Impact of Inflation and Exchange Rate on the Financial Performance of Commercial Banks in South Africa

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IMPACT OF INFLATION AND EXCHANGE RATE ON THE FINANCIAL PERFORMANCE OF COMMERCIAL BANKS IN SOUTH AFRICA

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Abstract

The study examines the impact of inflation and exchange rate on the financial performance of commercial banks in South Africa. The study covers four largest commercial banks in South Africa, namely; Standard bank, Nedbank, Capitec bank and Firstrand bank for the period 2003-2019. To measure the financial performance return on equity was used as the dependent variable and inflation and exchange rate as the independent variables. To achieve the objective of the study, the ARDL, FMOLS and DOLS models are used. The findings illustrated that there is a significant inverse relationship between inflation and the return on equity and there is a weak relationship between exchange rate and the return on equity.

Keywords; Financial Performance, Return on Equity, Inflation, Exchange Rate, Commercial Banks, South Africa.

1. Introduction

Inflation is generally the increase of prices in an economy over a period of time. When the price of goods and services increase, one unit of the local currency will buy fewer goods and services. Several factors cause inflation. It can be caused by too much money supplied into the market by the government through the purchase of bonds or by commercial banks when they issue loans to the public. The excessive growth of money supplied in the

economy compared to the economic growth will cause high inflation rate, when there is high inflation, businesses and consumers increasingly fear that it will erode their future purchasing power. A low rate of inflation is favourable since it enables businesses and consumers to make long-range plans as they know the purchasing power of their money and that it will not be steadily eroded. The measure of price inflation is called the rate of inflation annualized percentage change of the general price index (CPI) over time. The CPI measures the change in prices of a fixed basket of consumer goods and services.

The exchange rate is generally the value of one country's currency against the value of another country or economic zone. For instance, how many South African rand (ZAR) do we need to buy one dollar ($1US). As of January 1, 2009, the exchange rate was 6.79ZAR, which means that it took 6.79ZAR to buy $1USD. Foreign exchange also involves assets valued in foreign currencies. These foreign assets can be used to perform the same functions of foreign currency, for example, as a way of deferred payments for international activities and as a way of international payments. The foreign exchange market increased over the past years due to the increase of globalization which has promoted international trade, especially with the introduction of the electronic payment system. In the world, the foreign exchange market is one of the largest financial market and commercial, and investment banks benefit more as they are the greatest players in this market. According to Stephen et al.,.(1998) in the foreign exchange market, demand, and supply are the forces that determine the prices of each currency. According to Chiira (2009) in global trade, they are diverse currencies, and the exchange rates fluctuation is a motivating factor that controls the profitability levels of banks as it impacts their monetary intermediation procedure. Since no country can survive without other countries, they all perform their transactions with each other; therefore, the foreign exchange rate becomes available.

The exchange rate oscillations in South Africa are characterized by periods of South African rand depreciation, which negatively influenced the South African economy. This has seen the exchange rate against the USD to get as high as 16.76 ZAR, which made it difficult for the financial sector to forecast the future exchange rate with accuracy. This greatly affected the financial performance of commercial banks as they pursue to provide

enough currency to international trade. There have been several studies on the impacts of inflation and exchange rate fluctuations on financial performance in other countries. Most performance studies of South African commercial banks focused on branch performance [see Oberholzer and Van der Westhuizen (2004); O'Donnell and Van der Westhuizen (2002); Okeahalam (2006)]. More recently, Cronje (2007) and Ncube (2009) used Data Envelopment Analysis (DEA) to study the efficiency of South African banks and the periods 1997-2007 and 2000-2005.

This study will help stakeholders to make more informed investment decisions when considering South Africa's commercial bank investments.

2.0 Literature Review

2.1 Theoretical Review

The monetarist theory asserts that money is the immediate substitute for every other asset, a rise in money supply, given a steady velocity of circulation, will directly affect the need for different resources. If the aggregate yield of the economy is settled, an increase in the money supply will lead specifically to more expensive rates (Friedman, 1987). This theory achieved an indistinguishable end from the hypothesis of money that increase in money supply will cause a direct increase in prices and most likely income, a rise in actual yield, therefore, an increase in employment (Friedman, 1987). In the long run, an increase in money supply will mean more expensive rates unless if there is economic growth and development.

The monetarist school of economic thought that money supply is a critical factor of the level of creation of goods and services in the short run and the inflation rate over the long run.

Keynes contended that an expansion or diminishing in money supply just influences the interest for products and enterprises indirectly and the level of income. For instance, an expansion in money supply prompts a fall in the rate of interest, which in turn makes private venture to reduce and ultimately results in a reduction in the level of national income. The effect on the economy of the increase in money supply relies upon the impact of the financing costs created. According to Keynesian, speculation request and the

shopper request are insensitive to loan interest changes. That is why the premium is inelastic; he asserted that the volume of ventures is determined by innovative changes and business certainty and desires, henceforth an expansion in the supply of cash will have limited affect total interest and therefore generally have little impact on yield and employment. Keynesian contends that financial arrangement will have restricted impact on the economy and national income since increment in money supply will have a counter influenced in the decreases in the velocity of cash available for use. As indicated by Keynes, increment in cash supply does not mean a relative increment in the price level.

Fisher (1911) built up this hypothesis. Observational investigations of the quantity theory of money (QTM) have a focus specifically on the connection between the rate of change of the cash stock and inflation. In financial matters, the quantity theory of money is the hypothesis that cash supply has an immediate, corresponding association with the price level (Fisher, 1911). While renowned business examiners agree that the amount speculation stays consistent as time goes on, there is still inconsistency about its application in the short run. Commentators of the theory contend that money changes not steady and, in the short-run, costs are sticky, subsequently the association between money supply and value of the same money (Friedman, 1987). The quantity hypothesis of money has for some time been one of the acknowledged doctrines of the socialist monetary authority.

Purchasing power parity theory describes that similar goods in different countries have similar value when measured in the same currency. The theory was founded by two economists (Menon & Viswanathan, 2005). They stated that when the purchasing power is the same in different countries, the rate of exchange between the currency of those countries will be at equilibrium.

The International Fisher effect explains that the difference in returns between two countries is equal to the difference in inflation rates. Nominal risk-free interest rates include a real rate of return and anticipated inflation. It means that if investors of all countries need the same real return, the interest rate variability between countries can be the result of variances in the expected inflation.

2.2 Empirical Review

Several global studies have been established on the inflation rate, exchange rate fluctuations and financial performance of commercial banks, but a gap still exists in the discrepancy of theoretical and empirical results.

Wamucii (2010) examined the relationship between inflation and commercial bank financial results in Kenya from 2000-2009. The analysis of data was done using the correlation coefficient and the determination of coefficient to initiate the nature and strength of the relationship. Analysis of quantitative data was executed by using the statistical package for social science (SPSS). On the relationship between the two variables, the study showed that as inflation decreased, profits increased. This relationship between inflation and profits indicated that there is an inverse relationship. On the relationship between inflation and the total assets, it showed that there is no clear pattern which means that there is a weak relationship. The study concluded that the bank profits have a stable pattern which showed that when inflation decreased, profits increased; therefore, the independent variable has a significant relationship with the dependent variable that is financial performance.

Wanjohi (2003) studied why some commercial banks are successful than other commercial banks in terms of their profitability in Kenya. Inflation was defined as a determinant of commercial banks profitability as it affects the cost and the revenue of the firm. They were focusing on the period between 1993-2002, for commercial banks on the Nairobi Securities Exchange in Kenya. The study examined the profitability of internal and external factors of commercial banks. The findings of the study showed that regardless of the banks having different experiences and characteristics, there was evidence that internal factors added to the profitability, from interest on loans and it was because loans formed the major part of bank's capital structure. The study failed to ultimately show how inflation impacted profitability because the aim was on loan element as an internal factor.

Derick Adul, Domfeh and Denkyirah (2016) assessed the effect of inflation on the financial performance of Ghananian banks from 2004-2013 by using panel data of five banks. Pooled, random effects and generalized moment method (GMM) models were

used to estimate the effect of inflation on financial sector results. The quadratic function was used to estimate thresholds beyond which the financial sector performance is detrimental. They concluded that inflation would continue to have a positive impact on the financial sector development, except it hits a 15% threshold. To support the development of the financial sector, the study recommends a minimum threshold, not above 15 per cent of inflation.

Naceur & Ghazouani (2007) studied the relationship between inflation and financial performance for eleven the Middle East and North Africa countries from 1979-1999. The negative correlation is reported using the generalized method moment (GMM), by estimating a complex panel model. At the other hand, a threshold effect is also identified to show that negative inflation effects on the financial sector become successful once the inflation rate reaches certain threshold.

According to Bruno and Easterly (1995) they carried out a study on the relationship between inflation and the economic growth of Latin American countries between the period 1960 and 1992. They asserted that the negative relationship between inflation and the economic growth is a result of high inflation periods especially in the long-run. In a period of high inflation crises, they discovered that economic growth declines sharply, and then it recovers at a great rate after inflation falls. According to Fischer (1993) he found out that there is negative correlation between inflation and economic growth since inflation reduces growth by reducing the investment and the productivity growth declines sharply, and then it recovers at a great rate after inflation falls. According to Fischer (1993) he found out that there is negative correlation between inflation and economic growth since inflation reduces growth by reducing the investment and the productivity.

Bernanke, Laubach, Mishkin and Posen (2001) they carried out some studies in inflation, where the central banks increased or decreased the rate of interest based on targeted inflation levels to counter the impacts. The study targeted New Zealand as an inflation-targeting pioneer from 1970 to 1990. New Zealand was the first country to take the formal inflation that was a change in its conduct of monetary policies. The main aim was to protect the country from negative inflation impacts that it experienced between 1974-1988 during the first oil shock, which was caused by discretionary price, wage and

interest rate. The study discovered that with a decrease in inflation rates, the rate of interest that was initially high decline at a great rate leading to a rise in the rate of unemployment. The study concluded that with a rise in inflation and interest rates, the increase of exchange rates, there was GDP growth and a decrease in the rate of unemployment. The study failed to explain the impact of output shocks since the focus was on the price levels despite the fact that output has an effect on profitability.

Giorgi (1991) carried out a case study focusing on the relationship between inflation and regime for external trade and the monetary transactions. He focused on Uruguay for the period 1956 and 1987. Giorgi compared trade barriers and currency regulations in the country and exchange rates. Giorgi (1991) in his study he concluded by showing that several models which were analyzed also contributed inflation in Uruguay and for that reason he could not get rid of the structuralist approach and the neo-classical oriented approaches. The study did not show the impact that policies have on inflation in developing countries to their external debt and the durability of political regime.

Musyoki, Pokhariyal, and Pundo (2012) studied the effects of Kenyan economic growth's real exchange-rate volatility. The authors used GARCH (generalized autoregressive method of heteroscedasticity) and measurement of the unconditional standard deviation of changes to calculate volatility and GMM (generalized method moments) to analyze the effect of real volatility of exchange rates on Kenyan economic growth from 1993-2009. The study established that real exchange rate was unstable for the study period, the real exchange rate in Kenya showed an appreciating and unsettling trend, showing that the country's international competitiveness decreased over the study period. The authors concluded that the real exchange rate volatility showed an inverse relationship between real exchange rate volatility and the economic growth of Kenya.

Manyok (2016) studied the relationship between the rate of exchange variability on the financial performance of commercial banks in South Sudan from 2006 to 2015 using semi-annual data. The study discovered that there is a weak negative relationship between exchange rate variability and financial performance. Gachua (2011) examined the impact of foreign exchange exposure on the firm's financial performance in Kenya using a sample size of 38 firms but only the results of 32 firms were analyzed. The study

showed that the rate of exchange significantly affects imports and exports. The author concluded that the unrealized foreign exchange gains or losses negatively affects the Net Income.

Kipchirchir (2011) studied the relationship between fluctuation in the exchange rates and the financial performance of multinational companies in Kenya. He concluded that there was positive relationship between the exchange rate fluctuations and financial performance of multinational corporations. This was caused by the difference between the trading currency and the financial reporting currency.

Maina (2010) investigate the effect of exchange rate variability on investment in the sub-sector of electric power in Kenya. The author found out that when the exchange rate was stable the investments were also high in the electric power sub-sector as compared to the periods of exchange rate fluctuations.

Wanjau (2014) sought to investigate the relationship among the real exchange rate, current account balance and real income in Kenya. From the independence of Kenya in 1963 to date, the country implemented three policies of exchange rate which are; fixed exchange rate, floating exchange rate and managed float policy (Mudida et al, 2012; Kiptui and Kipyegon 2008). This study was based on two theories namely; neo-classical elasticity approach and the balance of payment constraint. The first was to ascertain the impact of the real rate of exchange fluctuation on current account balance. The second was to ascertain the impact to which import growth rate is compatible with balanced economic growth. The first aim was tested regressing trade balance against the real exchange rate, degree of openness and government expenditure, foreign income and relative prices. To ascertain if Marshal-Lerner holds, the significance and the signage of real exchange coefficient rate was used. For the second aim, the elasticity of income was evaluated by using an import function and compared to theoretical income elasticity proposed in the balance of payment constraint model. The Autoregressive distributed lag (ARDL) was used to model the annual time series from the year 1980-2011. The study showed that the Marshall-Lerner conditions hold and J curve phenomena is supported by data. Furthermore, the rate of import growth is significantly higher than the level compatible with the long-run growth of Kenyan economy.

Opaluwa, Umeh and Ameh (2010) investigated the impact of exchange rate fluctuations on the manufacturing sector of Nigeria from 1986-2005. The data used was collected from the Nigerian central bank, Statistical bulletin and the World Development Indicators(WDI). The used ARDL (Autoregressive Distribution Lag) through multiple regression analysis to analyze the impact of exchange rate volatility on the manufacturing sector. The authors found out that by using the ARDL model the exchange rate fluctuations have short run and long run relationship on the manufacturing sector's output. They argued that the exchange rate fluctuations negatively affected the manufacturing sector's output since the Nigerian manufacturing sector was highly depending on import of inputs and the capital goods were paid in foreign exchange of which the exchange rate was not fixed. This study found out that fluctuations in exchange rate and the performance have a statistically significant relationship and it concluded that exchange rate negatively affect manufacturing sector's output.

Adetayo (2013) analyzed the impact of foreign exchange risks on selected Nigerian commercial banks. The aim of the study was to find how effectively can the risk associated in foreign exchange managed. Primary data was collected using the structured questionnaires. The author tested the hypothesis and checked if there is a relationship between foreign exchange rate and the risk management by using chi-squared statistics. He concluded the study by showing that the spot transaction was effective in minimizing the risk in foreign exchange rate.

Owoeye and Ogubmakin (2013) examined the impact of exchange rate fluctuations on commercial banks performance in Nigeria by using two factors for bank performance that is, the loan loss to total advances ratio capital deposit ratio. The independent variable included the following government expenditure, the real gross domestic product and interest rate. The loan loss to total advance ratio showed exchange rate fluctuations might affect the lender's ability to manage loans which causes high level of bad loans. Capital deposit ratio do not have a significant relationship with the exchange rate. The study concluded that there is a significant relationship between exchange rate fluctuations and the lender's ability in managing loans.

Ani et al. (2013) examined the impact of reforms on foreign exchange on the financial deepening, a case study of Nigeria. The nation of Nigeria witnessed at least fifteen different reforms on foreign exchange from the year 1962 with mixed results on the economy in financial depth. The ordinary least square regression was used to the data to ascertain the overall impact of reforms on foreign exchange on the financial depth of the Nigerian economy. They discovered that reforms of foreign exchange do not have the required positive impact on the depth of financial sector in Nigeria. The authors argued that financial deregulation can have a very strong positive impact on the economic performance. This indicated that after the required reforms in foreign exchange, the country's economy failed to encounter the impressive performance like a stable rate of exchange competent to attract foreign investment.

Wong, Wong and Leung (2008) investigated the foreign exchange rate exposure of Chinese banks. The study used the Capital market approach for 14 Chinese banks. The study showed that there is positive relationship between foreign exchange exposure and the bank size. It also found out that the increase of foreign exchange reduces equity values consequently slowing down the bank's performance.

Berger and Bouwman (2011), conducted a study investigated the effects of bank equity on probability of survival and market share during various financial crises and regular periods. The period regarded was 1984-2010, spanning two banking crises, three financial crises and two "natural" cycles. Our results indicate that a high level of equity during banking crises raises the likelihood of survival and the market share of small banks.

Bolt *et al*. (2012) discovered that bank profitability is affected by an economic cycle during the current recession. They showed that if real gross domestic product contracts 1 per cent during deep recessions, then return on assets decreases at the level of the banking industry by 0.24 per cent. This result can be attributed to the fact that bank loans issued to private sector are heavily dependent on the level of gross domestic product. A decrease in gross domestic product deteriorates the efficiency of the assets and increases the un-performing loans.

3 Methodology

3.1 Data Collection

The secondary data for the dependent variable that is the return on equity was collected from the statement of financial position of banks from 2003-2019 and inflation rate and exchange rate was retrieved from the International Monetary Fund (IMF) website.

3.2 Sample

The sample consists of four big commercial banks in South Africa, thus in the study we use a panel data methodology which is a combination of cross sectional data and time series data. The banks are as follows; ; (i) Standard Bank (ii) Nedbank (iii) Capitec Bank (iv) Firstrand Bank.

3.3 Research Model and Econometric Models

The Auto-regressive Distributed Lag Models (ARDL), Fully-Modified OLS and Dynamic OLS will be employed to confirm consistence and robustness of the ARDL model. An ARDL model is used to estimate the distributive effects over future periods of a series of independent variables on a dependent variable (Pesaran & Shin, 1998). It also incorporates the use of Error Correction Term (ECT) to assess the adjustment speed and the existence of a long-run relationship by using Bound test.

This was further achieved by the aid of E-views 10 to estimate the Autoregressive distributed lag model (ARDL). In this study, the use of ARDL has been based on the ability to provide consistent estimators perhaps when used as a small sample size (Bahmani-Oskooee, 2002). This can be confirmed by conclusions drawn from Pesaran and Shin (2001), who mentioned that the use of the ARDL also allows to resolve estimation problems like collinearity by integrating the dependent variable lags into the model. Also, when using an ARDL model, it is not important to specify the number of lags needed to run the ARDL model, as it automatically defines the lag length needed (Baharumshah, Mohd & Masih, 2009). Pesaran and Shin (2001), notes that an ARDL model estimation must meet the following assumptions; variables must be I(0) or I(1) or both but not I(2), normal distribution, no heteroscedasticity and no serial correlation. The standard ARDL model is as follows;

$$yt = \beta 0 + \beta 1yt\text{-}1 + \ldots + \beta py^{t\text{-}m} + \alpha 0xt + \alpha 1xt\text{-}1 \ldots + \alpha qxt\text{-}n + \varepsilon t \ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

In this study the dependent and independent variables were converted to natural logarithms and the Ordinary least square equation is as follows;

$lnROE_t = \beta_0 + \beta_1 lnINF_t + \beta_2 lnEXC_t + \varepsilon_it$.....(2)

The variables on equation (2) can be substituted into equation (1) to form equation (3) as follows;

$\Delta lnROE_t = \gamma_0 + \sum_{i=1} \gamma \Delta lnROE_{t-1} + \sum_{i=2} \gamma \Delta lnINF_{t-1} + \sum_{i=3} \gamma \Delta lnEXC_{t-1} + \sigma_1 lnROE_{t-J} + \sigma_2 lnINF_{t-J} + \sigma_3 lnEXC_{t-J} + \varepsilon_it$.....(3)

The equation (3) above is the ARDL model with the error correction term.

3.3.1 Descriptive Statistics

The analysis begins with the descriptive statistics or summary statistics to measure the normality of the data by Jarque-Bera test and central tendency by mean and median. The test also shows the variability of the data to measure the minimum, maximum, skewness, and kurtosis of all variables. Descriptive statistics are distinguished from inferential statistics. With the former, we are simply showing what the data is or what the data shows, while with the first, we are trying to reach conclusions that summarize a given data set alone. For example, we try to estimate what population could be using the sample data. In addition, another feature of inferential statistics is the judgment on the likelihood that a realized variation between two sets of groups will occur by chance or will be reliable in that study. Therefore, descriptive statistics are simply often used learn what data are, however, inferential statistics used only to estimate population by our data sample.

3.3.2 Unit Root Test

It is performed for testing whether or not the variables are stationary. In other terms, if the mean, variance, and covariance of the series are constant over time. If they are non-stationary then there is a problem that the collected results will be invalid (Dickey & Pantuala, 1987). Hypothesis testing tends to require that the asymptotic standards or assumptions be relevant, otherwise testing for the hypotheses will be impossible. The other issue of non-stationarity is that a model might have high R-squared which shows a high level of interdependence and even in fact it is not (Dickey & Fuller, 1979). With the

existence of unit root problem in a regression model sequence, conventional t-statistics and F-statistics do not follow t-distribution and F-distribution, and the hypothesis testing would, therefore, be misleading. It can be indicated that the non-stationary is in two different forms that is the random walk model and deterministic trend procedure.

In this study, the unit root test is founded on Augmented Dickey-Fuller (ADF) and Phillip-Perion (PP). The additional benefit of using Phillip-Perion (PP) is that it takes into account the problem of autocorrelation as compared to the Augmented Dickey-Fuller (ADF) that ignores it. Therefore, the PP is often preferred as opposed to the ADF but it is best to use both measures.

The bound test which is based on ARDL model is used to evaluate the short run and long-run relationship between the dependent and independent variables of the study. The bound test allows the dynamics of short-run and long-run to be evaluated separately.

3.3.3 Dynamic Regressions

In this study, the fully modified OLS and DOLS are used to determine the relationship between the variables. FMOLS implemented by Phillips and Hansen(1990), DOLS implemented by Stock and Watson (1993). These methods help to check for serial-correlation and endogeneity issues that assist in preventing fallacious analysis.

3.3.4 The Hausman Test

First, in order to conduct a panel regression estimation, we must identify the most appropriate model that is the fixed-random model. To perform this, the study used the Hausman test (model mis-specification test). In a panel data regression, the Hausman test helps to select between the fixed effect or random effect model. Null hypothesis states that the best model has random effects, while the alternative hypothesis states that the model has fixed effects. Basically, the tests check to see if there is the correlation between the unique errors and explanatory variables in the model. Null hypothesis states that there is no correlation. The fixed effect model equation is written as follows;

$$yit = \alpha + \beta xit + vit$$

yi t – dependent values

α – the intercept

β – kx1 vector of parameters to be estimated on the independent variables

it – vector of the observations on independent variables

t = 1,..,T; i = 1,..,N

The random effect model is as follows;

$$yit = \alpha + \beta xit + \omega it, \qquad \omega it = i + vit$$

4. Data Analysis and Presentation

4.1 Descriptive Analysis

Table 1: Descriptive Statistics

Variable	*LNROE*	*LNINF*	*LNEXC*
Mean	-0.00148	0.051763	0.010009
Median	0.02965	0.055137	0.043276
Maximum	0.371564	0.095868	0.312697
Minimum	-0.947598	-0.006848	-0.339279
Std. Dev.	0.214466	0.023450	0.194387
Skewness	-1.713305	-0.410497	-0.134866
Kurtosis	8.254623	3.849087	1.879918
Jarque-Bera	111.4994	3.952444	3.760790
Probability	0.00000	0.138592	0.152530
Sum	-0.096452	3.519894	0.680627
Sum Sq. Dev	3.081703	0.036843	2.531672

Summary statistics display the data set of the study in an enlightening way. The essential results of descriptive statistics of the dependent and independent variables are discussed in this section (the mean, median, minimum, maximum and the standard deviation). The result shows that the return on equity minimum and maximum values range is -0.9 and 0.02. The arithmetic mean is a negative value of 0.148% with a standard deviation of 21.4% indicating that the value of variant on the data is widely spread.

The mean of inflation between 2003-2019 is 5.1% in South Africa and the minimum and maximum is -0.6 and 9% respectively, the standard deviation of 2% shows that it is not widely spread. The exchange rate mean is 1% during the period of study.

4.2 Correlation Analysis

The table below shows that lninf is negatively related to lnroe and it is statistically significant and the t-value is greater than 2 in absolute value. The results indicate that if inflation rise by 1% return on equity will fall by 0.4. *Lnexc* is positively related with lnroe although it is insignificant by checking the p-value and t-value. A rise by 1% in exchange rate will increase return on equity by 0.09. In regard to the multicollinearity, which occurs if the independent variables in a model are correlated. The results below show that the relationship between inflation and exchange rate is -0.039 which is good according to the rule of thumb which state that the correlation level between independent variables should be not more than 80%. Therefore, there is no multicollinearity between independent variables.

Table 2: Covariance Analysis

Correlation t-statistic	***LNROE***	***LNINF***	***LNEXC***
LNROE	1.000000		

LNINF	-0.403902	1.000000	
	-3.586908	-----	
	0.0006	-----	
LNEXC	0.090037	-0.039510	1.000000
	0.734445	-0.321233	-----
	0.4653	0.7490	-----

4.3 Unit Root Test

The unit root test (Phillips-Perron and Augmented-Dickey Fuller) confirmed the stationarity among the variables. These tests were taken so as to ascertain if the variables make it viable to estimate the ARDL model. The hypothesis is as follows

Null Hypothesis : Has a unit root (non-stationary)

*Alternative Hypothesis : Has no unit root (*stationary*)*

The results on both tests shows that the variables are stationary on both level and first difference that is I(0) and I(1) which makes it easier to perform the ARDL model dynamics.

Table 3. Phillips-Perron test at 5% significant level

Variable	***t-stat***	***Prob.***	***t-stat***	***Prob.***
LNROE	*37.4327*	0.0000*	*88.2235*	*0.0000***
LNINF	*21.8829*	*0.0051**	*39.2439*	*0.0000***
LNEXC	*40.3707*	*0.0000**	*92.344*	*0.0000***

**At level and ** At first difference (Individual Intercept)*

Table 4. Augmented-Dickey Fuller test at 5% significant level

Variable	***t-stat***	***Prob.***	***t-stat***	***Prob.***
LNROE	*44.2721*	*0.0000**	*45.6311*	0.0000**
LNINF	*36.7588*	*0.0000**	*28.4686*	*0.0004***
LNEXC	*32.9228*	*0.0001**	38.6206	*0.0000***

**At level and ** At first difference (Individual Intercept)*

4.4.1 ARDL Short-run model

The estimated model below shows that the error correction term is statistically significant and it is causing a negative impact of 0.652, which means that the adjustment speed is 65.6% which takes the performance of commercial banks the same year to go back to equilibrium. The outcome of the model indicates that negative impact of inflation on return on equity and it is statistically insignificant. The coefficient of inflations reveals

that if inflation increases by 1% return on equity will decline by 98% and in the following year the rate at which the financial performance react as inflation increases that is if inflation increases by 1% return on equity decline by 11% and it is statistically insignificant. The table is also indicating that if exchange rate increase by 1% the return on equity will increase by 0.08 and in the following period it will rise by 0.02, it is statistically insignificant.

Table 5. Short-Run Equation

Dependent Variable: D(LNROE)

Selected Model: ARDL(3,3,3)

Variable	***Coefficient***	***Std. Error***	***t-Statistic***	***Prob.****
COINTEQ01	-0.656272	0.221327	-2.965169	0.0064
D(LNROE(-1))	0.114766	0.155174	0.739597	0.4662
D(LNROE(-2))	0.245577	0.363203	0.676142	0.5049
D(LNINF)	-3.870157	2.565565	-1.508501	0.1435
D(LNINF(-1))	-0.987786	3.679156	-0.268482	0.7904
D(LNINF(-2))	-0.116383	1.582853	-0.073528	0.9419
D(LNEXC)	0.053904	0.231162	0.233186	0.8174
D(LNEXC(-1))	0.085094	0.208463	0.408200	0.6865
D(LNEXC(-2))	-0.022550	0.084506	-0.266850	0.7917
C	-0.159516	0.050657	-3.148973	0.0041

4.4.2 ARDL Long-run model

The results below indicate that when inflation increased by 1% in the long-run the return on equity declined by 4.85 and it is statistically significant. The t-statistic is also showing that the it statically significant that is if the t-value is greater than two (2) in absolute form.

The increase of exchange rate by 1% caused the return on equity to decline by 0.16 and the model is statistically insignificant.

Table 6. Long-Run Equation

Dependent Variable: D(LNROE)

Selected Model: ARDL(3,3,3)

Variable	***Coefficient***	***Std. Error***	***t-statistic***	***Prob.****
LNINF	4.856538	1.512957	3.209965	0.0035
LNEXC	-0.164994	0.193713	-0.851742	0.4021

4.5 The Hausman Test

The Hausman test is used to decide the best method that should be used between fixed and random effect test. The hypothesis is as follows;

The results show that the pe-value is greater than 0.05 therefore we accept the null hypothesis which means we will use the random-effect test.

Table 7. Random Effects - Hausman Test

Correlated Random Effects- Hausman Test

Equation: Untitled

Test cross-section random effects

Test Summary	***Chi-Sq. Statistic***	***Chi-Sq. d.f.***	***Prob.***
Cross-Section random	0.00000	2	1.0000

4.6 Panel Co-integration

The hypothesis of no cointegration is as follows;

Null Hypothesis : No co-intergration exists

Alternative Hypothesis : co-intergration exists

The results below show the existence of cointegration among variables in which the p value is less than 5% therefore we reject the null hypothesis.

Table 8. Kao Residual Co-integration Test

	t-Statistics	Prob.
ADF	-3.551970	0.0002
Residual Variance	0.076594	
HAC variance	0.016554	

4.7 Dynamic Regressions (FMOLS AND DOLS)

The regression analysis tables below for fully-modified OLS and Dynamic-OLS indicated that inflation is statistically insignificant and shows a negative relationship with return on equity with a coefficient of both FMOLS and DOLS as -3.650980 and -5.175961 respectively and it indicates that when inflation rise by 1% return on equity will decrease by 3.6 and 5.1 Consequently, we accept the null hypothesis of negative relationship and reject alternative hypothesis of positive relationship.

The exchange rate is insignificant and shows a positive relationship with return on equity with coefficients of 0.098595 and 0.117589 on both FMOLS and DOLS respectively. This indicates that when exchange rate increase by 1% return on equity also increases by 0.09 and 0.11.

Table 9. Panel Fully Modified Least Squares (FMOLS)

Variable	***Coefficient***	***Std. Error***	***t-Statistics***	***Prob.***
LNINF	-3.650980	1.097849	-3.325575	0.0015
LNEXC	0.098595	0.134810	0.731361	0.4675

R-squared	0.168995	Mean dependent var	0.011256
Adjusted R-squared	0.097356	S.D. dependent var	0.203992
S.E. of regression	0.193808	Sum squared resid	2.178569
Long-run variance	0.032012		

Table 10. Dynamic Ordinary Least Squares (DOLS)

Variable	***Coefficient***	***Std. Error***	***t-Statistics***	***Prob.***
LNINF	-5.175961	3.050704	-1.696644	0.1017
LNEXC	0.117589	0.390532	0.301099	0.7657

R-squared	0.653572	Mean dependent var	0.017596
Adjusted R-squared	0.267172	S.D. dependent var	0.167742
S.E. of regression	0.143596	Sum squared resid	0.536118
Long-run variance	0.012854		

5. Conclusion and Recommendation

The study investigated the impacts of inflation and exchange rate on the financial performance of commercial banks in South Africa. The study used panel data by selecting

four major South African commercial banks and the time period covers 16years from 2003-2019. The ADF and PP statistic unit root was used to test for stationary between the variables, ARDL model was used to estimate coefficient in the short and long run, FMOLS, and DOLS were used to authentic the consistence and robustness of ARDL model. Panel cointegration was tested by Kao-residual model and the Hausman test for fixed or random effect model.

The result from the correlation analysis explored an inverse correlation between inflation and return on equity with a significant coefficient while the exchange rate is found to have a positive correlation with return on equity with an insignificant coefficient. The short run and long run coefficients of ARDL model suggest that the increase or decrease of inflation and exchange rate led to increase or decrease of return of equity for commercial banks in South Africa.

In regard to FMOLS and DOLS, the coefficient of inflation is significant and insignificant for both FMOLS and DOLS respectively. The R-squared for both is 0.16 and 0.65 for FMOLS and DOLS which means that the 16% and 65% variation in the financial performance (dependent variable) occurs because of the independent variables, the 84% and 35% variant is due to other indicators not in the model.

The findings illustrated that there is a significant inverse relationship between inflation and the financial performance and there is an insignificant positive relationship between exchange rate and the financial performance.

5.1 Recommendations

The study focused mainly on the impact of inflation, exchange rate and financial performance of South African commercial banks. The study did not take into consideration the impact of inflation and exchange rate on other financial performance measures like return on assets and net income margin as it only focused on the profitability ratio (return on equity) as a financial performance measure. It is therefore, recommends that further research in this area can be carried out to give clear and immersive results on the impact of inflation and exchange rate on other financial performance measures. A longer duration more than 16years should also be considered to give a wider range of research to enable better analysis.

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