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EXCHANGE RATE AND ECONOMIC GROWTH IN NAMIBIA

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ABSTRACT

This study investigated the relationship between exchange rate and economic growth in Namibia. In particular, the study examined how exchange rate, interest rate and trade openness affects output growth. Time-series techniques such as unit root test, cointegration, generalized impulse response functions and generalized forecast error variance analysis were applied on quarterly data for the period 1993 to 2015, within the VAR framework. The results showed a positive relationship between exchange rate and economic growth in the short-run, but a negative relationship the two variables exchange rate and economic growth in the long-run.

Keywords: Exchange rate, Economic growth, Output growth, Namibia

INTRODUCTION

Numerous research studies have investigated the relationship between exchange rates and economic growth. Exchange rate is the price of one country's currency in relation to another country. It is the amount of units required of a currency, which can buy another amount of units of another currency. Furthermore, it determines the relationship between domestic and foreign goods' prices, as well as the strength of external sector involvement in international trade (Adeniran, Yusuf & Adeyemi, 2014). On the other hand, economic growth is an increase in the capability of an economy to produce goods and services, which is compared from one period of time to another (Rodrik, 2008). The market value of the goods and services are inflation-adjusted.

There is a positive relationship between exchange rate and economic growth, which suggests that economic growth, can increase through devaluation/depreciation (Ahmad, Ahmad & Ali, 2013). Abu-Bakarr (2010) shared the same sentiments that through an aggregate demand channel, exchange rate depreciation enhances the international competitiveness of domestic goods,

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increases net exports and subsequently boosts gross domestic product (GDP). The author further states that, depreciation of the exchange rate through an aggregate supply channel increases the cost of production. Hence reduced GDP, this helps redistribute income in favour of the rich instead of the masses in the economy.

According to Bazlul, Sayema and Mohammad (2012), the management of the exchange rate is a major policy instrument in achieving a set of various objectives of economic growth, control of inflation and at the same time, maintaining external competiveness. Abu-Bakarr (2010) concur that exchange rate is an important macroeconomic tool as it ensures a low inflation rate and a stable financial system, promotes exports, control imports, and boost economic growth. It is well acknowledged that a mismanagement of the exchange rate can cause a major disruption on the economic growth of a country. For example, a decline in exchange rate can stimulate the economic growth through export-led growth, but at the same time, strong output growth in the economy can encourage export activities.

The understanding on the relationship between exchange rate and economic growth helps monetary authorities and analysists in examining trends in the economy as a whole which subsequently translate in better decisions of transitional targets. The principal focus of this paper is to investigate the relationship between exchange rate and economic growth in Namibia.

Exchange rate fluctuations determine economic performance through the convergence of developing and developed countries' incomes. Evidently, an increase in undervaluation boosts economic growth just as powerfully as a decrease in overvaluation. There has been great concern regarding the impact of tradable and non-tradable goods (real exchange rate) on economic growth in developing countries, more especially Namibia. This raises questions to monetary authorities; hence the need to investigate the relationship between exchange rate and economic growth in Namibia is serious. In addressing the above question, the specific objectives of the study are, to examine whether the relationship between exchange rate and economic growth is short-run or long-run in nature; and to investigate whether the relationship among the two variables is negative or positive. The paper is organized as follows: the next section presents a literature review. Section 3 discusses the methodology. The empirical analysis and results are presented in section 4. Section 5 concludes the study.

LITERATURE REVIEW

There are few contrasting theoretical views when it comes to the relationship between exchange rate and economic growth. These theories compose of the traditional approach to exchange rate - holds that devaluation has expansionary effects on the economy (Salvatore, 2005). The other theory is that of the structuralist approach to exchange rates, which is similarly convincing that devaluation is contractionary to expansion in the economy (Acar, 2000). There is also the

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Balassa-Samuelson hypothesis holds that there is a positive correlation between exchange rates and growth.

In respect to the traditional approach to exchange rate, it has been noticed that a raise in domestic currency price of exchange rate devaluation results in an increase in the price of traded goods relative to non-trade goods. This causes a reallocation of resources resulting in increased production in import competing sectors. Bazlul, Sayema and Mohammad (2012) state that devaluation contributes to the enhancement of external competitiveness boosting production in the export sector. On the other hand, as a direct consequence of nominal devaluations, import prices go up. This is likely to lower the demand for imports in the domestic economy. Furthermore, the authors argue that, although nominal devaluations help to achieve the goal of relative price adjustment along with an improvement in trade balance, they might do so at a high cost. There are concerns that indirect costs of devaluation can outweigh the benefits, adversely affecting the overall output growth. This is known as the contractionary effect of devaluation.

There is another branch of work which examine if the exchange rate regimes of developing countries have been overvalued. The equilibrium exchange rate of a country is determined by a number of basics, but distortionary monetary and fiscal policies can cause disturbance to the equilibrium rate (Edwards, 1986). In addition, Dollar (1992) indicates that there seems to be an agreement that overvaluation has unfavourable implications for economic growth.

Another branch also looked at how undervalued exchange rates affect economic growth. Rodrik (2008) argues that tradable sectors are more severely affected by bad institutions and market failures, resulting in their size being small than optimal. The author further outlined some possible market failures that affect exchange rate through tradable goods, hence affecting the level of economic growth. A selective list of some of these market failures would include, first, learning externalities: valuable technological, marketing and other information spill over to other firms and industries. Second, credit market imperfection: entrepreneur cannot finance worthwhile projects because of limited liability and asymmetric information. Third, coordination externalities: getting new industries off the ground requires lumpy and coordinated investment upstream, downstream or sideways.

However, Rodrik's findings were scrutinized by (Gluzmann, Levy-Yeyati and Sturzenegger, 2012), who argues that depreciated exchange rate does not influence the tradable sectors, but it is through increased saving and investment that growth is facilitated.

Several studies have empirically looked at the relationship between exchange rate and economic growth in different countries. They came to different conclusions depending on the country, method and time of study. This section provides a selective list of empirical studies from developed countries and also from developing countries.

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The empirical evidence from developed countries include among others, Jaussaud and Rey (2009) investigated the long-run determinants of Japanese exports to China and the United States using annual data for the period 1971–2007. The study adopted the Autoregressive Conditional Heteroscedasticity and the Generalized ARCH models. The results found that Japanese sectoral exports to China and the United States have depended on real exchange rate fluctuations and external demand. In general, the real exchange rate fluctuations and GDP have had the expected negative effects.

From a developing country's perspectives, empirical evidence includes among others, Morley (1992) analyzed the effect of exchange rates on output for twenty eight developing countries that have devalued their currencies using a regression framework, based on data for the period 1970-1990. After the introduction of controls for factors that could simultaneously induce devaluation and reduce output including term of trade, import growth, the money supply, and fiscal balance. The study discovered that depreciation of the level of the exchange rate reduced the output.

Rodriguez and Diaz (1995) estimated a six-variable VAR-output growth, real wage growth, exchange rate depreciation, inflation, monetary growth, and Solow residuals-in an attempt to decompose the movements of Peruvian output. The study covered a period from 1971-1993. They found that output growth could mainly be explain by "own" shocks but was negatively affected by increases in exchange rate depreciation as well. The author however noted that exchange rate depreciations led to a decline in output growth.

McPherson and Rakovski (2000) analysed the possible direct and indirect relationship between the real and nominal exchange rates and GDP growth in Kenya, based on data for the period 1970 to 1996. They derived these relationships in three ways: within the context of a fully specified (but small) macroeconomic model, as a single equation instrumental variable estimation, and as a vector-auto regression model. The results show that there is no statistically significant direct relationship between the two variables. They, however, are indirectly linked through several channels, including money, imports, agricultural production, and foreign aid.

Thapa (2002) examined the econometric relationship between the real exchange rate and economic growth in Nepal. The study used annual data from 1978-2000 and included GDP, REER revealed that real appreciation of the exchange rate had a contractionary effect on output.

Eita and Sichei (2006) estimated equilibrium real exchange rate and exchange rate misalignment in Namibia during a period of 1970-2004. They used a vector auto-regression model employing the Johansen (1988) full information maximum likelihood procedure. Their estimation consisted of terms of trade, openness and investment to GDP as explanatory variables and they found that increase in openness and a ratio of investment to GDP lead to an appreciation of the real exchange rate, while the terms of trade caused depreciation.

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Abu-Bakaar (2010) examines the real effect of exchange rate on economic growth of Sierra Leone. The author used quarterly data for the period 1990-2006 for analysis in order to investigate the relation of the two variables with the help of Granger causality tests. The author found a positive relationship between real effective exchange rate and economic growth of Sierra Leone.

Hua (2011) estimated an economic model using the GMM system estimation approach and panel data of 29 Chinese provinces for the period 1987 to 2008. The results show that the real exchange rate appreciation had a negative effect on economic growth. In addition, real exchange rate appreciation was higher in coastal than in inland provinces, this narrowed the gap of GDP per capita amongst provinces. The results also show that the real exchange rate appreciation has a negative effect on employment.

Ndlela (2011) investigated implications of real exchange rate misalignment in developing countries with particular reference to growth performance in Zimbabwe. The study followed ARDL (autoregressive distributed lag) approach to the cointegration method. The study found that exchange rate misalignment exerts a negative and highly statistically significant impact on growth. The findings also support the notion that real exchange rate overvaluation was fundamental in the post-2000 economic growth contraction in Zimbabwe.

Ganesh, Moses and Danson (2012) examine the impact of real exchange rate volatility on economic growth in Kenyan. The study employed the Generalized Autoregressive Condition of Heteroscedasticity (GARCH) and computation of the unconditional standard deviation of the changes to measure volatility. The study also used Generalized Method Moments (GMM) to assess the impact of the real exchange rate volatility on economic growth for the period January 1993 to December 2009. The study found that Kenya's real exchange rate generally exhibited an appreciating and volatility trend, implying that in general, the country's international competitiveness deteriorated over the study period. The REER Volatility reflected a negative impact on economic growth of Kenya.

Chen (2012) investigated the role of the real exchange rate in economic growth by merging the growth rates among provinces in China. The study used the generalized method of moments (GMM), and data from 28 Chinese provinces for the period 1992–2008 together with dynamic panel data estimation. The results found that there is a positive effect of real exchange rate appreciation on economic growth in the provinces.

Sibanda, Ncwadi and Mlambo (2013) examined the impact of real exchange rates on economic growth in South Africa. The study used quarterly time series data for the period 1994-2010. Both Johansen cointegration and vector error correction models were used. The results reveal that real exchange rates have a dampening long-run impact on economic growth in South Africa. From

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the regression results, it is noted that undervaluation of the currency significantly hinders growth in the long run, whilst it significantly increases economic growth in the short-run.

Aman, Ulla and Khan (2013) attempted to explore the relationship between exchange rate and economic growth in Pakistan for the period 1976-2010. The study employed two and three stage least squares (2SLS and 3SLS) techniques. The results found that the exchange rate has a positive association with economic growth through the channels of export promotion incentives, enlarging the volume of investments, enhancing FDI inflow and promoting import substitute industry.

Uddin, Rahman and Quaosar (2014) attempted to examine the relationship between exchange rate and economic growth in Bangladesh for a period of 41 years that is from 1973-2013 using time series econometric technique. The empirical results show that there is a significant positive correlation between exchange rate and economic growth. The results also advocate the presence of long-run equilibrium relationship between exchange rate and economic growth.

There are lessons to be learnt from the theoretical and empirical literature review. Firstly, the exchange rate appears to be important to economic growth. However, there seem to be variation in terms of the way it affects the economic growth, as in some cases it is significant and ineffective, while in other cases it is not. Secondly, the techniques employed varies from one study to the next ranging from a single equation instrumental variable estimation, Granger causality tests, GMM system estimation, two-stage least squares, three stage least squares(2SLS, 3SLS), the Generalized Autoregressive Condition of Heteroscedasticity, Vector Autoregression models. The VAR technique was used mostly as compared to the other techniques. This study draws findings from the literature to obtain a reasonable set of additional controls to use as a benchmark to test whether there is a positive or negative relationship between exchange rate and economic growth in Namibia. In terms of Namibia, the only study that comes close to this study is that of Eita and Sichei (2006). This study differs from that of Eita and Sichei (2006) because their study estimated equilibrium real exchange rate and exchange rate misalignment in Namibia. The study paid more attention on exchange rate misalignment, while this study examines the relationship between the exchange rate and economic growth in Namibia.

RESEARCH METHODOLOGY

Econometric framework and model specification

Based on the empirical literature, this study adapts and modifies Sibanda's (2012) model to examine the relationship between the exchange rate and economic growth in Namibia. This model was used because of the complicated nature of the economic relationships between the variables, which cannot be explained by a single equation model. Moreover, VAR approach has been used in many empirical studies in examining the relationship between the exchange rate and economic growth; hence this justifies the use of this approach. VAR is a system of dynamic linear equations where all the variables in the system are treated as endogenous. To draw the VAR mainframe, assume that the relationship between bank specific determinants and profitability is described by a dynamic system whose structural form equation is given by:

$$Ay_t = \Psi + \Omega_1 y_{t-1} + \Omega_2 y_{t-2} + ... + \Omega_p y_{t-p} + B\mu_t \qquad \ldots 1$$

where A is an invertible $(n \times n)$ matrix describing contemporaneous relations among the variables; y_t is an $(n \times 1)$ vector of endogenous variables such that; $y_t = (y_{1t}, y_{2t}, ..., y_{nt})$; Ψ is a vector of constants; Ω_i is an $(n \times n)$ matrix of coefficients of lagged endogenous variables $(\forall i = 1,2,3,..., p)$; B is an $(n \times n)$ matrix whose non-zero off-diagonal elements allow for direct effects of some shocks on more than one endogenous variable in the system; and μ_t are uncorrelated or orthogonal white-noise structural disturbances ie the covariance matrix of μ_t is an identity matrix $E(\mu_t, \mu'_t) = 1$. Equation (1) can be rewritten in compact form as:

$$Ay_t = \Psi + \Omega \ (L) y_{t-i} + B\mu_t \qquad \ldots 2$$

where $\Omega(L)$ is a $(n \times n)$ finite order matrix polynomial in the lag operator L.

The VAR presented in the primitive system of equations (1) and (2) cannot be estimated directly (Enders, 2004). However, the information in the system can be recovered by estimating a reduced form of VAR implicit in (1) and (2). Pre-multiplying equation (1) by A^{-1} yields a reduced form VAR of order *p,* which in standard matrix form is written as:

$$y_t = \Phi_0 + \sum_{i=1}^{p} \Phi_i y_{t-i} + \varepsilon_t \qquad \ldots 3$$

Where: $y_t = f(Y_t, NEER_t, OP_t, R_t)$

$\Phi =$ matrix of coefficients of autonomous varibales.

$A_i =$ Matrix of coefficients of all variables in the model.

$y_{t-1} =$ is the vector of the lagged values of Y, ER, OP and R

$\varepsilon_t =$ the vector of the error term

Given the estimates of the reduced form VAR in equation (3), the structural economic shocks are

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separated from the estimated reduced form residuals by imposing restrictions on the parameters of matrices A and B in equation (4):

$$A\varepsilon_t = B\mu_t \qquad \ldots 4$$

The model consist of four endogenous variables, hence the VAR model in matrix notation can be expressed in the following manner:

$$Y_t = \alpha_1 + b_{11}Y_{t-1} + b_{12}NEER_{t-1} + b_{13}\,OP_{t-1} + b_{14}R_{t-1} + \varepsilon_t^Y$$

$$NEER_t = \alpha_1 + b_{21}Y_{t-1} + b_{22}NEER_{t-1} + b_{23}\,OP_{t-1} + b_{24}R_{t-1} + \varepsilon_t^{NEER}$$

$$OP_t = \alpha_1 + b_{31}Y_{t-1} + b_{32}NEER_{t-1} + b_{33}\,OP_{t-1} + b_{34}R_{t-1} + \varepsilon_t^{OP}$$

$$R_t = \alpha_1 + b_{41}Y_{t-1} + b_{42}NEER_{t-1} + b_{43}\,OP_{t-1} + b_{44}R_{t-1} + \varepsilon_t^R$$

Where: $\varepsilon_t^Y, \varepsilon_t^{NEER}, \varepsilon_t^{OP}$ and ε_t^R are the white noise error terms for the regressors and regressand. The matrix of coefficient is:

$$y_t' = [\Delta Y_t \quad \Delta NEER_t \quad \Delta OP_t \quad \Delta R_t]$$

$$\begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix} \begin{bmatrix} \varepsilon_t^Y \\ \varepsilon_t^{NEER} \\ \varepsilon_t^{OP} \\ \varepsilon_t^R \end{bmatrix} = \begin{pmatrix} b_{11} & b_{12} & b_{13} & b_{14} \\ b_{21} & b_{22} & b_{23} & b_{24} \\ b_{31} & b_{32} & b_{33} & b_{34} \\ b_{41} & b_{42} & b_{43} & b_{44} \end{pmatrix} \begin{bmatrix} \mu_t^Y \\ \mu_t^{NEER} \\ \mu_t^{OP} \\ \mu_t^R \end{bmatrix}$$

$b_i =$ is a (4x4)matrix of parameter that are non − zero.
$\varepsilon_i =$ is a (4x1) column vector of the random disturbance term.

The main uses of the VAR model are the impulse response analysis and forecast error variance decomposition. The analysis is carried out in the following order. Before VAR estimation, test for non-stationary (unit root) of time series is essential to determine the order of integration. The test was conducted by employing the Augmented Dickey Fuller (ADF) and the Phillips-Perrons (PP). Thereafter, the optimal lag length is tested as it affects the VAR model. There are many criteria used to indicate the number of optimal lags namely, Hannan-Quinn (HQ), Schwarz information criterion (SC), Akaike Information Criterion (AIC), Final prediction error (FPE) and Likelihood Ratio (LR). After determining the number of lags it is essential to also check whether VAR satisfies the stability condition. The next step would be to conduct tests for co-integration, i.e. if two or more series have long-run equilibrium. The cointegration test can be applied in several ways, according to the nature of the equation that is tested ie single or multivariate system. If co-integration is found among the variables, the adjustment of the short-run to the

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long-run equilibrium is obtained through the vector error correction model (VECM). When co-integration is not found, then a VAR model specification is estimated. Thereafter, the impulse response function and forecast error variance decomposition would be derived from the estimated VAR/VECM. In order to avoid biasedness towards a particular school of thought as a result of the ordering of the variables, a generalized impulse response function (GIRF) is used in this regard. This is because it is insensitive to the ordering of variables and it does not require orthogonalisation of shocks.

Data and Data Sources

This study uses quarterly time-series data covering the period 1993Q1-2015Q4. The data was obtained from various sources namely, *National Accounts* (Republic of Namibia), Bank of Namibia's *Quarterly Bulletins and Annual Reports* as well as from the International Monetary Fund's *International Financial Statistics.* The data for the following variables was obtained namely, output, exchange rate, trade openness and interest rate.

EMPIRICAL FINDINGS AND ANALYSIS

The Augmented Dickey-Fuller (ADF) test, Phillip- Perron (PP) tests are used to test for the presence of the unit root prior to estimating the model. This is to determine the order of integration and also avoid spurious or nonsensical results. That is, results making statistical sense even for variables that do not have any economic relationship.

Table 1 presents the results of the unit root tests for the series. The results show that the interest rate and trade openness are stationary in levels when considering intercept and trend, otherwise they are stationary in levels. The rest of the variables exchange rate and output growth are stationary after differencing them once.

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Table 1: Unit root tests: ADF and PP in levels and first differences

Variable	Model Specification	ADF	PP	ADF	PP	Order of integration
		Levels	Levels	First Difference	First Difference	
lnR_t	Intercept	-1.385	-1.325	-5.947**	-4.881**	1
	Intercept and trend	-3.628*	-2.555*	-5.915**	-4.843**	0
lnY_t	Intercept	2.835	2.098	-10.373**	-17.189**	1
	Intercept and trend	-0.576	-3.472**	-11.285**	-30.067**	1
$lnNEER_t$	Intercept	-1.082	-1.128	-7.319**	-7.352**	1
	Intercept and trend	-0.922	-1.268	-7.596**	-7.585**	1
$lnOP_t$	Intercept	-3.389**	-2.436	-3.969**	-14.297**	1
	Intercept and trend	-4.445**	-3.534**	-4.093**	-17.968**	0

Source: author's compilation and values obtained from E views.

*Notes: * and ** denotes rejection of the null hypothesis at 10% and 5% respectively*

Table 2 below shows the optimal convergence of the lag length for the VAR system that was estimated thereafter. The information criteria are the LR test statistic, Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwarz Information Criterion (SC) and Hannan-Quinn Information Criterion (HQ).

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Table 2: VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	192.588	NA	1.320	-4.490	-4.375	-4.444
1	560.386	691.809	3.041	-12.866	**-12.288***	-12.63
2	586.921	47.384	2.371	-13.117	-12.075	**-12.698***
3	**604.763**	**30.162***	**2.281***	**-13.161***	**-11.656**	**-12.556**
4	615.035	16.386	2.651	-13.025	-11.057	-12.234
5	626.573	17.306	3.011	-12.918	-10.488	-11.941
6	639.564	18.249	3.331	-12.847	-9.953	-11.683
7	654.878	20.054	3.541	-12.830	-9.473	-11.481
8	667.047	14.777	4.121	-12.739	-8.919	-11.204

* indicates lag order selected by the criterion

Source: author's compilation and values obtained from E views

At the chosen lag length, the VAR system should satisfy the stability condition. This happens when all the inverse roots of the characteristic AR polynomial have a modulus of less than one and lie inside the unit circle. The results indicate that the estimated VAR is stable or satisfies the stability condition as shown in Table 3.

Table 3: Roots of Characteristic Polynomial

Root	Modulus
0.940981 - 0.049736i	0.942295
0.940981 + 0.049736i	0.942295
0.862227	0.862227
0.405633 - 0.345020i	0.532519
0.405633 + 0.345020i	0.532519
-0.021699 - 0.173035i	0.174390
-0.021699 + 0.173035i	0.174390
0.067461	0.067461

No root lies outside the unit circle.

VAR satisfies the stability condition.

Source: author's compilation and values obtained from E views

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Cointegration test

In order to estimate a system of equation of a dynamic structure, a support mechanism between the variables of interest either in the short run or in the long run has to be established. This will help to identify the relationship between variables, with reference to long run equilibrium. The approach used to test for cointegration in this regard is the Johansen cointegration test. The null hypothesis is that r=0 against the general alternative hypothesis r >= 1, or r >= 2, 3, 4. In this regard, a λ-trace statistic is employed, since the null hypothesis is r=0 and there are four variables (ie, n=4). The trace-statistics have a very general alternative hypothesis. A more specific hypothesis is tested and in this regard a λ-maximal test is applied and the null hypothesis is that r=0 against the specific alternative hypotheses r=1.

Table 4: Johansen Cointegration Test

Maximum Eigen Test				Trace Test			
H_0: rank = r	H_a: rank = r	Statistic	95% Critical Value	H_0: rank = r	H_a: rank = r	Statistic	95% Critical Value
r = 0	r =1	66.734*	47.856	r = 0	r >=1	40.522*	27.584
r <=1	r = 2	26.212	29.797*	r <= 1	r >= 2	15.077	21.132*
r <=2	r = 3	11.135	15.495*	r <= 2	r >= 3	9.297	14.265*
r <=3	r = 4	1.838	3.841*	r <= 3	r >= 4	1.837	3.841*

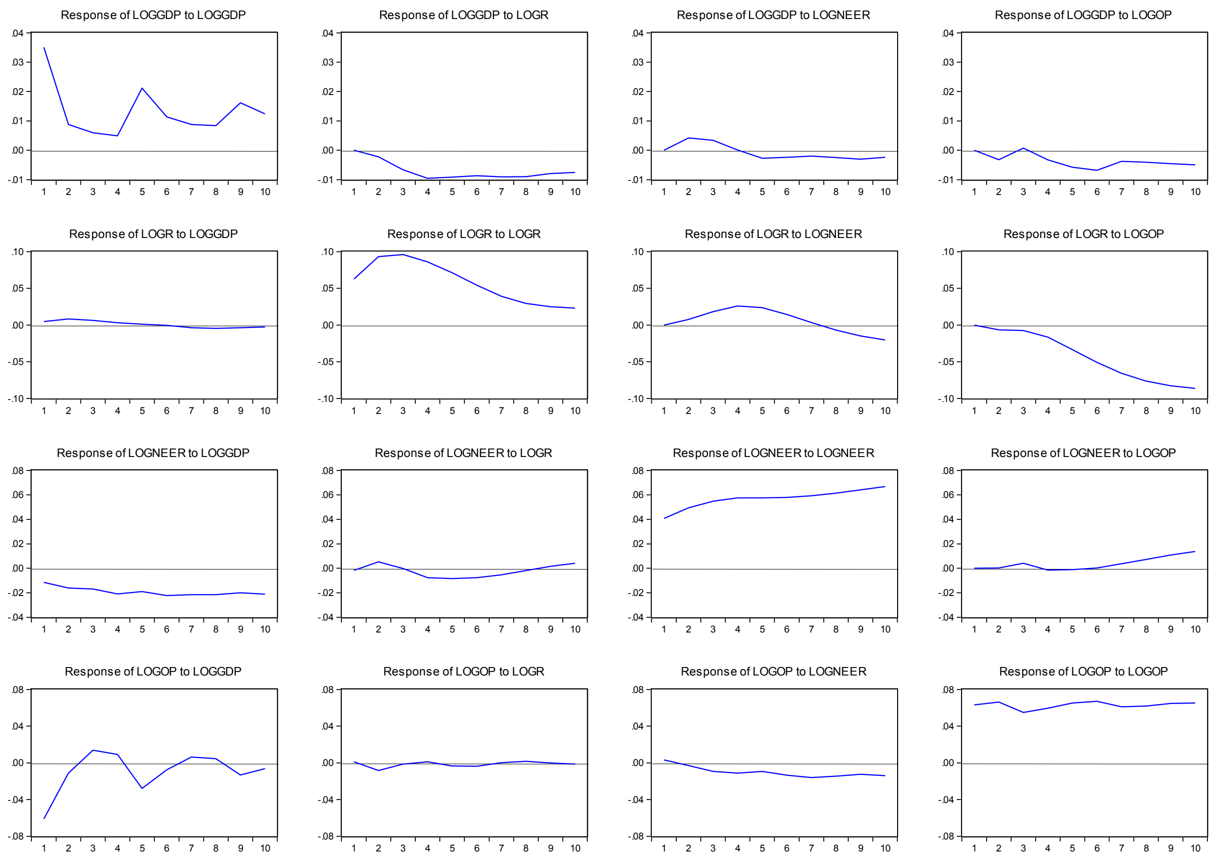
Both Max-eigenvalue and Trace tests indicates 1 cointegrating equations at the 0.05 level.

Source: author's compilation and values obtained from E views

Table 4 shows the results for the Johansen cointegration test grounded on a VAR system of four variables. The null hypothesis is that there is no cointegration among the variables. Both the Trace and Maximum Eigen value tests show that there is cointegration among the variables. This is because the calculated t-statistics are greater than the critical value at 5% significance level. Therefore, the null hypothesis of no cointegration is rejected and that indeed there are co-integrating vectors between these variables.

Impulse Response Functions

Figure 1: Generalised Impulse Response Functions



Source: author's compilation and values obtained from Eviews

Figure 1 shows the response from the four variables among themselves namely, (GDP, interest rate, nominal exchange rate and trade openness). Firstly, the response of GDP to shocks imposed on itself showed an immediate positive response between quarter 1 and quarter 2 and a continuous decrease is experienced after quarter 3. The effects of the shocks appear to be permanent because the variable finds a new equilibrium level. Secondly, the response of GDP to shocks on exchange rate displayed a steady increase in GDP between quarter 1 and quarter 2, before decreasing at a constant rate. This is in line with the theory because in a short-term, the economy respond positively to an increase in exchange rate, but as times go by, the increase in exchange rate affects economic activity, subsequently leading to a decrease in the output growth. The response of output growth to trade openness revealed a negative relationship. This implies that an increase in the level of trade openness results in a decline in trading activities between

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nations and thus a decrease in economic growth. This is in contradiction with the economic theory.

In the Namibian case, the attribute would be due to the fact that Namibia exports primary commodities while it is a net importer of most basic items to most sophisticated items. Even though Namibia might be exporting finished valuable products, the import level is excessively high and more dominant, thus it overshadows the exports. For this reason, this could be the attribute to the inverse relationship between the two variables. Lastly, the response of the variables seems to be permanent because a new level of equilibrium was identified.

Forecast Error Variance Decomposition

Table 5: Forecast Error Variance Decomposition

Variance Decomposition of LNP				
Quarter	LNY	LNR	LNNEER	LNOP
1	100.000	0.000	0.000	0.000
2	97.550	0.381	0.285	0.784
4	87.664	9.093	1.839	1.404
6	81.375	12.610	0.753	0.262
8	76.299	16.963	0.903	0.836
10	75.100	17.534	0.014	0 .351

Source: author's compilation and values obtained from E views

Table 5 presents forecast error variance decomposition for output growth in the model over a 10-quarter forecast distance. In the first quarter, output growth contributed 100% to the fluctuation, with other variables being insignificant. Interest rate contributed 9% in the 4th quarter. Interest rate contributed fairly to fluctuation, with 12.6% in the 6 quarter. After the 8th quarter, interest rate contributed over 76% and 17%, respectively. While the contribution of exchange rate and trade openness contribution was insignificant.

CONCLUSION

This study investigated the relationship between exchange rate and economic growth in Namibia. The research closely looked at how interest rate, exchange rate and trade openness affects output growth. The study employed time-series techniques such as generalized impulse response functions, granger causality and generalized forecast error variance analysis within the VAR framework.

The unit root test confirms that individual series are non-stationary at first difference, in other words they are integrated of order one. The results for cointegration showed that there is a long-run relationship between exchange rate, output, interest rate and trade openness.

The results further show that there is a positive relationship between exchange rate and economic growth in the short-run, but the relationship the two variables (exchange rate and economic growth) is negative in the long-run. Namibia as a developing country needs to diversify its export and increase it capacity to export in order to benefit from exchange rate depreciation. The benefits will even be more evident if Namibia exports more finished goods rather than raw materials. Industrial based agriculture production should be encouraged.

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