoretical description of the effect of inflation on the economy, the situation of the financial sector, and indicators that affect the performance of commercial banks in Albania. Section 2 proposes the literature review to give an overview of the relevant literature. Section 3 presents the data and methodology used to highlight the relationships between dependent and independent variables. Section 4 includes all data analysis and processing, giving the results of the methodology used. Section 5 concludes the study.

2. LITERATURE REVIEW

The deterioration of the financial performance of the banking system brings adverse effects on the economy. Studies have shown an essential relationship between inflation, the exchange rate, the interest rate, and the performance of banks. In their research, Jeevitha et al. (2019) show a negative correlation between inflation and ROA, ROE, and net profit of select public sector banks, which means that inflation has no significant effect on these indicators. Also, Jaouad and Lahsen (2018) examine the internal and external factors that affect the profitability of banks in Morocco and found that macroeconomic factors (real GDP growth rate and inflation rate) do not have a significant effect on Moroccan banks' performance. Banks' profitability determinants usually sort into internal and external factors (Gul et al., 2011). Internal factors are influenced by a bank's management decisions, whereas external factors are the macroeconomic variables, which reflect the economic environment where banks operate, like GDP, inflation rate, etc., (Çekrezi, 2015). In her study, Chabot (2021) explains that to preserve the stability of the financial system, financial regulators mainly rely on systemically important banks that are recognized as such and on whose behalf, they call for increased injections of capital. Our study uses only external factors such as inflation, exchange rate, and interest rate.

Many studies have shown an important correlation between commercial bank performance and inflation because the deterioration of financial performance harms the economy. However, in some other studies, these indicators have resulted in non-linear relationships. Inflation above a certain level affects the distribution of resources and economic activity, adversely affecting the financial system's performance. The negative correlation between inflation and financial sector performance can also be seen after continuous monitoring and forecasting of volatility. Sustainable high inflation negatively impacts the performance of the financial sector. In some countries with low-inflation rates, there is an inversely proportional relationship between real and nominal returns. In the bank's performance, stock exchanges, bank lending, bank debt, and liquidity have a negative relationship with inflation, but this occurs only in countries with low and moderate inflation. As inflation grows, the slight impact on banks and stock exchanges diminishes rapidly. However, the development of the financial sector is related to the long-term performance of the country's economy. Variables that impact inflation are unpredictable, and their effects will harm economic development in the long run (Lipsey, 2008). Many empirical studies have concluded that inflation is negatively linked to bank performance or profitability. The studies also show that borrowing or lending credit is highly dependent on the increase in inflation. Many studies have found that the greater the inflation, the more difficult it is to obtain external funding. Some other theories are also related to changes in the rate of return on investment, and as inflation rises, so does the rate of return on investment. Such fluctuations can increase the likelihood of causing a banking crisis that will adversely affect the country's actual economic activity in the long run.

Another aspect is that high inflation is associated with the high volatility of banks in the returns of various assets. The dilemma that economists argue is when inflation is at a level that does not adversely affect the economy. Some theories rely on the fact that low inflation can lead to increased economic activity in the country, but this does not mean that it will also impact the profitability of the bank sector. According to Azariadis and Smith (1996), the relationship between inflation and financial sector performance highlights the importance of starting point level of inflation. One of the effects of inflation is the impact on the economic development of the banking sector by reducing the total amount of credit. Real asset interest rates fall as inflation rises. Meager returns discourage savings but encourage borrowing. Rising nominal interest rates exacerbate the situation as low-risk borrowers exclude from the credit market. Low inflation does not result in credit allocation, suggesting that an increase in inflation will lead to an increase in actual economic activity.

According to Gatobu (2012), commercial banks have an intermediary role between supply and demand for foreign currency, directly impacting their financial performance. Thus, exchange rate fluctuations bring large profits and losses. The financial performance of banks is very important to stakeholders. The purpose of commercial banks is to perform the role of intermediaries in a sustainable manner. As Ngerebo (2012) mentioned, apart from this role, their financial performance affects countries' economic growth. The poor performance of the banks will bring a financial crisis for the banks that will be accompanied by a decrease in the country's economic growth Adeniran et al. (2014). Some studies have shown that the exchange rate is a decisive factor in banks' profits.

In contrast, others emphasize that macroeconomic factors (real GDP, inflation, and

the exchange rate) have an insignificant effect on banks' profitability, but this depends on the country's characteristics. Okika Christian et al. (2018) investigate the effect of exchange rate fluctuation on firm profitability, taking into evidence selected quoted conglomerates in Nigeria. Empirical results confirm that the exchange rate has a positive and non-significant effect on ROA.

One of the most important elements for banks that influences their performance is the ability to predict volatility in rates and the direction of interest movement. Interest rate fluctuations have a significant effect on the bank's net income incurred by interest, English (2002), Hanweck and Ryu (2005). Malik et al. (2014) state that comparing private and public bank sectors, the results show that the interest rate has more effects on both ROA and ROE in private banks than in public sector banks. According to Monfared and Akin (2017), a direct relationship exists between exchange rates and inflation, so an increase in foreign exchange rates makes inflation go up. They conclude that both the money supply and the exchange rate affect inflation in a positive direction. The study by Wolfgang (2003) found that financial institutions have a high sensitivity to interest rates in the long term.

According to Revell (1979), inflation affects a bank's profitability when spending and wages grow faster than inflation. A study by Wamucii (2010) found a negative relationship between inflation and profitability. According to Naceur and Ghazouani (2007), Huybens and Smith (1999), there is a negative correlation between inflation and commercial banking performance. Wanjohi et al. (2017) confirms that inflation affects the profitability of commercial banks, although it is not defined as a decisive factor. The research of Manyok (2016) found that foreign exchange fluctuations influenced banks' performance. The co-relation findings revealed a weak negative association between exchange rate fluctuations and ROA and also are related to changes in inflation rates. Other studies viewed a positive relationship between inflation and bank performance. Bourke (1989), Molyneux and Thornton (1992) concluded that exists a positive relationship between inflation and bank profitability. A study by Derick et al. (2016) showed that if inflation does not reach 15%, it will have a positive impact on the development of the financial sector. Also, Jackson et al. (2021) confirm that inflation is said to manifest a positive effect on banking sector performance based on empirical outcomes.

3. DATA AND RESEARCH METHODOLOGY

The study period contains data obtained monthly from December 2015 to May 2022, due to data availability, in a total of 78 months for each variable. Monthly data helped us to have uniformity for creating a better panorama and studying each fluctuation of the variables. The study is based on secondary data collected from the Bank of Albania and the Institute of Statistics of Albania (INSTAT), the official institutions for publishing micro and macroeconomic data in Albania. Bank of Albania is the only first-level bank in the banking system in Albania, and the 12 banks in our study, are second-level banks. It is responsible for setting the interest rate and giving sovereign guarantees to commercial banks.

During the study period, the number of commercial banks in Albania changed, starting with 16 banks in the period December 2015–September 2018, continuing with 14 banks in the period October 2018–July 2019, and 12 banks in the period August 2019–June 2022 (Bank of Albania, 2022). The model chosen for this study is multiple regression because it focuses on identifying the relative impact of one or several variables on the dependent variable. This model can generate an equation that, by setting the numbers of the dependent variables, we might generate a projection of the dependent variable. This model helps us to make predictions, which lead to the reduction of the risk level. Also, the application of multiple regression can indicate the unexpected changes that may occur in the micro and macro-economic factors, which can serve to identify new phenomena. This model also gives the relationship that the variables can display with each other.

The technique used in this study is the ordinary least squares (OLS) because it helps us to select a high number of variables compared to the number of observations. In some cases, variables may not be added to the model because they may break the cohesion of the model, making it ineffective. Thus, this technique allows us to include those variables that make the model effective. The generalized method of moments (GMM) technique was not applied because this technique has problems with categorical variables and may also show problems with numerical variables. This technique will not work well when there is no regularity in the data. Before it is applied, the variables must be evaluated with the covariance matrix to use the model, and the amount of data obtained in this technique is not too large. Also, in this technique, the data must be grouped, which is difficult in determining the groups because it is impossible to determine the limit for a grouping to be called good, and which of them is the best. Furthermore, the GMM technique does not include other variables, not included in the study, which leads to the division into separate groups, complicating the model. Another critical reason we did not use this model is that the starting point is significant. If we chose different starting points, we would get different results, distorting the model's results.

The variables taken in the study are *ROA* as the dependent variable and *interest rate*, *exchange rate*, and *inflation* as independent variables. The research is based on several similar studies to avoid performing the multiple regression method by taking variables that bring out the null relationship. The variables used in our paper align with the study of Wamucii (2010), which identifies the relationship between inflation and the financial performance of commercial banks to find the needed variables for this purpose. While Adu et al. (2016) used a quadratic function to study the impact of inflation on a bank's financial performance, as methodology, they used the cumulative, random, and GMM. Naceur and Ghazouani (2007) studied the relationship between inflation and financial performance, using the GMM methodology, evaluating a complex panel model.

Musyoki et al. (2012) studied the impact of real exchange rate fluctuations on economic growth using two different methods: the generalized

autoregressive conditional heteroskedasticity (GARCH) and GMM. While Moyo and Tursoy (2020), to study the impact of inflation and exchange rate on the financial performance of commercial banks, utilized the autoregressive distributed lag (ARDL), fully modified ordinary least square (FMOLS) and dynamic ordinary least square (DOLS) models, and ROE as the dependent variable and inflation and exchange rate as the independent variables. Jackson et al. (2021), focused on establishing the relationship between exchange rate and inflation on the financial performance of commercial banks, have also used the ARDL approach to adopt cointegration analysis and error correction techniques. They found that inflation has a positive effect on banking sector performance, while the exchange rate has a negative effect on the overall economy. Gul et al. (2011) investigated the impact of assets, loans, equity, deposits, economic growth, inflation, and market capitalization on profitability, measured through ROA, ROE, return on capital employed (ROCE) and NIM, using pooled ordinary least square (POLS) method. The results found that both internal and external factors strongly influence profitability. Mosko and Bozgo (2016), to measure the banking output suggests a three-stage model combining the regression of efficiency and variables indicating risk and capital, regressing capital against variables indicating efficiency and risk, and after, risk-taking regressed against variables indicating efficiency and capital. Fibriyanti and Nurcholidah (2020), using descriptive quantitative research, concluded that the most dominant factor affecting financial performance is non-performing loans (NPL) and that capital adequacy ratio (CAR), NPL, ROA, NIM, and loan-to-deposit ratio (LDR) variables partially have a significant effect on bank financial performance. Jaouad and Lahsen (2018), using panel data regression techniques, found a positive and significant relationship between the total assets of the banks and profitability measured by ROA, but macroeconomic factors (real GDP growth rate and inflation rate) do not have a significant effect on the Moroccan banks' performance.

The results expected in this study are in line with the literature review, which evidences the impact of inflation on the performance of commercial banks and the impact of the combination of independent variables on the dependent variable, which will be at a high level. Related to this, five research hypotheses are raised in this study, as follows:

H1: Inflation affects the performance of commercial banks measured by ROA.

H2: The exchange rate affects the performance of commercial banks measured by ROA.

H3: The interest rate affects the performance of commercial banks measured by ROA.

H4: Other factors beyond the variables taken in the study affect the performance of commercial banks measured by ROA.

H5: The multiple regression equation can be used for prediction.

The study includes data on variables based on the number of banks according to the respective years. The variable interest rate is taken on the average monthly rate of ALL (Albanian lek) deposits at non-profit organizations (NPO), deposit of individuals, and non-governmental organizations (NGOs) for all deposits and maturity effects. The reason for taking this indicator is because it affects the performance of commercial banks, but it is also affected by other variables studied, such as inflation and exchange rate. The evaluation of the parameters was done with the least square method as one of the most applied methods in finding the best equation. To aim the goal of the paper, we have used the parametric method multiplied regression analysis, taking these steps: correlation coefficient matrix, augmented Dickey-Fuller (ADF) test, least squares method, the Ramsey regression equation specification error test (RESET) test, lin-lin and log-lin model, homoskedasticity test, the Breusch-Pagan test, and Fisher test. All these helped us to: study the correlation of variables; perform unitary root test; select the independent variable; find the functional form testing; analyze which model is better, the quadratic, cubic, or linear one; analyze if there is or no homogeneity; prove the significance of the model; and finally taste and interpret the coefficients.

4. RESULTS

The study used multiple regression analysis. Table 1 shows the relationship between the financial factor *ROA* and the interest rate is 0.084, with the nominal effective exchange rate (*NEER*) factor being -0.15, and the relationship between the *NEER* rate and inflation, specifically -0.65. Results are in line with macroeconomic functions, where the interest rate has a positive effect on *ROA*, and the exchange rate has a negative one.

Table 1. Correlations matrix

	ROA	*INTEREST_RATE*	*NEER*	*INF*
ROA	1	0.08408397	-0.1598359	-0.1581865
INTEREST_RATE	0.08408397	1	0.16481259	-0.0205964
NEER	-0.1598359	0.16481259	1	-0.6542040
INF	-0.1581865	-0.0205964	-0.6542040	1

Table 1 shows that the relationship between the *ROA* financial factor and the *interest rate* is 0.084, i.e., a slightly positive relationship, which means that an increase in the *interest rate* would also bring small incremental changes in the *ROA* factor. Even though the relationship between the financial factor *ROA* and the *exchange rate* is -0.15, it appears again as a weak relationship, but in this case, negative. This fact means that we expect a slightly negative impact of the *NEER* on *ROA*. Continuing with the impact of the rate of *inflation* on *ROA*, we would say that this impact is almost the same as the previous factor, *NEER*, because this factor also presents a weak negative relationship, -0.15, which means that the more the rate of *inflation* increases, the more the *ROA* decreases. The above matrix shows a strong negative relationship between the two variables, *NEER* and *inflation*, specifically -0.65. During the following analysis, we will have to check whether or not there is multicollinearity between these two factors.

A problem often encountered in parametric

regression analysis is the presence of unit roots. So before making the connection between the above factors in the regression equation, we must test whether they have a unit root or not. In this study, the unit root test is based on ADF test.

Table 2. ADF test

Factor	*p-value (lag 0)*	*p-value (lag 1)*
ROA	0.0039	-
INF	1.0000	0.0000
NEER	0.9237	0.0000
INTEREST_RATE	0.000	-

Table 2 shows that only *NEER* and *inflation* variables have unit roots and are placed in the equation with a time difference. In the table, it is also shown that for the factors *ROA* and *interest rate*, the original series came out stationary (both values are smaller than 5%). While, for the factors *inflation* and *NEER*, the p-value exceeds 5%; therefore, these series are not stationary. So, only *NEER* and *inflation* variables have unit roots. For this reason, it was necessary to make the first difference (lag 1) for these series to return them to stationery.

Table 3. Evaluations of the initial model with the OLS method (*ROA* dependent variable)

Model 1 (ROA)				
Variable	*Coeficient*	*Std. error*	*t-Statistic*	*Prob.*
Constant	2.753923	0.556471	4.948909	0.0000
INTEREST_RATE	2.028107	1.398201	1.450512	0.1511
NEER	-0.018486	0.005265	-3.510945	0.0008
INF	-0.144349	0.042119	-3.427131	0.0010
R^2	0.169844			
Adj R^2	0.136189			
SSR	7.787270			
F-statistic	5.046621			
Prob (F-statistic)	0.003094			

Note: Dependent variable: ROA. Method: Least squares. Date: August 3, 2022. Sample: 2015M12–2022M05. Included observations: 78.

The model is evaluated with the OSL method. The variable R^2 has a value of 0.169 (or nearly 17%), which means that the model has low importance in forecasting. So, the combination of selected variables, based on the literature and the obtained Albanian parameters used for our study, is not the right combination. The study will continue with other regression steps to better understand the importance of the model parameters.

To test the functional form, we will study how the data we have in the form of time series will be better related because the relationship between the data is not always linear. This requires the performance of relevant tests to verify this. If the relationship is not linear, it can be logarithmic or quadratic, which are often encountered in practice. To suggest how the data should be related between them and if the relationship is linear or not, we used the Ramsey RESET test. The procedure of this test goes through several steps, the results of which, processed with the EVIEWS program, are presented in Table 4.

Table 4. Results of the Ramsey RESET test

Variable	*Coeficient*	*Std. Error*	*t-Statistic*	*Prob.*
Model 1 (ROA linear)				
Constant	2.753923	0.556471	4.948909	0.0000
INTEREST_RATE	2.028107	1.398201	1.450512	0.1511
NEER	-0.018486	0.005265	-3.510945	0.0008
INF	-0.144349	0.042119	-3.427131	0.0010
R^2	0.169844			
Adj R^2	0.136189			
SSR	7.787270			
F-statistic	5.046621			
Prob (F-statistic)	0.003094			
Model 2 (ROA nonlinear)				
Constant	5.581304	71.76341	0.077774	0.9382
INTEREST_RATE	4.930317	60.80860	0.081079	0.9356
NEER	-0.043637	0.556731	-0.078380	0.9377
INF	-0.330718	4.325965	-0.076449	0.9393
$FITTED^2$	-0.356338	26.66703	-0.013363	0.9894
$FITTED^3$	-0.128685	7.811640	-0.016474	0.9869
R^2	0.172106			
Adj R^2	0.114614			
SSR	7.766047			
F-statistic	2.993538			
Prob (F-statistic)	0.016421			

Note: Dependent variable: ROA. Method: Least squares. Date: August 3, 2022. Sample: 2015M12–2022M05. Included observations: 78.

Based on Table 4, the functional form of the linear and nonlinear models resulted:

Linear model (the model without extensions)

$$ROA = 2.75 + 2.02 * INTEREST\_RATE - 0.018 * NEER - 0.14 * INF \quad (1)$$

Nonlinear model (*the model with extensions*)

$$ROA = 5.58 + 4.93 * INTEREST\_RATE - 0.04 * NEER - 0.33 * INF - 0{,}35 * FITTED^2 - 0.12 * FITEED^3 \quad (2)$$

With the variables *FITTED*^{2} and *FITTED*^{3}, we refer, respectively, to the square and cube of the forecasted values of the *ROA* variable.

As we can see from Table 5, most of the indicators of Model 1 (lin-lin) are at better levels than the indicators of Model 2 (log-lin). However, the indicators are very close to each other regarding the values of the coefficients for interpretation. The linear model better approximates the data in the study, and the best-tested form is the linear one.

So, we concluded that the linear model is better than the quadratic or cubic one and that the linear model is at the same level of goodness as the log-log model. Therefore, the following analysis will continue with this model.

Table 5. Indicators for comparing two models: lin-lin and log-lin

Indicators	*Model 1 (lin-lin)*	*Model 2 (log-lin)*
R^2	0.169844	0.155157
Adjusted R^2	0.136189	0.120907
SSR	7.787270	7.022401
F-statistic	5.046621	4.530091
Prob (F-statistic)	0.003094	0.005693

Note: Dependent variable: Log(ROA). Method: Least squares. Date: August 3, 2022. Sample: 2015M12–2022M05. Included observations: 78.

The lin-lin model, defined as the best model, should continue with the evaluation of the residuals because the OLS method assumes that the residuals should be normally distributed so that the statistical inferences of *t* and *F* for the significance of the partial coefficients of the regression and the statistical significance of the model as a whole are valid. For the residuals to have a normal distribution, it means that the graph or histogram presentation of the residuals has the shape of a bell.

Figure 1. Residual graph for the linear model

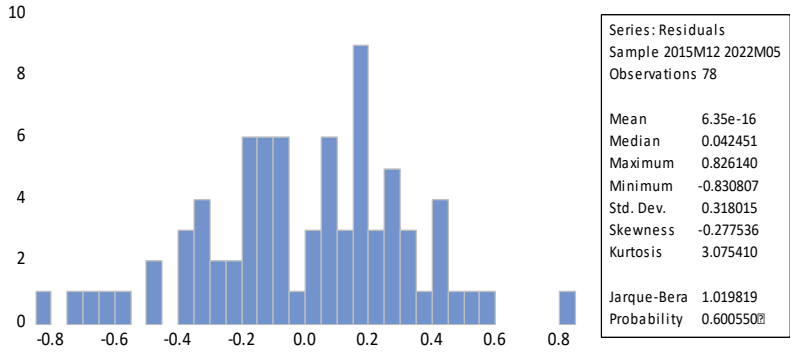

Figure 1 obtained by EVIEWS software shows that the residuals have an approximate bell shape. The probability of the JB statistic is 0.60, i.e., it exceeds the critical value of 5%; therefore, the residuals of the model are normally distributed. So, as seen in Figure 1 and Table 5, this model has a normal distribution, allowing us to continue with the Heteroscedasticity test.

Table 6. Jarque-Bera test indicators

Indicators	*Values*
Skewness	-0.277536
Kurtosis	3.075410
Jarque-Bera	1.019819
Prob JB	0.600550

To further obtain the normality of the residuals, it is necessary to conduct a study of the homoscedasticity of the residuals. If the residuals are heteroscedastic, they change with changing the independent variables' values in different segments, and the model is not correct in drawing conclusions and predictions. To study this phenomenon, we used the Breusch-Pagan (BP) test, and the results are summarized in Table 7.

Table 7. Breusch-Pagan test for heteroscedasticity

Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
Constant	-0.270571	0.242170	-1.117279	0.2675
INTEREST_RATE	1.087463	0.608481	1.787176	0.0780
NEER	0.001736	0.002291	0.757575	0.4511
INF	-0.011914	0.018330	-0.649981	0.5177
R^2	0.085969			
Adj R^2	0.048914			
SSR	1.474825			
F-statistic	2.320025			
Prob (F-statistic)	0.082234			

Note: Test equation: Dependent variable: RESID^2 *(the dependent variable that ensures that the model's residuals have a mean of zero). Method: Least squares. Date: August 3, 2022. Sample: 2015M12–2022M05. Included observations: 78.*

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Prob (F-statistic)	0.082234			

Note: Test equation: Dependent variable: RESID² (the dependent variable that ensures that the model's residuals have a mean of zero). Method: Least squares. Date: August 3, 2022. Sample: 2015M12–2022M05. Included observations: 78.

With the data in the table, the estimated model for heteroskedasticity has resulted:

$$u.\hat{2} = -0.27 + 1.08 * INTEREST\_RATE + 0.00 * NEER - 0.01 * INF \quad (3)$$

As can be seen from the statistical table of the observed Fisher test and the corresponding probability are respectively at the values of 2.32 and 0.08 (with a significance level of 5%, these values are more significant than this level), which means that the model is homoscedastic.

To verify whether or not the model correlates, we continued with the Breusch-Godfrey test, where from the obtained data, it can be seen that the probability value for the Fisher test is 0.000, that is, smaller than 1% and 5%, which means that the model exhibits serial correlation. This is a problem of the OLS method.

In the last step, we will focus on testing the model's significance and the coefficients' significance. After we guarantee that we have no problems with the model's residuals, we can now test the overall significance of the model through Fisher's test. Table 3 (Model 1) shows that F-statistic = 5.04 and Fisher's probability is 0.003. Since the probability value is smaller than the critical value of 5%, the model is statistically significant and can be used for predictions.

Since the model is statistically significant, the partial regression coefficients should be tested separately to see which variables have a significant impact on the financial profit margin factor *ROA*.

Each independent variable must be shown whether or not it is statistically significant. For this, the t-test will be used, and if $|t\beta_j| > tkr = 1.69$ or its probability value is lower than 0.05 (5% significance level), then the variable is statistically significant. These values are taken from Table 3 (Model 1).

$$|t\beta_0| = 4.94, \quad p\text{-}value = 0.000 \; is\; statistically\; significant \quad (4)$$

$$|t\beta_1| = 1.45, \quad p\text{-}value = 0.151 \; is\; not\; statistically\; significant \quad (5)$$

$$|t\beta_2| = 3.51, \quad p\text{-}value = 0.000 \; is\; statistically\; significant \quad (6)$$

$$|t\beta_3| = 3.42, \quad p\text{-}value = 0.001 \; is\; statistically\; significant \quad (7)$$

The coefficient $\beta_0 = 2.75$, in the Eq. (1), shows that the influence of other factors that are not taken into the study influence the financial factor *ROA* with 275%. This significant influence shows that the performance of commercial banks in Albania is influenced by other factors unrelated to the *interest rate*, *exchange rate*, and *inflation*. The coefficient $\beta_1 = 2.02$ shows that the *interest rate* has a 202% impact on the financial factor *ROA*. This shows that the variability of the *interest rate* has a high impact on the performance of commercial banks, which is in line with other studies on this topic. While the coefficient $\beta_2 = -0.018$ shows that the variability of the *exchange rate* has a negative impact of 1.8% on the financial factor *ROA*. This value shows that the impact of *NEER* is low, which means that the volatility of the exchange rate of foreign currencies against the Lek (Albanian currency) has a low impact on the *ROA* factor. The coefficient $\beta_3 = -0.144$ shows that the influence of *inflation* on the financial factor *ROA* is 14.4%, which means a negative effect on *ROA*. This shows that *inflation* is an essential factor that affects *ROA*, and this coincides with many other studies that stress the same conclusion, like the study of Revel (1979), which examines that inflation affects the performance of banks because costs and wages increase faster than inflation. This result is consistent with the findings of our study. The study of Molyneux and Thornton (1992) shows a positive relationship between inflation and bank profitability. This result contradicts our study's result; this is because the micro and macroeconomic parameters in both studies are not the same, and other factors may have influenced these results. A study by Wamucii (2010) shows a negative relationship between inflation and profitability. The results of this study are consistent with our findings. Wanjohi et al. (2017) found that inflation affects the profitability of commercial banks but is not the determining factor. A study by Adu et al. (2016) determined that if inflation does not reach 15%, it will positively affect the development of the financial sector. In this case, this does not match the conclusions of our study. This suggests that other macroeconomic factors may have influenced these results. The study of Naceur and Ghazouani (2007) and Huybens and Smith (1999) resulted in a negative correlation between inflation and the performance of commercial banks, which is consistent with the study's findings. The research of Manyok (2016) concluded that there is a weak correlation between the exchange rate and banking activity. These results are consistent with the findings of our study.

5. CONCLUSION

With this paper, we want to give our contribution related to the factors that affect commercial banks' performance, even though the study is focused only on the Albanian financial sector.

First, the regression equation has passed all the statistical steps related to creating a multiple regression equation. However, the level of significance measured by the OLS method by the coefficient of determination R^2 is at a low level, a fact that rejects *H5*, that the equation of our study can be used for prediction. Another conclusion of the study is that *inflation* as an independent variable affects the *ROA* factor even though the impact is negative. This fact makes the hypothesis accepted because the significance value is less than 5%, following the literature where inflation affects decreasing purchasing power. There is an inverse relationship between higher nominal returns on equity. However, in high-inflation economies, nominal stock and returns move as a function of marginal increases in inflation rates. In banking and stock market development, bank lending activity, bank liabilities, stock market size, and liquidity have a negative relationship with inflation, but this occurs only in countries with low and moderate inflation. This increases the probability that the performance of commercial banks in these countries will be affected by inflation.

The *exchange rate* impacts the dependent variable *ROA*, although the impact is negative. *H2* is accepted as the condition that the significance value is less than 5% is met. This follows the literature, which states that the purpose of commercial banks is to perform the role of intermediary sustainably; banks must be profitable, including the exchange rate. The study of Ngerebo (2012) examines that banks, in addition to the intermediary role, also their financial performance affects countries' economic growth. Poor performance of the banks would bring financial crisis for the banks, which in turn would bring down the country's economic growth (Adeniran et al., 2014). Exchange rate fluctuations have much influence on the performance of banks. For example, according to the study by He et al. (2014), it was found that the value of the US dollar compared to foreign currencies increased the profits of financial institutions in the USA.

Another important conclusion is that the impact of the *interest rate* is high on the *ROA* financial factor, but *H3* falls because the significance value is greater than 5%. This conclusion contradicts the literature and other studies; the study of Wolfgang and Opfer (2003), which compared the performance of financial institutions in five different industries, resulted that financial institutions have a high sensitivity to interest rates in the long term. The most crucial element in banks to influence performance is their ability to predict volatility in interest rates and the direction of movement. The most significant risk faced by second-tier banks is their uncertainty about inflows, mainly related to customer deposits, which constitute an expense for commercial banks (Baltensperger & Milde, 1987).

Other factors that should have been taken into the study significantly impact the *ROA* variable. *H4* is accepted because the condition that significance is less than 5% is met. It should be emphasized that these factors are related to the performance of commercial banks operating in Albania.

The regression equation created by the OLS method cannot be used for prediction because the significance level needs to be higher. This fact shows that for the banking sector in Albania, the combination of the dependent variable *ROA* and independent variables such as *interest rate* (*INTEREST_RATE*), *exchange rate* (*NEER*), and *inflation* (*INF*) has not been appropriate to measure the impact of inflation on the performance of commercial banks. This highlights that this combination of variables should not always be considered to measure the impact of inflation on commercial performance. The fact that this combination of variables for the banking sector in Albania has not resulted to be appropriate, raises questions about why, based on the literature review, this combination has resulted to be the right one to measure the impact of inflation on the *ROA* factor, in contrast, in the Albanian banking sector it does not measure this impact. It also stands out that other factors can have a greater impact on *ROA* than the variables taken in the study. This study concludes that the combination of variables *inflation*, *exchange rate*, and *interest rate* does not measure the impact of inflation on the performance of commercial banks in Albania. This contradicts the studies that show that this combination of variables measures the impact that inflation has on commercial banks' performance. It should also be analyzed why, based on the macroeconomic factors in Albania, this combination has not been effective to be used for forecasting. Other internal or external factors need to be taken into consideration. Further research is needed to analyze why this combination is not the right one to be used for the Albanian bank system.

Firstly, not all possible variables that can impact the performance of commercial banks are considered in this study. Other limitation is also not a long time span of data because if Albania is been a communist country, the first bank with totally private capital was formed in 1996. So, the commercial banking sector in Albania is almost a new one.

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APPENDIX A. UNIT ROOT TEST

Table A.1. Unit root test results (ADF tests) for *ROA*

Parameter		*t-Statistic*	*Prob.**
Augmented Dickey-Fuller test statistic		-3.840937	0.0039
Test critical values	1% level	-3.517847	
	5% level	-2.899619	
	10% level	-2.587134	

Note: Null hypothesis: ROA has a unit root. Exogenous: Constant. Lag Length: 0 (Automatic-based on SIC, maxlag = 11). MacKinnon (1996) one-sided p-values.

Table A.2. Unit root test results (ADF tests) for inflation (*INF*)

		t-Statistic	*Prob.**
Augmented Dickey-Fuller test statistic		2.310659	1.0000
Test critical values	1% level	-3.517847	
	5% level	-2.899619	
	10% level	-2.587134	

Note: Null hypothesis: INF has a unit root. Exogenous: Constant. Lag Length: 0 (Automatic-based on SIC, maxlag = 11). MacKinnon (1996) one-sided p-values.

Table A.3. Unit root test results (ADF tests) after the first difference *D*(*INF*)

		t-Statistic	*Prob.**
Augmented Dickey-Fuller test statistic		-6.015112	0.0000
Test critical values	1% level	-3.517847	
	5% level	-2.899619	
	10% level	-2.587134	

Note: Null hypothesis: D (INF) has a unit root. Exogenous: Constant. Lag Length: 0 (Automatic-based on SIC, maxlag = 11). MacKinnon (1996) one-sided p-values.

Table A.4. Unit root test results (ADF tests) for *NEER*

		t-Statistic	*Prob.**
Augmented Dickey-Fuller test statistic		-0.269378	0.9237
Test critical values	1% level	-3.517847	
	5% level	-2.899619	
	10% level	-2.587134	

Note: Null hypothesis: NEER has a unit root. Exogenous: Constant. Lag Length: 0 (Automatic-based on SIC, maxlag = 11). MacKinnon (1996) one-sided p-values.

Table A.5. Unit root test results (ADF tests) after the first difference *D*(*NEER*)

		t-Statistic	*Prob.**
Augmented Dickey-Fuller test statistic		-7.170120	0.0000
Test critical values	1% level	-3.517847	
	5% level	-2.899619	
	10% level	-2.587134	

Note: Null hypothesis: D(NEER) has a unit root. Exogenous: Constant. Lag Length: 0 (Automatic-based on SIC, maxlag = 11). MacKinnon (1996) one-sided p-values.

Table A.6. Unit root test results (ADF tests) for interest rate (*NORMA_INT*)

		t-Statistic	*Prob.**
Augmented Dickey-Fuller test statistic		-6.241288	0.0000
Test critical values	1% level	-3.517847	
	5% level	-2.899619	
	10% level	-2.587134	

Note: Null hypothesis: NORMA_INT has a unit root. Exogenous: Constant. Lag Length: 0 (Automatic-based on SIC, maxlag = 11). MacKinnon (1996) one-sided p-values.

APPENDIX B. OLS ESTIMATION OF THE INITIAL MODEL

Table B.1. Output: *ROA* as depended variable

Variable	*Coefficient*	*Std. error*	*t-statistic*	*Prob.*
C	2.753923	0.556471	4.948909	0.0000
INF	-0.144349	0.042119	-3.427131	0.0010
NEER	-0.018486	0.005265	-3.510945	0.0008
NORMA_INT	2.028107	1.398201	1.450512	0.1511
R^2	0.169844	Mean dependent var.		1.220385
Adj R^2	0.136189	S.D. dependent var.		0.349034
S.E. of regression	0.324397	Akaike info criterion		0.636223
Sum squared resid	7.787270	Schwarz criterion		0.757079
Log-likelihood	-20.81268	Hannan-Quinn criterion		0.684604
F-statistic	5.046621	Durbin-Watson stat.		0.830764
Prob (F-statistic)	0.003094			

Note: Dependent Variable: ROA. Method. Least squares. Date: August 3, 2022. Time: 23:11. Sample: 2015M12–2022M05. Included observations: 78.

Table B.2. The log-lin model

Variable	*Coefficient*	*Std. error*	*t-statistic*	*Prob.*
C	8.661271	2.408282	3.596452	0.0006
INF	-0.128548	0.040826	-3.148639	0.0024
LOG(NEER)	-1.706921	0.492853	-3.463347	0.0009
LOG(NORMA_INT)	0.359014	0.271971	1.320045	0.1909
R^2	0.155157	Mean dependent var.		0.151117
Adj R^2	0.120907	S.D. dependent var.		0.328556
S.E. of regression	0.308054	Akaike info criterion		0.532838
Sum squared resid	7.022401	Schwarz criterion		0.653694
Log-likelihood	-16.78066	Hannan-Quinn criterion		0.581219
F-statistic	4.530091	Durbin-Watson stat.		0.861384
Prob (F-statistic)	0.005693			

Note: Dependent Variable: Log(ROA). Method: Least squares. Dale: August 3, 2022. Time: 23:12. Sample: 2015M12–2022M05. Included observations: 78.

Table B.3. Resulting output after applying the Ramsey RESET test

	Value	*df*	*Probability*	
F-statistic	0.098379	(2.72)	0.9064	
Likelihood ratio	0.212863	2	0.8990	
F-test summary				
	Sum of Sq.	*df*	*Mean squares*	
Test SSR	0.021223	2	0.010611	
Restricted SSR	7.787270	74	0.105233	
Unrestricted SSR	7.766047	72	0.107862	
LR test summary				
	Value			
Restricted Logl	-20.81268			
Unrestricted Logl	-20.70625			
Variable	*Coefficient*	*Std. error*	*t-statistics*	*Prob.*
C	5.581304	71.76341	0.077774	0.9382
INF	-0.330718	4.325965	-0.076449	0.9393
NEER	-0.043637	0.556731	-0.078380	0.9377
NORMA_INT	4.930317	60.80860	0.081079	0.9356
FITIED^2	-0.356338	26.66703	-0.013363	0.9894
FITIED^3	-0.128685	7.811640	-0.016474	0.9869
R^2	0.172106	Mean dependent var.		1.220385
Adj R^2	0.114614	S.D. dependent var.		0.349034
S.E. of regression	0.328423	Akaike info criterion		0.684776
Sum squared resid	7.766047	Schwarz criterion		0.866061
Log-likelihood	-20.70625	Hannan-Quinn criterion		0.757348
F-statistic	2.993538	Durbin-Watson stat.		0.842183
Prob (F-statistic)	0.016421			

Note: Unrestricted test equation: Dependent variable: ROA. Method: Least squares. Date: August 3, 2022. Time: 23:11. Sample: 2015M12–2022M05. Included observations: 78. Omitted variables: Powers of fitted values from 2 to 3. Specification: ROA, C, INF, NEER, NORMA_INT.

APPENDIX C. TESTING THE MODEL FOR HETEROSKEDASTICITY

Table C.1. Testing the model for heteroskedasticity: Breusch-Pagan-Godfrey heteroskedasnoty test

Variable	*Coefficient*	*Std. error*	*t-statistics*	*Prob.*
C	-0.293993	0.449882	-0.653489	0.5155
INF	0.041764	0.034970	1.194280	0.2363
NEER	0.003699	0.004301	0.859931	0.3927
NORMA_INT	-0.539353	l.133876	-0.475672	0.6357
RESID (-1)	0.478272	0.115119	4.154574	0.0001
RESID (-2)	0.208784	0.118781	1.757716	0.0830
R^2	0.374211	Mean dependent var.		0.099837
Adj R^2	0.330753	S.D. dependent var.		0.144759
S.E. of regression	0.260160	Akaike info criterion		-1.027728
Sum squared resid	4.873191	Schwarz criterion		-0.906871
Log-likelihood	-2.531769	Hannan-Quinn criterion		-0.979347
F-statistic	8.610936	Durbin-Watson stat.		1.593077
Prob (F-statistic)	0.000002			
F-statistic	2.320025	Prob. F (3,74)		0.0822
Obs· R^2	6.705600	Prob. Chi-Square (3)		0.0819
Scaled explained SS	6.263048	Prob. Chi-Square (3)		0.0995

Note: Test equation: Dependent variable: RESID² (the dependent variable that ensures that the model's residuals have a mean of zero). Method: Least squares. Date: August 3, 2022. Time: 23:11. Sample: 2015M12–2022M05. Included observations: 78. Null hypothesis: Homoskedasticity.

Table C.2. Testing the model for serial correlation: Breus-Godfrey serial correlation LM test

Variable	*Coefficient*	*Std. error*	*t-Statistics*	*Prob.*
C	-0.270571	0.242170	-1.117279	0.2675
INF	-0.011914	0.018330	-0.649981	0.5177
NEER	0.001736	0.002291	0.757575	0.4511
NORMA_INT	1.087463	0.608481	1.787176	0.0780
R^2	0.085969	Mean dependent var.		6.35E-16
Adj R^2	0.048914	S.D. dependent var.		0.318015
S.E. of regression	0.141174	Akaike info criterion		0.218763
Sum squared resid	1.474825	Schwarz criterion		0.400049
Log-likelihood	44.08140	Hannan-Quinn criterion		0.291335
F-statistic	2.320025	Durbin-Watson stat.		2.009327
Prob (F-statistic)	0.082234			
F-statistic	21.52734	Prob. F (2,72)		0.0000
Obs·R^2	29.18843	Prob. Chi-Square (2)		0.0000

Note: Test equation: Dependent variable: RESID (the dependent variable that ensures that the model's residuals have a mean of zero).. Method: Least squares. Date: August 3, 2022. Time: 23:11. Sample: 2015M12–2022M05. Included observations: 78. Presample missing value lagged residuals set to zero. Null hypothesis: No serial correlation at up to 2 lags.