(RESEARCH ARTICLE)

A study of the effect of macroeconomic factors on the profitability of commercial banks in Zambia

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Abstract

This study investigates the impact of key macroeconomic factors; exchange rates, Gross Domestic Product (GDP), inflation, and unemployment on the profitability of commercial banks in Zambia, where the banking sector faces significant challenges due to economic fluctuations. Recent trends reveal an increase in bank losses and closures, as demonstrated by the Bank of Zambia's (2016) seizure of Intermarket Banking Corporation Zambia Limited, reflecting the broader vulnerability of Zambian banks to external economic shocks. Despite Zambia's commercial banks showing lower profitability levels compared to the Southern African Development Community (SADC) average, there is limited research addressing how macroeconomic variables influence their profitability. This study adopts a correlational research design using the Johansen cointegration test to identify long-term effects and employs secondary annual time series data spanning from 1996 to 2022 from sources including the World Bank and Bank of Zambia. Regression analysis, conducted using Stata 14, specifies bank profitability as a function of exchange rate, GDP, inflation, and unemployment, with diagnostic tests such as the Augmented Dickey-Fuller (ADF) test for stationarity, the Durbin-Watson test for autocorrelation, and the Jarque-Bera test for normality to ensure robustness. Findings indicate that exchange rate fluctuations and inflation negatively impact profitability, as exchange rate depreciation and inflationary pressures contribute to deteriorating asset quality and increase non-performing loans (NPLs), thus lowering bank profitability. Similarly, high unemployment adversely affects banks by reducing demand for loans and increasing loan default rates, as unemployed borrowers struggle to meet financial obligations. Conversely, GDP growth positively correlates with profitability, as economic expansion bolsters demand for financial products, supports creditworthiness, and enhances the bank's asset quality. Comparative analysis with studies from other emerging markets, such as Kenya and Central and Eastern Europe, reveals regional economic conditions uniquely shape these effects, underscoring the significance of context-specific factors in understanding bank profitability. Based on these findings, the study recommends that Zambian banks diversify loan portfolios to mitigate the effects of exchange rate fluctuations and unemployment, implement robust risk management strategies, and adopt sustainable funding models that reduce exposure to economic volatility. Such measures are essential for fostering resilience in Zambia's banking sector and promoting financial stability, which is crucial for the country's economic development. This study thus contributes to the literature on bank performance in emerging economies, providing valuable insights for policymakers and banking institutions seeking to navigate macroeconomic uncertainties and enhance the financial stability of Zambia's banking sector.

Keywords: Macroeconomic Factors; Bank Profitability; Zambia; Exchange Rate Fluctuations; Economic Stability

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1. Introduction

Globally, financial Institutions contribute crucially to the role of economic development and growth. Financial institutions provide financial intermediation services where they engage in collecting and mobilizing resources for investors and businesses which enhance economic development (Were & Wambua, 2014). An efficient banking system is of utmost importance for adequate financial intermediation which brings about sustainable investments in the private sector investment. Importantly, these roles played by the banking sector is hinged on bank performance and as such, knowing the factors affecting bank performance is of high crucial to banks and of high importance in stabilizing the economy (Alper & Anbar, 2011). The banking system stands as the most significant part of the financial system of countries. The role of capital provision, where banks channel funds to deficit economic units from surplus units cannot be over emphasized (Rasiah, 2010). Despite the past and ongoing reforms witnessed in Africa, the performance of banks has remained poor as they are not effective their financial intermediation roles. These poor performances experienced by banks have continued have resulted in high liquidity risk levels and loss of confidence by investors and customers in some cases. These are also seen in the high cost of financial intermediation charged by banks (Agade, 2014).

Profitability of banks can be measured in several ways. The most common measures of profit include return of assets (ROA), return on equity (ROE) and net interest margin (NIM). ROA is the most basic measure of profit computed as net profit after taxes divided by the total assets. This indicates how efficient the bank is as it gives information on how much profit is made on each unit of the assets as opposed to general profit (income less expenses). ROE is computed by dividing the net profit after taxes with the total equity capital. Since assets are equal to the summation of total equity and liabilities, (therefore equity is less than assets), which implies that ROE is higher than ROA. ROE is of greater interest to shareholders as it indicates how much profit is made per unit of bank capital or their investment. Thus ROA measures how efficiently the bank is run whilst ROE measures how well bank equity investments are performing. NIM is computed by dividing the difference between interest income and interest expenses on total assets. A high NIM implies the bank is able to acquire assets with a high interest income and/or obtain liabilities at a low interest cost. However, interest rate margin may be affected by external forces thus ROA may be more relevant in showing internal bank efficiency.

Studying the determinants of profitability of banks has been of increasing interests as financial inclusion and innovation has grown worldwide. It has also gained more importance after the global financial crisis as this was in a huge part caused by the collapse of commercial banks. Thus, establishing the factors that increase a bank's profitability, which will ensure it is shielded from collapse, cannot be over emphasized (Iacobelli, 2017). Therefore increased profitability of banks directly implies increased investment through intermediation, growth in the real sector and essentially economic growth. Increased profits also entail increased expansion of the financial sector which directly contributes to Gross Domestic Product.

The Zambian banking sector has made significant progress from the time the country gained its independence in 1964. With only three commercial banks(all foreign sub diaries) at the time, the sector now has 17 commercial banks with nine of these privately owned by Zambian citizens/organizations or Government owned. The sector has however faced a number of challenges with about ten commercial banks being liquidated between 1995 and 2003. For example, as of 31 December 1999, the African Commercial Bank, Credit Africa Bank, Manifold Investment Bank, Meridien BIAO Bank, and Prudence Bank were in liquidation, while First Merchant Bank was undergoing reorganization. This was mainly due to liquidity problems and inadequate capital. This encouraged the regulatory authorities to put in heavier requirements on capital adequacy, statutory reserves and liquidity insurance to ensure no banks became insolvent. This has since resulted in less bank closures and increased profitability and efficiency (Bank of Zambia, 2014). The sector, however, still remains with significant challenges, i.e. cost management, credit risk, liquidity risk, interest rate risk and cyber security (Price Waterhouse Coopers, 2016). As observed during the 2008 global financial crisis, the failure of banks can adversely affect economic growth of the real sector. This necessitates the need for this study to assess the impact of macroeconomic factors on the profitability of banks in Zambia.

1.1. Theoretical Underpinnings

The theoretical framework explores the relationships between exchange rates, GDP, inflation, and interest rates on bank performance. Exchange rate volatility can raise production costs and increase the need for banking finance, adversely affecting banks' performance by contributing to economic uncertainty and higher non-performing loans (NPLs). Meanwhile, the Economic Growth and Impact Theory posits that real GDP growth positively influences banking performance through enhanced net interest income and reduced loan losses, although its effect on operating costs is less clear. Inflation's impact on investment decisions varies among three theories: the Positivists assert that inflation encourages investment by redistributing income; the Negativists argue that it undermines savings and profitability, and the Neutralists contend that inflation's effects on investment are negligible. Finally, interest rates influence bank

performance through the Monti-Klein model, which indicates that higher reference rates can reduce loan demand and increase non-performing exposures, ultimately harming bank income. These theories suggest that both external economic factors and internal banking dynamics significantly impact bank performance.

2. Empirical Literature Review

2.1. Overview of Commercial Bank Profitability

2.1.1. Exchange Rate

The exchange rate, representing the price of one currency in terms of another, plays a pivotal role in international economic activities, directly affecting import and export prices. It can be classified into floating and fixed categories, with floating rates fluctuating based on market supply and demand, while fixed rates require central bank intervention to maintain stability (Krugman & Obstfeld, 2014). Exchange rate volatility can lead to inflationary pressures, impact foreign investment, and ultimately affect economic growth. Policymakers must monitor exchange rates to implement monetary policies that promote stability and competitiveness, as an overvalued currency can harm export competitiveness, potentially resulting in trade deficits and job losses. Additionally, exchange rate policies have broader implications on macroeconomic factors such as employment and inflation. A depreciated currency may enhance export competitiveness but increase import costs, thereby contributing to inflation (Krugman & Obstfeld, 2014). This highlights the exchange rate's significance as a macroeconomic variable, influencing not only trade balances but also the overall economic landscape.

2.1.2. Gross Domestic Product (GDP)

Gross Domestic Product (GDP) serves as a comprehensive indicator of economic performance, reflecting the total monetary value of all final goods and services produced within a country over a specified period. It provides insights into economic productivity, growth rates, and living standards while employing three main calculation approaches: production, income, and expenditure (Mankiw, 2020). Each approach offers a unique perspective, making GDP an invaluable tool for economic analysis and comparison across nations. However, GDP has limitations, including its failure to account for income inequality, environmental degradation, and unpaid labor, prompting policymakers to consider additional metrics for a holistic view of economic well-being. The relationship between GDP and bank profitability is generally positive, as economic growth typically leads to increased borrowing and lending activities. Studies have shown that higher GDP correlates with improved bank performance, although some research indicates that the impact may diminish when other factors, such as interest rates, are considered (Barasa, 2014). Thus, while GDP is a critical measure of economic health, it is essential to analyze it alongside other indicators to capture the full picture of economic dynamics.

2.1.3. Inflation

Inflation, defined as the rate at which general price levels rise, is a crucial macroeconomic indicator reflecting changes in the purchasing power of money. Moderate inflation is often a sign of economic growth, resulting from increased demand for goods and services, while excessive inflation or deflation can destabilize economies (Blanchard & Johnson, 2017). Inflation is typically measured using indices such as the Consumer Price Index (CPI) and Producer Price Index (PPI), which central banks monitor to maintain price stability through interest rate adjustments. The causes of inflation can be categorized into demand-pull and cost-push factors, with the former occurring when aggregate demand exceeds supply and the latter arising from rising production costs. Managing inflation poses significant challenges for policymakers, as rapid money supply growth can lead to currency devaluation and rising prices. Effective inflation management is vital for sustaining economic growth and stability, as unchecked inflation can erode consumer purchasing power and increase default risks for borrowers. Consequently, central banks play a crucial role in monitoring inflation rates and adjusting monetary policies to foster a stable economic environment (Blanchard & Johnson, 2017).

2.1.4. Unemployment Rate

The unemployment rate, representing the percentage of the labor force that is jobless yet actively seeking work, is a key indicator of economic health. A high unemployment rate signals economic underperformance, while a low rate generally indicates a healthy labor market. Understanding the various types of unemployment—frictional, structural, cyclical, and seasonal provides deeper insights into labor market dynamics (Samuelson & Nordhaus, 2010). For example, frictional unemployment arises from short-term job transitions, while structural unemployment occurs when workers' skills no longer align with available jobs, often due to technological advancements. High unemployment can have far-reaching

consequences, including reduced household income and consumer spending, which can slow economic growth. To address unemployment challenges, governments may implement labor market reforms, vocational training programs, and fiscal stimulus measures aimed at enhancing job creation and economic stability (Samuelson & Nordhaus, 2010). Understanding the interplay between unemployment and other macroeconomic factors is essential for developing effective policies that promote a stable and prosperous economy.

2.2. Macroeconomic Factors

2.2.1. Macroeconomic Factors

Macroeconomic factors significantly influence the performance of banks, as they operate within an environment shaped by external conditions beyond their control (Ongore & Kusa, 2013). Key macroeconomic variables include exchange rates, GDP, inflation, and interest rates, which collectively determine the financial landscape for banking institutions. Njuguna (2013) categorizes these factors into three classes: those related to the general external environment, such as inflation and unemployment; those indicating the direction of economic movement, like GDP; and those linked to financial market conditions, including interest and exchange rates. Understanding these macroeconomic factors is crucial for monitoring and enhancing bank profitability in Zambia. The interplay between these macroeconomic factors and bank performance can create challenges and opportunities for financial institutions. For instance, inflation can affect the solvency of debts, leading to increased non-performing loans (NPLs) (Rovell, 1979). Exchange rate fluctuations can also impact bank performance, particularly for banks with significant exposure to foreign currency loans (Ajayi & Atanda, 2012). Consequently, this study will utilize exchange rates, GDP, inflation, and interest rates as a framework to analyze the profitability of banks in Zambia, recognizing their critical roles in shaping the banking sector's performance (Agade, 2014).

2.2.2. Macroeconomic Factors and Financial Performance

The global macroeconomic environment lays the foundation for the financial performance of banks, with stability in macroeconomic indicators being essential for operational efficiency and profitability. Changes in macroeconomic factors, such as inflation rates, interest rates, and exchange rates, directly influence banks' ability to maintain profitability and competitiveness in a rapidly evolving economic landscape (Shingjergji, 2013). Inflation, for example, can alter real asset values and operating costs, impacting loan repayment behaviors and ultimately affecting bank profitability. Banks that fail to adjust their fees and charges in response to inflationary pressures may experience compressed profit margins, particularly in high-inflation environments. Interest rates also serve as a critical determinant of bank profitability, as they influence the cost of borrowing and the quality of bank assets. High interest rates can lead to increased defaults, diminishing loan recoveries and overall profitability (Fredric, 2014). Consequently, effective interest rate management is crucial for banks to navigate the complexities of financial performance while mitigating risks associated with interest rate fluctuations. Policymakers must balance monetary policies that stabilize interest rates with strategies that foster economic growth, ensuring the resilience of the banking sector (Taylor, 1993).

2.2.3. Zambia's Macroeconomic Conditions and Financial System Stability

Zambia's Macroeconomic Conditions

Unfavorable macroeconomic developments can precipitate financial crises, impacting the stability of Zambia's financial system. Key macroeconomic variables, including economic policies, GDP, inflation, commodity prices, interest rates, and exchange rates, influence the resilience of the financial system (Schumpeter, 1969). A decline in GDP can hinder deposit growth, reduce banks' willingness to issue new loans, and impair borrowers' repayment capabilities, leading to a rise in non-performing loans (NPLs) and declining returns on equity (ROE). Although a rise in NPLs may not immediately destabilize the financial system, the feedback effects can undermine broader economic recovery and exacerbate vulnerabilities. Historically, Zambia has experienced significant financial crises, such as the banking crisis from 1994 to 2001, the commodity crisis of 2008/09, and the foreign exchange crisis of 2015. These episodes illustrate the interconnectedness of macroeconomic factors and financial system stability, demonstrating that macroeconomic shocks can adversely affect the functioning of the banking sector. Strengthening the financial system's resilience to such shocks is crucial for promoting sustainable economic growth and stability in Zambia.

Commercial Bank Profitability and Macroeconomic Factors: Review of Similar Studies

A review of empirical studies examining the impact of macroeconomic factors on bank profitability reveals a complex relationship influenced by both internal and external factors. Studies such as Kiganda (2014) and Casey et al. (2014) highlight the significance of exchange rates on bank performance, with varying results across different contexts. For instance, while Casey et al. found a notable relationship between foreign exchange risk and profitability in U.S. banks,

Kiganda reported no significant effect in Kenyan banks. This inconsistency underscores the need for standardized methodologies and robust multivariate analyses to better understand the nuanced interactions between macroeconomic variables and profitability. Additionally, studies focusing primarily on African countries, particularly Kenya and Nigeria, provide valuable insights but may limit the generalizability of findings to other regions. The lack of consideration for industry-specific dynamics, such as competition and technological change, further complicates the understanding of how macroeconomic factors influence bank profitability. Future research should aim to adopt more sophisticated econometric methods, expand geographical scope, and explore the interactions between inflation, interest rates, and other macroeconomic variables to provide actionable insights for policymakers and financial institutions.

2.3. Commercial Bank Profitability and Macroeconomic Factors: Review of Similar Studies

2.3.1. Exchange Rates and Profitability

Several studies have explored the relationship between exchange rates and commercial bank profitability, with varying results. Kiganda (2014) investigated the impact of macroeconomic factors on the profitability of Equity Bank in Kenya, concluding that exchange rates had an insignificant effect on profitability at a 5% significance level. Conversely, Casey et al. (2014) found that U.S. banks were significantly affected by foreign exchange fluctuations, indicating that the value of the dollar relative to other currencies directly impacts bank performance. Similarly, Otuori (2013) identified a positive correlation between exports, imports, and bank profitability in Kenya, suggesting that higher trade volumes enhance financial performance. Ngerebo (2012) examined the impact of foreign exchange fluctuations on Nigerian banks, concluding that exchange rate volatility significantly affects banks' intermediation processes. Osoro and Ogeto (2014) further supported the notion that exchange rate risks, including translation, transaction, and economic exposure, impact financial performance. Overall, these studies suggest that the relationship between exchange rates and profitability is context-dependent, highlighting the need for tailored strategies to mitigate risks associated with currency fluctuations.

2.3.2. Gross Domestic Product and Profitability

The relationship between GDP growth and bank profitability is generally positive, as increased economic activity typically leads to higher demand for banking services. Barasa (2014) found a weak positive correlation between GDP, inflation, and stock market performance, while Hong and Razak (2015) demonstrated that nominal GDP significantly impacts the financial performance of Islamic banks in Malaysia. However, Kiptoo (2012) noted that GDP growth had a limited influence on commercial bank profitability, particularly when interest rates were factored in. This suggests that while GDP growth is essential for banking profitability, its effects may be moderated by other economic factors. Francis (2013) identified a range of determinants influencing commercial bank profitability in Sub-Saharan Africa, emphasizing the importance of both bank-specific and macroeconomic factors. Additionally, Ongore and Kusa (2013) highlighted that declining GDP growth negatively affects credit demand and, consequently, bank profitability. The findings collectively indicate that banks must navigate the complexities of GDP growth alongside other macroeconomic variables to maintain profitability and support economic development.

2.3.3. Inflation and Profitability

Inflation and Profitability

Inflation significantly impacts bank profitability, as evidenced by various studies examining its effects on financial institutions. Hooshyari and Moghanloo (2015) found a strong correlation between inflation and profitability among banks in Iran, suggesting that increased economic activity during inflationary periods leads to higher deposits and, consequently, bank performance. Chioma et al. (2014) similarly reported a positive, albeit not statistically significant, relationship between inflation and banks' performance in Nigeria, indicating that inflation influences investment decisions in the banking sector. Khan et al. (2014) analyzed inflationary trends and their effects on large banks in Pakistan, concluding that a strong positive relationship exists between inflation and bank performance. Omondi (2014) further demonstrated that rising inflation rates correlate with increased base lending rates at Kenya Commercial Bank, reinforcing the idea that inflation affects banks' lending practices. These findings underscore the importance of inflation management for banks to sustain profitability and adapt to changing economic conditions.

Interest Rates and Profitability

Interest rates play a critical role in determining the financial performance of commercial banks, with several studies highlighting their influence on profitability. Ngure (2014) found that interest rate volatility and bank size significantly affect bank profitability in Kenya, suggesting that effective monetary policies are essential for enhancing financial performance. Irungu (2013) established a strong positive relationship between interest rate spreads and the financial

performance of commercial banks, indicating that higher spreads contribute to increased profitability. Additionally, Ndichu (2014) and Ngumi (2014) emphasized the importance of interest rates in shaping the financial performance of deposit-taking microfinance institutions in Kenya. Their findings suggest that lending interest rates significantly impact profitability, highlighting the need for banks to manage interest rate risks effectively. Overall, these studies demonstrate that interest rates are a key determinant of bank profitability, necessitating careful monitoring and management by financial institutions to optimize performance.

3. Methodology

This section outlines the research methodology, including the design, sampling technique, data collection methods and data analysis procedures.

3.1. Research Design

A research design is a scheme, outline or plan that is used to generate answers to research problems (Orodho, 2003). The study adopted a causal/correlational research design aimed at examining how the independent variables affects the dependent variable. To perform this, the study employed the Johansen cointegration test to establish the long effect of the independent variables on the dependent variable bank profitability. As stated by Ericsson (1992), co-integration implies and is implied by existence of an error correction representation of the relevant variables. Therefore, co-integration provides the statistical and economical basis of the empirically successful error-correction models (ECMs) and bring the short and long run information together and modelling the data.

3.2. Data collection tools

The data from this study will be collected from a secondary source and the use of annually time series data from 1980 to 2021. The study will not consider the period before 1996 due to non-availability of due in some specific years because of the structural adjustment programmes (SAP) and most of the data was not collected during that period on certain variables to be used in the study. Hence, the study will focus only data from 1996 to 2022 which is the latest date at the time of carrying out the study.

3.3. Source of data

The source of the data will be from World Bank Data Base, Bank of Zambia (BOZ) Reports, Balance sheets and Income statements of all 19 commercial banks.

3.4. Data analysis method and tools

The relationship between the dependent variable and independent variables will be analyzed econometrically using a regression analysis. The study employed stata 14 and Microsoft Excel as the statistical packages

3.4.1. Model specification

a. Econometric model

This study employed the econometric model. Specifically:

Yt=(UER,INF,EXR,GDPTH) ....*equation* 1
where;
UER is Unemployment rate

INF is Inflation

EXR is Exchange rate

GDPTH is Gross Domestic Product growth

Therefore, formulating the econometric model, this study states the following operational and log form of model 1:

$Y_t = \beta_0 + \beta_1 UER_t + \beta_2 INFt + \beta_3 EXR_t + \beta_4 GDPTH_t + \varepsilon$ .... (Equation 2)

Where, β_2 = intercept, $\beta_1, \beta_2, \beta_3$ *and* β_4 are the coefficients of the independent variables andε=errorterm

Theoretically expected signs – are priori expectations where $\beta_1, \beta_2, \beta_3 < 0 \; and \; \beta_4 > 0$

3.4.2. Preliminary economic tests

Stationary tests and Johansen Co-integration tests were used

3.5. Diagnostic tests

3.5.1. Auto-regression test

Auto regression maybe defined as correlation between members of series of observations ordered in time (as time series data). In the regression context, the classical linear regression model assumes that such autocorrelation doesn't exist in the disturbance (Gujarati, 2009, p413) symbolically

$(u_i, u_j / x_i, x_j) = (u_i, u_j) = 0$ Equation 4

However if there is such a dependence, we have autocorrelation

$(U_I, U_J) \neq 0$ Equation 5

To test the presence of autocorrelation, we use the Durbin-Watson d test

$$d = \frac{\sum_{t=2}^{r=n}(\widehat{u_t} - \widehat{u_{t-1}})^2}{\sum_{t=1}^{t=n}\widehat{u_t}^2} \qquad \text{Equation 6}$$

This is simply the ration of the sum of squared difference in successive residuals to the RSS

Where ≈ means approximately now let define

$$\hat{p} = \frac{\sum \widehat{u_t}\widehat{u_{t-1}}}{\sum \widehat{u_t}^2} \qquad \text{Equation 7}$$

Where $-1 \leq \rho \leq 1$ and $0 \leq d \leq 4$

$H_0: \rho = 0$ verse $H_1: \rho > 0$ reject H_0 at the alpha level of significance if $d < d_u$ that is, there is statically significant positive auto-correction.

$H_0: \rho = 0$ verse $H_1: \rho < 0$ reject H_0 at the alpha level of significance if $(4-d) < d_u$ that is, there is statically significant evidence of negative auto-correction

$H_0: \rho = 0$ verse $H_1: \rho = 0$ reject H_0 at the 2 alpha level of significance if $d < d_u$ that is, there is statically significant evidence of auto-correction, positive or negative (Gujarati, 2009, p434-437)

If there is presence of autocorrelation, we can use the following remedy. In large sample size the Newey-West method used by obtain standard errors of the OLS estimators that are corrected for autocorrelation. This method is actually an extension of white's heteroscedasticity-consistent standard errors. (Gujarati, 2009, p441)

3.5.2. Heteroscedasticity test

As with multicollinearity, the important practical question is, how does one know that heteroscedasticity is present in a specific situation? Again as the case of multicollinearity there is no hard and fast way for detecting heteroscedasticity, only a few rules of thumb but this situation is inevitable because ∂^2 can be known only if we have the entire Y (population) corresponding to the chosen Xs. In economics studies there is only sample y-value corresponding to a particular value of x and there is no way one can know ∂_i^2 from just one y-observation. Therefore in most cases involving econometrics investigations, heteroscedasticity may be a matter of intuition, educated guesswork, prior empirical experience or sheer speculation. (Gujarati, 2009, p377)

Graphical method can be used to detect heteroscedasticity, if there is no priori or empirical information about the nature of heteroscedasticity. In practice one can do the regression analysis on assumption that there is no heteroscedasticity and then do a post-mortem examination of the residual square $\hat{u}^2$ if they exhibit any systemic pattern (Gujarati, 2009, p377).

3.5.3. Normality test

An ordinariness test is applied to decide whether the mistake terms are regularly conveyed. The Jarque Bera (JB) tests "... whether the co-proficient of skewness and the co-effective of abundance kurtosis are mutually zero" (Streams, 2008: 163). In the event that both Skewness (s) and Kurtosis (K-three) are equivalent to nothing, the circulation of the time series data is viewed as normal. This investigate can demonstrated through the accompanying condition:

$$JB = \frac{n}{6}\left[S^2 + \frac{(K-3)^2}{4}\right]$$

Where,

n = sample size

S = skewness,

K = kurtosis

(Gujarati and Porter, 2010)

Should Skewness or Kurtosis be preferable over nothing, then, at that point, the worth of the JB measurement could begin to rise. The invalid speculation of ordinariness ought to be dismissed assuming the proportion of the JB measurement is higher than the imperative expense of two levels of opportunity (Gujarati and Doorman, 2010). In any such case, the conveyance isn't thought about to be customary.

4. Data presentation and analysis

4.1. Pre-estimation analysis

Before estimation, the graphs of the time series under study are plotted, descriptive statistics are displayed, unit root test for the variables are performed and cointegration analysis is done on the variables.

4.1.1. Descriptive statistics

The descriptive statistics of the variables were conducted. Table below provides a descriptive statistics of macroeconomic variables used for the research work.

Table 1 Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
ROA	27	1.426	1.293	-0.753	5
EXR	27	6.731	5.099	1.208	20.018
UER	27	10.516	3.406	5.03	15.9
GDPTH	27	5.108	2.836	-2.785	10.298
INF	27	15.846	8.743	6.429	43.073

Source: data results from STATA

Our sample for this paper has 27 observations from 1996 through 2022. The central tendency as depicted by the mean of the commercial banks profitability which was measured by returns on assets (ROA) is 1.426 and the mean for exchange rate (EXR) is 6.731 for our dataset. The mean values for unemployment rate (UER) and gross domestic product growth (GDPTH) is 10.516 and 5.108 respectively. Lastly, the mean value for inflation (INF) is 15.846. The standard deviations of the variables are high thus suggesting that the data points are scattered over a wide range of values. The maximum and minimum values for each respective data on the variables are not too close to their respective means hence variables show some level of fluctuations from the mean

The figure below shows the line graphs of historical performance of the variables used in the study
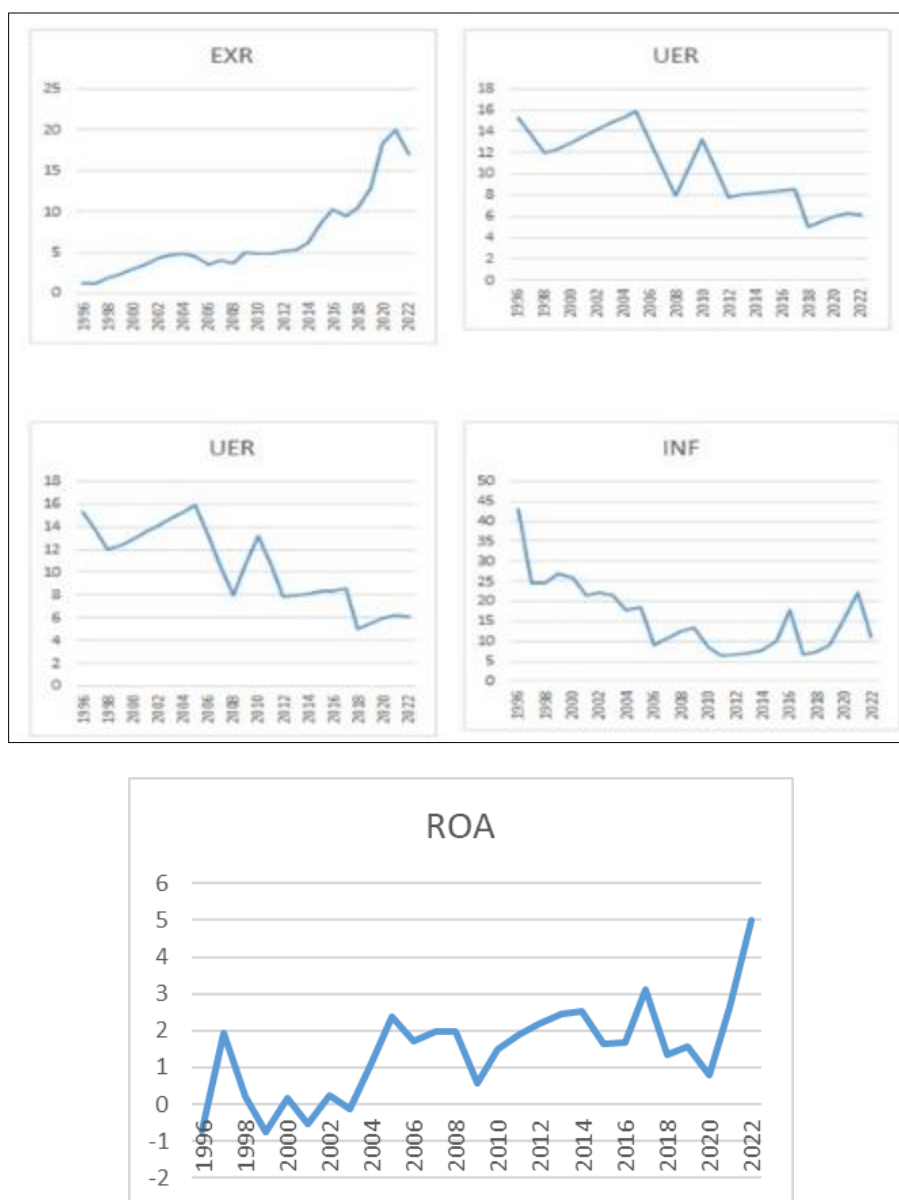
Source: Author's illustration

Figure 1 Historical trend of variables

The figure shows the multiple graphs of the series at their level form. The graphs show there is little evidence to the presence of structural breaks or outlier in the variables but the graphs on series display a stable variance

4.1.2. Unit root test for the study variables

In order to carry out any multivariate time series analysis, stationary time series data was required. The use of VAR model does impose pre-testing of variables for unit root problems. Therefore, unit root test is conducted in this study to find out if there are mixtures in the order of integration of our variables. The primary reason for directing the unit root test was on the grounds that non stationarity can prompt misleading relapse results. The order of integration of the time series was investigated by applying the Augmented Dickey-Fuller (1979) test. The test was done both at level and first difference.

Table 2 Unit root results

Variable	ADF at Level		ADF at 1st Difference	
	t-statistic	p-value	t-statistic	p-value
ROA	-1.002	0.7527	-3.669	0.0046
EXR	0.308	0.9777	-4.356	0.0004
GDP growth	-1.846	0.3578	-6.869	0.0000
INF	-1.996	0.2883	-4.865	0.0000
UER	-1.368	0.5976	-5.164	0.0000

Source: Data results from STATA

From the outcomes in the table, at level, every one of the variables were uncovered to be non-stationary at the 5% level of significance as the p-value of all variables were viewed to be greater than 0.05. Nonetheless, in the wake of testing for stationarity at first difference every one of them were viewed to be stationary on the grounds that all the p-values are less than 0.05. Thus, every one of the variables are integrated of order I (1) since they generally become stationary solely after first difference.

4.1.3. Johansen cointegration test results

The Augmented Dickey-Fuller (ADF) estimates presented in section 1 above show that the all the variables in this study are integrated of order one I (1) Therefore, the Johannsen cointegration test was employed to test for the long run relationship between the independent variables and dependent variable. The empirical results for bound cointegration test are summarized and presented in the table below

Table 3 Cointegration results

	Max-Eigenvalue		Trace	
Hypothesized no. of CE (s)	Statistic	5% Critical value	Statistic	5% Critical value
None	40.9179	33.46	83.5041	68.52
At Most 1	22.0511	27.07	42.5862*	47.21
At Most 2	10.9106	20.97	20.5351	29.68
At Most 3	8.2065	14.07	9.6245	15.41
At Most 4	1.4180	3.76	1.4180	3.76

Source: Data results from STATA; Trace test indicates cointegration equation at the 0.05 level at most 1; Max-eigenvalue test indicates cointegrating equation at the 0.05 level at most 1; *denotes failed rejection of the hypothesis at the 0.05 level

4.2. Estimates of VAR

The VAR results above shows that the reliant variable ROA is firmly endogenous implying that it emphatically impacts itself as demonstrated by significant impact of all the 4 lags. For the four variables, the results show that exchange rate, GDP growth, inflation and unemployment all have an effect on commercial bank profitability. Exchange rate, unemployment rate and inflation have a negative impact on commercial banks profitability while GDP growth has a positive impact on the commercial bank profitability.

Table 4 VAR results

	Coef	Std.Err.	z	P>z
ROA				
L1	-1.36645	0.1203164	-11.36	0.000
L2	-1.24272	0.0848901	-14.64	0.000
L3	0.265807	0.0729509	3.64	0.000
L4	-0.3405	0.0656248	-5.19	0.000
EXR	-0.15675	0.0276754	-5.66	0.000
UER	-0.6265	0.0430949	-14.54	0.000
GDPTH	0.28254	0.0311604	9.07	0.000
INF	-0.12231	0.0202281	-6.05	0.000
_Cons	12.20168	1.039315	11.74	0.000

Source: Data results from STATA

4.3. Correlation analysis

Table 5 Pearson correlation results

Pearson correlationt-Statistic probability					
	ROA	EXR	UER	GDPTH	INF
ROA	1				
EXR	-0.494	1			
	0.0088				
UER	-0.5332	-0.7415	1		
	0.0042	0			
GDPTH	0.0677	-0.4433	0.3977	1	
	0.7373	0.0206	0.0399		
INF	-0.6367	-0.2882	0.5657	-0.136	1
	0.0004	0.1449	0.0021	0.4988	

Source: Data results using STATA

The consequences of the connection in the table 5 uncovers major areas of strength for a connection between the profitability of banks and the four variables as should be visible from the p-values which are under 0.05. All the more explicitly, the ostensible exchange rate, inflation and unemployment each has major areas of strength for a straight relationship with the profitability of banks. That is, devaluation in the Zambian Kwacha is related with decrease in the profitability of banks. Additionally, an expansion in inflation or unemployment is related with decrease in the profitability of banks.

GDP growth then again, and true to form, has major areas of strength for a direct relationship with the profitability of banks. This suggests that growth in the economy is related with expansion in the profitability of banks.

4.4. Diagnostic test

The accompanying tests were led to check the legitimacy of the consequences of the VAR model results prior introduced by the review.

4.4.1. Autocorrelation

To test for correlation in the residuals, the study used the Breusch-Godfrey serial correlation LM test and the results were as follows

Table 6 Autocorrelation results

Lagrange-multiplier test			
Lag	Chi2	df	Prob > Chi2
1	0.0620	1	0.80343
2	6.0277	1	0.1408
H: No autocorrelation at lag order			

Source: Data results using STATA

The probability value of the Chi2 (0.80343) fails to reject the null hypothesis of no serial correlation at first lag Similarly, the probability value of the Chi-square statistics (0.0.1408) is insignificant at 5% level and therefore we conclude there is no serial correlation in the residuals of our model**.**

4.4.2. Test for Heteroscedasticity

To test for Heteroscedasticity, the study used the Breusch-Pagan-Godfrey test and the results

Table 7 Heteroscedasticity results

H0: Constant variance (homoscedasticity)	
Chi2(1)	0.22
Prob > chi2	0.6355

Source: Data results using STATA

The null hypothesis states that there is homoscedasticity while the alternative hypothesis is that there is heteroscedasticity. Since the p-value of the observed Chi-square (0.6355) is insignificant at 5% level, we fail to reject the null hypothesis and conclude that our VAR model has no heteroscedasticity in the residual which is also a desirable result for the model

4.4.3. Normality test

To test for Normality, the study used the Jarque-Bera test and the results were as follows

Table 8 Jargue-bera test results

Jarque-bera test			
Equation	Chi2	df	Prob > Chi2
Roa	0.795	2	0.67213
All	0.795	2	0.67213

Source: Data results using STATA

The null hypothesis states that the residuals are normally distributed while the alternative hypothesis is that the residuals are not normally distributed. The value of the Jarque-Bera is about 0.67213 both the dependent values and independent variables which is more than 0.05 meaning that we cannot reject the hypothesis but we accept the null hypothesis that the residuals are normally distributed which is good for the model.

4.4.4. Multicollinearity test

To test for Multicollinearity, the study used the Variance Inflation Factor (VIF) and the results were as follows:

Table 9 VIF results

Variable	VIF	1/VIF
UER	3.63	0.275194
EXR	2.41	0.415324
INF	1.94	0.51436
GDPTH	1.57	0.63557
Mean VIF	2.39	

Source: Data results using STATA

Multicollinearity test was carried out using the Variation Inflation Factor (VIF). According to the table above, all the VIF values of the variables were less than 10. Therefore, this implies that no severe multicollinearity existing in the model

4.4.5. Stability test

This section attempts to investigate whether the period under study had encountered structural changes over the study period and whether it can be used for reliable predictive purpose by monetary authorities. The study employed eigenvalue stability condition for stability tests on the model. The null hypothesis is that the parameters are stable while the alternative hypothesis is that the parameters are not stable

Table 10 Eigenvalue stability condition results

Eigenvalue stability condition		
Eigenvalue		modulus
-0.4878551	0.6642348i	0.824142
-0.4878551	0.6642348i	0.824142
0.559895	0.5630834	0.79132
0.559895	0.5630834	0.79132
All the eigenvalues lie inside the unit circle. VAR satisfies stability condition.		

Source: Data results using STATA

5. Discussion of findings

5.1. Exchange rate and bank profitability

The findings of this study indicate that exchange rate fluctuations significantly affect bank profitability in Zambia, demonstrating a negative correlation. Specifically, a one-unit increase in the exchange rate results in a 0.15675-unit decrease in profitability, suggesting that exchange rate volatility adversely affects the banking sector. This effect may be attributed to factors such as the deterioration of asset quality, where a depreciating local currency increases the burden of foreign currency-denominated loans on borrowers. As a result, borrowers may struggle to service their loans, leading to an increase in non-performing loans (NPLs) and thereby affecting the bank's asset quality and return on assets (ROA). Additionally, economic instability linked to volatile exchange rates can further erode profitability by reducing demand for banking services, as banks are forced to increase provisioning for potential loan losses in response to uncertain economic conditions. These findings contrast with Kiganda's (2014) study in Kenya, which concluded that macroeconomic factors, including exchange rate fluctuations, had an insignificant effect on bank profitability. The difference in outcomes may be attributed to varying economic conditions and structural differences between the financial sectors of Zambia and Kenya, illustrating how regional economic factors can distinctly affect bank performance.

5.2. Unemployment rate and bank profitability

This study finds that fluctuations in the unemployment rate significantly and negatively affect bank profitability in Zambia, with a one-unit increase in unemployment leading to a 0.6265-unit reduction in profitability. High

unemployment tends to lower consumer spending, reducing the demand for financial products and services, including loans, thereby limiting banks' ability to generate interest income. Additionally, elevated unemployment often leads to an increase in NPLs, as unemployed borrowers face greater challenges in repaying loans. Consequently, banks must allocate more resources to loan-loss provisions, which erodes net income. Furthermore, unemployment reduces household savings, resulting in lower deposit levels, and a key source of funds for lending activities. This reduction in deposits can constrain lending capacity, further affecting profitability. The results of this study align with Horobet, Radulescu, Belascu, and Dita's (2021) findings in Central and Eastern Europe, where unemployment was also found to negatively affect bank profitability. This similarity suggests a consistent effect of unemployment on bank profitability across various economic contexts, particularly in emerging economies where high unemployment can destabilize the banking sector.

5.3. GDP growth and bank profitability

The findings indicate a positive effect of GDP growth on bank profitability, with a one-unit increase in GDP growth correlating to a 0.28254-unit increase in profitability. GDP growth is generally accompanied by increased consumer and business confidence, which promotes demand for loans and other banking services. As a result, banks benefit from higher interest income due to expanded lending activities. Economic growth also enhances the creditworthiness of borrowers, reducing the likelihood of loan defaults and subsequently improving the bank's asset quality. Additionally, a growing economy typically leads to increased savings and deposits, providing banks with a stable source of low-cost funds for lending. This stable financial environment supports profitability by ensuring that banks maintain a healthy interest spread. The positive effect of GDP growth on profitability in this study is consistent with findings from Hong and Razak's (2015) study on Malaysian Islamic banks, where GDP growth was found to significantly enhance banks' return on assets (ROA). This similarity highlights the importance of a stable, growing economy for the banking sector, as economic expansion fosters both profitability and operational stability.

5.4. Inflation and bank profitability

This study reveals that inflation significantly and negatively affects bank profitability in Zambia, with a one-unit increase in inflation resulting in a 0.12231-unit reduction in profitability. High inflation erodes the purchasing power of money, diminishing the real returns on loans if interest rates do not keep pace with rising prices. Consequently, the bank's net interest margin is reduced, directly impacting ROA. Inflation also affects loan portfolio quality by increasing the cost of goods and services, which can strain borrowers' ability to repay their loans, thereby increasing NPLs. Additionally, inflation raises operational costs, as banks face increased expenses for staff wages, rent, and other overhead costs. Furthermore, inflationary volatility can lead to uncertain economic conditions, prompting banks to adopt cautious lending practices and set aside additional provisions for potential loan losses, which further depresses profitability. These findings align with Hooshyari and Moghanloo's (2015) study in Iran, which also observed a strong negative effect of inflation on bank profitability. This consistency across different contexts suggests that inflation is a universal challenge for banking institutions, particularly in emerging economies where inflationary pressures are more pronounced and economic volatility can significantly affect the financial sector.

6. Conclusion

The study conclusions were as follows:

- The study concluded that there is a significantly negative relationship between exchange rate and the commercial banks profitability which was measured by return on assets because its p-value was less than 0.05, meaning an increase in exchange rate lends to an increase in bank profitability. This was attributed by asset quality deterioration where depreciating local currency can lend to difficulties for borrowers serving loans denominated in foreign currency. This can result in an increase in non-performing loans, affecting the bank's asset quality and subsequently, it's ROA and economic stability concerns meaning a volatile exchange rate can reflect broader economic instability. Uncertain economic conditions might lead to reduced lending, increased provisioning for potential loan losses or a decline in demand for banking services, all of which could impact the bank's ROA.
- The study concluded that there is a significantly negative relationship between unemployment and the commercial banks profitability which was measured by return on assets because its p-value was less than 0.05, meaning an increase in unemployment rate lends to an increase in banks profitability. This can be attributed by reduced consumer spending, increase in non-performing loans, decreased deposits and savings. . These results can be attributed by increased loan demand, improved asset quality, higher interest income, enhanced consumer confidence and deposits and stable economic environment

- The study concluded that there is a significantly positive relationship between GDP growth and the commercial bank profitability which is measured by return on assets because its p-value is less than 0.05, meaning a growth in GDP lends to an increase in bank profitability. These results can be attributed by increased loan demand, improved asset quality, higher interest income, enhanced consumer confidence and deposits and stable economic environment
- The study concluded that there is a significant negative relationship between inflation and bank profitability which is was measured by return on assets because its p-value is less than 0.05, meaning an increase in inflation leads to a decrease in bank profitability. These results can be attributed by erosion of real interest rate that high inflation can erode the purchasing power of money over time. When interest rate rates on loans offered by banks do not keep pace with inflation, the real returns decreases, this reduces the bank's net interest margin, impacting its profitability and ROA. Other attributes would be the impact on loan portfolio quality, cost of funds and operational expenses, effect on deposits and savings and volatility and economic uncertainty.

Recommendations

Based on the results of the study, the researcher recommends the following:

- Diversification of loan portfolios: Encourage banks to diversify their loan portfolios to mitigate the impact of exchange rate fluctuations and unemployment. This might involve focusing on sectors less susceptible to macroeconomic factors or implementing hedging strategies to manage currency risks.
- Risk management strategies: Develop and implement robust risk management strategies tailored to address the impact of inflation and exchange rate fluctuation as asset quality. This involves stress testing, improved credit assessment processes and closer monitoring of loan portfolios.
- Sustainable funding models: Encourage banks to develop sustainable funding models that can withstand fluctuations in exchange rates and inflation. This might involve exploring long term-term funding sources or developing innovative financial products to attract deposits.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study

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