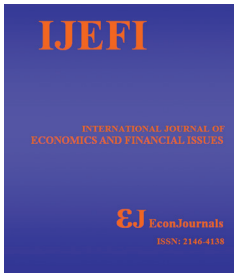

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How Did Covid-19 Affect the Structural Relationship between Exchange Rates and Money Supply? Evidence from Malawi

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ABSTRACT

For countries that participate in international trade, exchange rate management is crucial as the exchange rate affects the competitiveness of the country in international trade. This affects the country's balance of payments (BOP) position and economic growth. This paper, therefore, set out to find out how Covid-19 containment measures have affected the Malawi Kwacha-US Dollar exchange rate, as well as money supply. Previous studies have assessed the short-term impacts of Covid-19 on the Malawian economy in general, without considering how they have affected the exchange rate and money supply. This study adds to the literature by analyzing how the Covid-19 containment measures have affected the exchange rate, and consequently, the money supply in Malawi. The study employs the dummy variables approach and the vector error correction (VEC) model to find out if there is a structural change in the exchange rate regression over time and whether that structural change in the exchange rates affects the money supply. Regression results indicate that there is a structural break in the regression over time and that the Malawi Kwacha appreciated following the breakout of the pandemic. Additionally, the results from the Error Correction Model have indicated that the appreciation of the Malawi Kwacha, positively, affected the money supply in Malawi. As a policy implication arising from this study, policymakers are encouraged to take advantage of the prevailing donor goodwill and ensure that the various donations received are put to good use so that the Malawi Kwacha should continue being relatively strong against the United States Dollar. If this is not done, the Malawi Kwacha could, greatly, depreciate, a thing that can make the economy experience inflation thereby making people experience a lot of hardships caused by the Covid-19 pandemic.

Keywords: Endogenous, Error Correction Model, Monetarism, Post-Keynesian, Money Supply
JEL Classification: G0

1. INTRODUCTION

Ever since its breakout, Covid-19 has brought about unspeakable illnesses and fatalities globally. Covid-19 first appeared in the Hubei province of China in December 2019 and has been spreading rapidly to Asia, Europe, and the rest of the world. It is a respiratory disease caused by the SARS-CoV-2 virus, a zoonotic pathogen kind of virus that is transmitted between animals and people. As an airborne infection, symptoms of Covid-19 include fever, coughing, and shortness of breath. It is responsible for high death rates among people, the world over, mainly those with underlying health conditions such as diabetes, heart disease, chronic lung diseases, cardiovascular disease, and obesity. This made the World Health Organization (WHO) declare Covid-19 as a pandemic on 11th March 2020.

Despite its breakout in December 2019, Malawi recorded its first case of Covid-19 on 2 April 2020, an indication that the disease took some time before reaching Malawi. Nevertheless, the government had already put in place some measures aimed at containing the disease even before registering the first confirmed case. For example, it declared the country a state of disaster

on 21 March 2020 and immediately introduced containment measures such as banning street vending across the country, banning public gatherings such as religious gatherings, and wedding ceremonies, and closure of all schools as well as colleges. Further virus containment measures included mandatory use of face masks in public places, washing hands with soap and water or use of hand sanitizers, and reporting to the nearest hospitals if one has any unusual symptoms. Also, all visitors arriving in Malawi from high-risk countries were asked to self-quarantine for 14 days. Furthermore, the government closed its land borders and suspended all international flights except for flights involved in the transportation of goods and services deemed essential to the country. Policy-wise, the government enacted some policies aimed at cushioning Malawians from the effect of Covid-19. For example, the Governor of Financial Institutions agreed with the Bankers Association of Malawi to introduce some monetary measures aimed at mitigating the impact of Covid-19 on Malawians as follows: (1) a 3-month moratorium on interests and principal repayments for loans by borrowers on a case by case basis, (2) restructuring, refinancing or renegotiation of loans for small and medium scale enterprises, corporate and other borrowers affected by Covid-19 on a case by case basis, (3) a reduction by 40% of the fees and charges related to internet banking or mobile payments to encourage the use of electronic payment transactions, and (4) deferment of all payments of bonuses and dividends until the risk of Covid-19 is under control.

Furthermore, the Registrar of Financial Institutions undertook the following actions: (1) reduced the liquidity reserve requirement (LRR)[1] on domestic currency deposits, thereby releasing 12 billion kwacha as additional liquidity availed to banks to directly support borrowers deemed to be distressed as a result of Covid-19, (2) reduced Lombard rate[2] margin by 50% so as to reduce the cost of accessing funds from the central bank and enable banks to pass on the benefits to borrowers, (3) activated the Emergency Liquidity Assistance Facility and made it available to banks, (4) approved the recapitalization plan in the unlikely event of a bank breaching the capital requirement direction as a result of Covid-19, and (5) granted relief to banks on the provision of restructured loans and loans on moratorium impacted by Covid-19.

However, much as these Covid-19, containment measures sound good for the control of the negative effects of the pandemic, their effect on Malawi's macroeconomic variables, particularly exchange rates, is not known. The study focuses on the exchange rates[3] because they play a very important role in an economy as they affect the relative price of domestic goods and foreign goods. For example, subject to the holding of the Marshal-Lerner condition[4], when a country's currency appreciates, its exports become expensive and, hence, less competitive on the international market because foreign goods become cheaper. On the other hand, when a country's currency depreciates, its goods abroad become cheaper while foreign goods become more expensive (Ogundipe et al., 2013). Moreover, as pointed out by Asif (2015), there is a statistically significant positive relationship between currency devaluation and money supply growth in the short run and long run. Thus, since Malawi actively engages in international trade, the exchange rate is a very important economic variable. Movements in the exchange rate influence the decisions of individuals, businesses, and the government. Consequently, this collectively affects the country's level of economic activity, inflation, and the balance of payments. It is for this reason that management of the exchange rate is one of the key functions played by central banks of most countries.

Hence, there is a need to find out how Covid-19 containment measures affected the exchange rates movement in Malawi. However, there is scanty literature on how the containment measures of Covid-19 have affected the exchange rates in Malawi. It is only the International Food Policy Institute (2020) that carried out an empirical estimation of the short-term impacts of Covid-19 on the Malawian economy even though it did not focus on how Covid-19 affected the exchange rates in Malawi. This paper, therefore, bridges this knowledge gap by, empirically, determining if there was a structural change in parameter values of money supply and exchange rates in Malawi following the break out of the Covid-19 pandemic. It thus poses the question: What is the effect of Covid-19 containment measures on the structural relationship between money supply and exchange rate in Malawi? The paper tests the following null hypotheses: (1) containment measures of Covid-19 have not led to currency appreciation in Malawi, and (2) Containment measures of Covid-19 have not led to an increase in money supply in Malawi. The results from this study give a clear picture of how Covid-19 containment measures have affected the relationship between some macroeconomic variables in Malawi. Furthermore, the study generates new knowledge that policymakers can use to further contain the disease and its economic effects in Malawi as well as globally.

2. METHODOLOGY

2.1. Conceptual Framework: A Literature Survey

According to World Bank (2020), there are four main channels of transmission of the effect of Covid-19 on economic activity in Sub-Saharan African countries, namely: (1) disruption in trade and value chains, (2) disruption in foreign financing flows, (3) disruption of economic activity due to the wider spread of the virus leading to an increase in the number of both infected people and the fatalities, and (4) the disruptions caused by containment and mitigation measures imposed by governments and the response of the citizens.

Containment measures to slow the spread of the Covid-19 virus have had a negative impact on various sectors of the economy globally. For instance, they have slowed global trade by reducing international travel and disrupting global value chains (World Bank, 2020). Official quarantines interrupted the free flow of people and goods, while precautionary behaviors (such as flight

1 This refers to the amount of funds that a commercial bank holds in reserve to ensure that it is able to meet liabilities in case of sudden withdraws.

2 This is the interest rate charged by central banks when extending short-term loans to commercial banks.

3 An exchange rate is the price of one currency expressed in terms of another currency.

4 The Marshall-Lerner condition states that currency devaluation will improve the trade balance if the devaluing nation's demand elasticity for imports plus the foreign demand elasticity for the nation's exports exceed 1.

cancellations) by consumers and firms, and restrictions imposed by governments have reduced travel and tourism (World Bank, 2020). Furthermore, tighter border controls and production delays also disrupted the tightly-linked system of global value chains such that factories around the world slowed or halted production due to shortages of intermediate inputs from China and elsewhere (Atkenson, 2020). In Malawi, the estimated short-term impacts of Covid-19 on the economy included the decline of GDP by around 11.6% between April and May, and between 4% and 5.2% over the 2020 calendar year thereby making around 1.1 million people fall into poverty temporarily (International Food Policy Research Institute, 2020).

Similarly, in their study, Benzid and Chebbi (2020) found that due to the plummeting commodity prices, exchange rates of key emerging market economies such as Brazil, Mexico, and South Africa dropped substantially due to the emergence of Covid-19. Furthermore, the study found as the emerging market economies were experiencing currency depreciation, the currencies of advanced economies, particularly the United States Dollar, had generally strengthened over the same period (OECD, 2020).

Eichenbaum et al., (2020) found that in an effort to reduce the chances of being infected by Covid-19, people cut back on consumption and work. Furthermore, they found that even though the decisions to reduce consumption and work tend to minimize the severity of the pandemic, they tend to exacerbate the size of the associated recession.

2.2. Theoretical Framework and Empirical Strategy

The analysis of the relationship between money supply and exchange rates is based on two theories of the determination of money supply, namely monetarism and post-Keynesian (Nayan et al., 2013). Monetarism theory is premised on the fact that money supply equals the money multiplier times the monetary base. Since the central bank can change the monetary base, it can also control the supply of money in the economy. Thus, according to the monetarist theory, the money supply is determined exogenously by the central bank (Nayan et al., 2013). This means that the money supply is not determined by other variables existing in the economy implying that the money supply curve is vertical at a given level of national output, hence, perfectly inelastic (Niggle, 1991). On the other hand, the post-Keynesian view holds that money supply is determined, endogenously, by changes in the level of economic activity which affects people's desire to hold currency relative to deposits, and the rate of interest (Nayan et al., 2013). This, in particular, works through the monetary base which is the amount of cash, made up of currency in circulation and central bank reserves, circulating in an economy. Key variables that can determine the monetary base are the market interest rates, excess reserve ratio, the required reserve ratio, and the exchange rates (Mishkin, 2004). According to Mishkin (2004), the relationship between money supply and exchange rates emanates from the fact that when central banks intervene in the foreign exchange market, they acquire or sell off international reserves thereby affecting their monetary base. However, there are different views regarding the effect of currency appreciation on the money supply, namely the traditional view and the new structuralism.

The traditional view posits that, if the Marshal-Lerner condition holds, the depreciation of domestic currency encourages exports and discourages imports thereby increasing an economy's competitiveness, a thing that leads to an increase in exports and a decrease in imports of the country. After some time period, the competitiveness of the economy leads to the emergence of a trade surplus which leads to an increase in foreign exchange reserves (Auer, 2015; Ogundipe et al., 2013). Consequently, the domestic economy experiences a rise in the stock of money which causes an increase in the aggregate demand and in the price level. On the other hand, the new structuralism school stresses that currency depreciation can only lead to an increase in the money supply in the economy if and only if the Marshal-Lerner condition is satisfied. This means that if the Marshall-Lerner condition is not satisfied, a country's currency devaluation can lead to a reduction in money supply, and hence become contractionary (Krugman, 1978). Currency depreciation negatively affects the monetary base thereby leading to a decline in money growth (Mishkin, 2004). Thus, the effect of exchange rate movement on money supply growth is not clear-cut. It depends on the existence of the Marshall-Lerner condition.

This paper, firstly, determines if following the outbreak of Covid-19, there has been a depreciation of the Kwacha-Dollar exchange rate, and, secondly, how that depreciation has affected the money supply in Malawi. It focuses on the Kwacha-US Dollar exchange rate because the US Dollar is a very important currency used widely in international trade so much so that it is referred to as the vehicle currency. By definition, currency depreciation is a decrease in the value of a country's currency relative to other currencies. If for example, the Kwacha-US Dollar exchange rate is given by 744.44, it means that one US Dollar is valued at 744.44 Kwacha. If the exchange rate rises to 750.43, it implies that the Kwacha has depreciated while the Dollar has appreciated. Thus, as one currency depreciates the other currency appreciates. The following model was used:

$$ER_t = \beta_0 + \beta_1 T + \beta_2 DUM_t + \varepsilon_t \quad (1)$$

Where: ER_t = exchange rate at time t;
β_0 = constant;
β_1 and β_2 = slope coefficients;
T = time period in months
$DUMt$ = Dummy variable which is equal to 1 for time period after December 2019[5], and 0 otherwise,
ε_t = The error term.

After finding out what happened to the Kwacha-Dollar exchange rate following the outbreak of the pandemic, the study now explored how the pandemic has affected the relationship between money supply and exchange rate. To achieve the foregoing, the study used the Vector Error Correction (VEC) model to determine if there exists a dynamic interrelationship between money supply and the Kwacha-Dollar exchange rate in Malawi.

5 The Covid-19 was discovered in December 2019. The study therefore expects a structural break in the money supply-exchange rate relationship following the outbreak of the disease in December, 2019.

2.3. Data and Estimation Methods

This study used quantitative data collected from various issues of the monthly economic reviews published by the Reserve Bank of Malawi (RBM) covering the period January 2018 to September 2020. It, firstly, employs the dummy variable approach to determine if there has been a structural change in the exchange rate following the outbreak of the pandemic. Secondly, it uses Engle-Granger test of cointegration and the VEC to establish if there exists a relationship between exchange rate and money supply. Table 1 presents the definition and measurement of the variables used in the regression analyses.

2.3.1. Estimation of the structural change of the exchange rate

Since Covid-19 emerged in December 2019, the study finds out if the values of the model remained the same through the entire period or there was a change in the values following the emergence of the disease. Literature suggests that the structural stability of a regression model can be examined by using either the Chow test or the dummy variable approach (Gujarati, 2004). However, the dummy variable approach is superior to the Chow test in the sense that it is able to show whether the difference in the two regressions was because of the differences in the intercept terms, or the slope coefficients, or both, something that the Chow test cannot show (Gujarati, 2004). It is due to the foregoing reason that this study employed the dummy variable approach.

Furthermore, the study used the Durbin-Watson d statistic to test for the presence of autocorrelation in the regression model, and it found a Durbin-Watson d statistic of 1.0251 $<$ 2 suggesting the presence of positive autocorrelation. As a remedy for this, the generalized least squares (GLS) method was applied. The advantage of the GLS method is that, in addition to correcting for autocorrelation, it also corrects for the presence of heteroscedasticity in the regression model (Gujarati, 2004).

2.3.2. Empirical estimation of the relationship between money supply and exchange rate

Literature provides a number of methods for testing the relationship and causality between variables. This study, however, employed the Vector Error Correction (VEC) model to test the existence of causality between money supply and the exchange rate. As a pre-requisite to testing for cointegration[6] and causality, there is need to establish the stationarity properties of the variables of interest. To do this, the study adopted the Augmented Dickey Fuller (ADF) and Phillips-Perron (PP) tests for unit root.

2.3.3. Model specifications

2.3.3.1. Augmented dickey fuller test (ADF)

The ADF test for a variable Y_t, involves estimating the following regression equation:

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \sum_{i=1}^{m} \alpha_i \Delta Y_{t-i} + \varepsilon_t \quad (2)$$

Where: ΔY_t shows the lagged differences of the variable of interest, ε_t is a pure white noise error term which is IIDN (0, σ^2)

6 Cointegration refers to the co-movement of two or more time series data so that in the long-run there is a constant linear combination between or among the series.

2.3.3.2. Engle-granger causality (EG) and VEC model

The Engle-Granger causality test applies the ADF test to the residuals obtained from the following regression assuming two variables X and Y:

$$Y_t = \alpha_0 + \alpha_1 X_t + \varepsilon_t \quad (3)$$

Where: α' s are the parameter coefficients to be estimated, and if stationarity is established in the residuals from equation (3), the two variables will be deemed cointegrated. Thus, the variables could still be in disequilibrium in the short run even if they are cointegrated in the long run (Gujarati, 2004).

3. EMPIRICAL RESULTS

3.1. Descriptive Statistics

Descriptive statistics for the variables used in the study are presented in Table 2.

As shown in Table 2, the mean money supply is MK1218.315 billion and its median is MK 1215.6 billion. On the other hand, the mean and median for exchange rate are 733.4553 and 733.159, respectively. Regarding standard deviation, money supply has a standard deviation of MK111.0864 billion while exchange rate has a standard deviation of 9.4467. This implies that money supply has a larger dispersion relative to its mean than exchange rate. Furthermore, the table shows that the minimum and maximum values for money supply are MK1021 billion and MK1400 billion, respectively. On the other hand, the minimum value for exchange rate is 723.425 while its maximum is 763.998.

The correlation between the two variables are presented in Table 3.

Table 1: Definition and measurement of the variables

No	Variable	Definition and measurement
1	Money supply (MS) (MK' billion)	Based on M1; a measure of money that includes currency, traveler's checks, and demand deposits
2	Exchange rate (ER)	The price of one country's currency in terms of another's. Here, we use the Kwacha-US Dollar exchange rate

Table 2: Descriptive statistics

Variable	Mean	Median	Standard deviation	Minimum	Maximum
MS (MK' billion)	1218.315	1215.6	111.0864	1021	1400
ER	733.4553	733.159	9.4467	723.425	763.998

Table 3: Correlation between the variables

Variable	Money supply	Exchange rate
Money supply	1.0000	
Exchange rate	0.6502 (0.0000)***	1.0000

***Significant at 1% level of significance

As shown in Table 3, there is a positive significant correlation between exchange rate and money supply (P = 0.0000 < 0.01). Regression results are presented in Table 4.

Table 4 shows that the constant is positive and statistically significant (P = 0.000 < 0.01). Similarly, the coefficient of the time variable is positive and statistically significant (P = 0.000 < 0.01). Furthermore, the coefficient of dummy variable is negative and statistically significant (P = 0.088 < 0.1). Therefore, using Table 4, the regression output can be presented as follows:

The general equation: $ER_t = \alpha_0 + \alpha_1 T + \alpha_2 DUM_t$ (4a)

The expected values for the two periods is given by:

For the pre-covid-19 period: $\mathrm{E}(ER_t / DUM_t = 0) = \alpha_0 + \alpha_1 T$ (4b)

For the post-covid-19 period:

$\mathrm{E}(ER_t / DUM_t = 1) = \alpha_0 + \alpha_1 T + \alpha_2 DUM_t$ (4c)

Thus, using the values from Table 4, the regression output is presented as follows:

For the pre-covid-19 period: $ER_t = 720.403 + 0.8893T$ (5a)

For the post-covid-19 period: $ER_t = 712.8309 + 0.88093T$ (5b)

Equation (5b) indicates that as time progresses, the US Dollar has been depreciating while the Malawi Kwacha has been appreciating.

Table 4: Regression output on the effect of covid-19 on the structural change of the kwacha-dollar exchange rate

Dependent variable: Exchange rate				
Variable	**Coefficient**	**Standard error**	**Z-statistic**	**P-value**
Constant	720.403	2.9886	4.28	0.000***
T	0.8893	0.2079	−1.70	0.000***
DUM_t	−7.5721	4.4447	−1.73	0.088*

Log likelihood = −110.5407. *Significant at 10% level of significance. *** Significant at 1% level of significance

Since the coefficient of the dummy variable is negative and statistically significant it suggests that there has been a structural change in the exchange rate following the outbreak of Covid-19 which was reflected in the appreciation of the Malawi Kwacha-US Dollar exchange rate. Having found that following the advent of Covid-19 pandemic the Malawi Kwacha has appreciated against the United States Dollar, the study then used the VEC to estimate how that appreciation has affected the supply of money in the economy, keeping other things constant.

3.2. Results of the Unit Root Tests

Before conducting the VEC regression analysis the study carried out unit root tests using both the ADF and PP tests for stationarity whose results are presented in Table 5.

Table 5 indicates that using both the ADF and PP tests, money supply is non-stationary in levels (P = 0.8043 > 0.1) and (P = 0.1541 > 0.1), respectively. The study, therefore, fails to reject the null hypothesis of non-stationarity. However, after taking the first differences, money supply becomes stationary. This is confirmed by the P-values for both ADF and the PP, which are 0.0000 < 0.01 in both cases. Hence, the study rejects the null hypothesis of non-stationarity.

Furthermore, Table 5 shows that the exchange rate is non-stationary, in levels, using both the ADF test and the PP test as the P-values are 0.1541 > 0.1 and 0.2193 > 0.1, respectively. On the other hand, after first differencing, both the ADF and PP tests indicate that the Kwacha-Dollar exchange rate becomes stationary. This is evidenced by the P-values of 0.0000 < 0.001 for both ADF and PP test statistics. The study, therefore, rejects the null hypothesis of non-stationarity. Therefore, the variables are now stationary and integrated of order 1.

After finding that both money supply and exchange rate are integrated of order 1, the study then proceeded to test if there exists cointegration between money supply and exchange rate. The cointegrating equation, estimated by using OLS, is given by:

$$MS_t = ER_t + \varepsilon_t \quad (6)$$

Table 5: Results for the ADF and PP unit root tests

Variable	**Augmented dickey fuller (ADF) test**		**Phillips-peron test (PP test)**	
Money supply				
Significance level	**Critical values**		**Critical values**	
	Level	**First differences**	**Level**	**First differences**
1%	−3.709	−3.716	−3.702	−3.709
5%	−2.983	−2.986	−2.980	−2.983
10%	−2.623	−2.624	−2.622	−2.623
Test statistic	−0.849	−4.731	−0.683	−5.717
Mackinnon *P* value for Z (t)	0.8043	0.0001	0.8511	0.0000
Exchange rate	**Critical values**		**Critical values**	
Significance level	**Level**	**First differences**	**Level**	**First differences**
1%	−3.709	−3.716	−3.702	−3.709
5%	−2.983	−2.986	−2.980	−2.983
10%	−2.623	−2.624	−2.622	−2.623
Test statistic	−2.357	−5.363	−2.165	−5.072
Mackinnon P-value for Z (t)	0.1541	0.0000	0.2193	0.0000

Results are presented in Table 6.

Table 6, shows that exchange rate is significantly influencing money supply in Malawi (P = 0.000 < 0.01). This, therefore, implies that the error term in equation 6 can be treated as an equilibrium error which is used to tie the short-run behaviour of money supply to its long-run value. Consequently, using the Granger-representation theorem[7], the study employed the error correction model (ECM) to estimate the relationship between money supply and exchange rate. The following regression equations were used:

$$\Delta MS_t = \beta_0 + \sum_{i=1}^{k-1}\beta_i \Delta ER_{t-i} + \sum_{j=1}^{k-1}\delta_j \Delta MS_{t-j} + \lambda_1 \Delta ECT_{t-1} + \mu_{1t} \quad (7a)$$

$$\Delta ER_t = \alpha_0 + \sum_{i=1}^{k-1}\beta_i \Delta ER_{t-i} + \sum_{j=1}^{k-1}\delta_j \Delta MS_{t-j} + \lambda_2 \Delta ECT_{t-1} + \mu_{2t} \quad (7b)$$

Where:
k-1= The lag length reduced by 1,
β_i and δ_j = short-run dynamic coefficients of the model's adjustment to long-run equilibrium,
λ_i = speed of adjustment parameter. To ensure convergence to long-run equilibrium, λ_i must always be negative, ECT_{t-1} = the error correction term. It is the lagged value of the residuals obtained from the cointegrating regression of the dependent variable on the regressors. It contains long-run information derived from the long-run cointegrating relationship.

The results of the long-run equation, also known as the Johansen normalization restriction, are presented in Table 7.

As indicated in Table 7, the error correction term is statistically significant at one percent level of significance as its Chi-squared statistic has a P-value of 0.000 < 0.01. This, therefore, suggests that there exists a long run relationship between money supply and the exchange rate in Malawi. Furthermore, coefficient of exchange rate is negative and statistically significant at one percent level of significance (P-value = 0.000 < 0.01). This indicates that exchange rate has a positive[8] effect on money supply in Malawi. This, therefore, implies that following the outbreak of Covid-19, the Malawi Kwacha appreciated which, as a result, endogenously led to the increase in money supply in Malawi. This finding conforms to the post-Keynesian view which posits that money supply is determined, endogenously, by the changes in the level of economic activity (Nayan et al., 2013).

3.3. Discussion of Results

This study has found that there was a structural break in the money supply-exchange rate relationship in Malawi following the outbreak of the Covid-19 pandemic. This structural change is in such a way that both the intercept term and the slope coefficients

Table 6: Results of cointegrating equation

Dependent variable: Money supply				
Variable	**Coefficient**	**Standard error**	**t-statistic**	**P-value**
Exchange rate	1.6620	0.0241	-68.94	0.000***
F-statistic=4752.92		R-squared=0.9933		
Prob>F = 0.0000		Adj. R-squared=0.9931		

***Significant at 1% level of significance

Table 7: Results of the error correction model

Error correction term	Parms	Chi²	P>Chi²
ECT_{t-1}	1	23.328	0.000
Dependent variable: Money supply			
Variable	**Coefficient**	**Standard error**	**Z-statistic**	**P-value**
Exchange rate	−17.8279	3.6911	−4.83	0.000

of the regression model changed. Also, the study found that the Malawi kwacha weakly appreciated against the US dollar amidst the pandemic. A possible explanation for this currency appreciation could be the fact that the country did receive foreign aid aimed at easing people's suffering due to the Covid-19 pandemic. For instance, from among its various donors, Malawi received a donation of US$37 million as support for Covid-19 response. The IMF donated US$91 million under the Rapid Credit Facility to help Malawi meet the urgent balance of payment (BOP) needs stemming from the Covid-19 pandemic. Additionally, on 25 April, 2020, Malawi alongside other 25 countries, received an immediate debt relief from the IMF which enabled the country save around K7.2 billion meant for debt servicing. And, again, in April, 2020, the World Bank donated US$37 million as support for Covid-19 response (World Bank, 2020). Cumulatively, these interventions had an effect of making currency appreciate since foreign aid leads to domestic currency appreciation in developing countries (Paldam, 1997; Rajan and Subramanian, 2009). Furthermore, the study has found that the currency appreciation positively affected money supply since money supply responds to changes in exchange rate in Malawi.

Implications arising from this study is that policy makers in Malawi needed to take advantage of the prevailing donor goodwill to ensure that the donations were put to good use so as to continue insulating the economy from negative shocks resulting from the Covid-19 pandemic and its containment measures. For example, there is a possibility that following the appreciation of the Malawi kwacha, there can be an increase in money supply which can lead to inflation.

4. CONCLUSION

This study set out to investigate whether Covid-19 pandemic has brought about a structural change in the money supply-exchange rate relationship in Malawi using the dummy variable approach and the VEC model. The findings have revealed that there has been a structural change in the money supply-exchange rate relationship following the outbreak of Covid-19 pandemic. Furthermore, it has shown that the Kwacha did appreciate following the outbreak of the pandemic, a thing that positively affected money supply in Malawi. One possible explanation for Kwacha appreciation

7 According to the Granger-representation theorem, if two variables are cointegrated, then their relationship can be expressed as error correction model (Gujarati, 2004).

8 When interpreting results from the error correction term the signs are reversed.

lies in the fact that the country received foreign aid aimed at cushioning people from the effects of the pandemic. It is possible that it is the foreign aid which made the Kwacha undergo currency appreciation. Policy makers are therefore encouraged to take advantage of the donor goodwill to ensure that the funds received are put to good use so as to continue insulating people from the devastating effects of the Covid-19 pandemic.

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