Determinants of Inflation in Liberia: An Econometric Analysis Using ARDL Bounds Testing Approach

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Abstract
The rate of inflation in Liberia has increased significantly over the last two decades and, since the ascendency of the new government headed by President George Manneh Weah, it has become more pronounced. The steep rise in inflation is increasingly eroding the purchasing power of consumers, thus leading to welfare decline especially for low income earners. The overarching objective of this study is to assess the determinants of inflation in Liberia. To achieve this objective, this study employs Bounds Testing Approach and Autoregressive Distributed Lag (ARDL) techniques using monthly time series data spanning the period 2014 to 2018. The empirical findings of this study reveal that, the current rate of inflation in Liberia is largely influenced by the unauthorized printing and infusion of new banknotes into the economy by the Central Bank of Liberia. In addendum, the results show that Customs taxes, foreign exchange rate depreciation arising from balance of payment deficits, international oil price, and import are key determinants of inflation in Liberia. Consistent with the results, this study recommends the demonetization of the current Liberian dollars banknotes (both old and new). This will provide the central bank with reliable data regarding the total quantity of Liberian dollars in circulation, thereby enabling the bank to promulgate salient contractionary monetary policies that would drive the current rate of inflation to single digit. Additionally, this study recommends that the government of Liberia embark upon diversification policies with greater emphasis placed on value addition in manufacturing and agricultural production for domestic consumption.

1.0 Introduction

Since the foundation of Liberia, the country has been confronted with several problems including unemployment, abject poverty, exchange rate crisis, political instability and Ebola outbreak, just to mention a few. Currently, the country is experiencing its worst inflation over the last two decades. According to the Central Bank of Liberia 2018 annual report, inflation, which has averaged 7 percent from 2006 to 2016 and was 12 percent in 2017, doubled in 2018 to 24 percent. This steep increase in inflation has created sever economic hardship in the country since the ascendancy of the new government headed by President George M. Weah. As indicated in figure 1, the trend of inflation was relatively calm from 2014 to 2016; however, inflation shows a deeper trend from 2017 to 2018.

Figure 1: trend of inflation in Liberia (2014-2018)
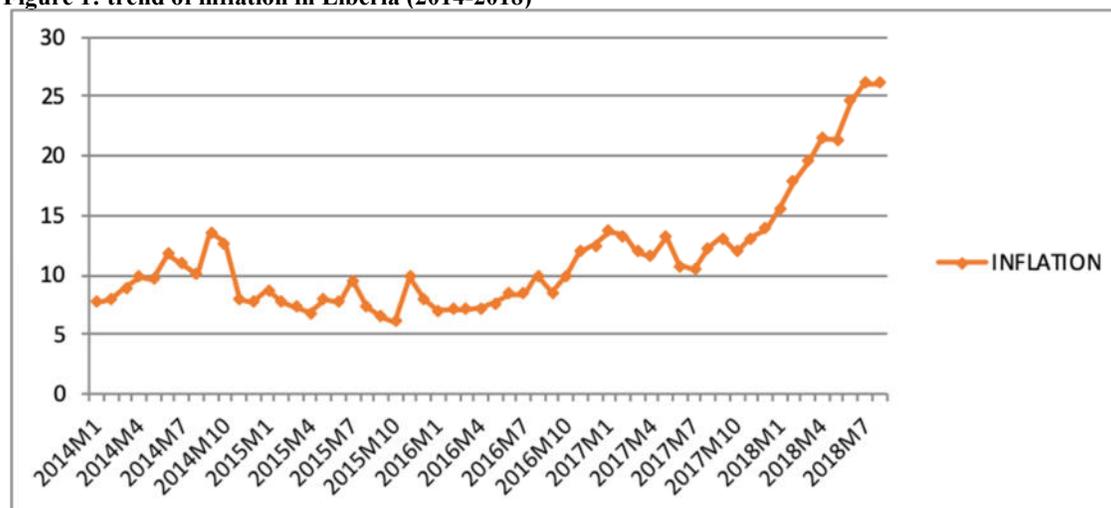
Source: author's computation

Inflation is the persistent increase in the general price level and such increase often leads to the fall in the value of money. Inflation has the potential to impact the economy negatively; therefore, most central banks around

the world have deemed it imperative to control it (Cheng and Tan, 2002). People with fixed income suffer the most from inflation because the real value of their income tends to reduce, thereby reducing their standard of living, and by extension, their total savings. Reduction in savings can be attributed to the fact that people need more money to finance the purchases of goods and services. A decrease in savings, by extension, reduces investment and capital accumulation (Bashir et al, 2011).

Additionally, inflation impacts foreign direct investment negatively. This is because materials and inputs used in production become more expensive during inflationary periods, and as a result, foreign direct investment becomes less profitable. Inflation also has the potential to reduce exports of goods and services, as domestically manufactured products become expensive to the rest of the world (ROW), and thus making them to be less attractive. Furthermore, inflation leads to increase in imports. Imports tend to increase because foreign products become less expenses compared to locally manufactured products. The Balance of payment (BOP) of a country is therefore affected as a result of increase in imports and decrease in export. It breads inequality in the distribution of income and leads to social and political unrest in the system.

As a result, several economists, researchers, and academicians have examined the main determinants of inflation in both developed and developing countries. However, there is no consensus among economists regarding the determinants of inflation especially in developing country. The debate has heightened in recent years predicated upon the fact that, inflation, in developing countries, particularly West Africa, has besmirched almost all economic policies largely because of their structural rigidities (Noko, 2016). Government attempts to control inflation by adopting different fiscal and monetary policies measures (Menji, 2008 and Hossain & Islam, 2013).

With this spirit, the government of Liberia instituted both fiscal and monetary policies measures aimed at reducing the prices of basic commodities and driving inflation to a single digit. From the fiscal front, the government reduced tariffs on over 2000 imported commodities in 2018, a decision which, on the other hand, is believed to have caused customs to lose millions in tax revenue. And from the monetary front, the president mandated the Technical Economic Management Team (TEMT) and the Central Bank of Liberia (CBL) to infuse US$25 million dollars into the economy to mob-up excess Liberian dollar liquidity to curb the rapid depreciation of the Liberian dollar against its United States dollar counterpart. This is because Liberian dollars depreciation is believed to have a pass-through effect to the current rate of inflation. Furthermore, as part of its policy measure intended to control the current rate of inflation, the Central Bank of Liberia announced that it has begun the sale of bonds with 7 percent interest rate. These efforts are aimed at ensuring that inflation is reduced to a single digit.

Despite these fiscal and monetary interventions by the government of Liberia, it is still unclear whether such interventions have yielded desired results as inflation continues to rise. In order to complement government's effort aimed at curbing the current rate of inflation to engender macroeconomic stability, this study assesses the determinants of inflation in Liberia, with the broad goal of promulgating salient economic policy measures.

The paper is structured in five sections. Following this introduction, section two focuses on the review of empirical literature, section three describes the methods and estimation techniques as well as the data employed in this research work, section four presents the empirical results and analysis. Finally, section five advances conclusion and policy implications.

2.0 Literature Review

Many economists, scholars and researchers have analyzed the determinants of inflation in both developed and developing countries. In developed countries, the cause of inflation is broadly identified as growth of money supply. However, in developing countries, there is no unanimous view among economists regarding the determinants of inflation as many researchers have found that inflation is not only a monetary phenomenon (Sergent & Wallace, 1981 and Montiel, 1989).

Liu and Adedeji (2000) conducted a study on the determinants of in inflation in Iran. The authors gathered data ranging from 1989 to 1999 and employed Johansen co-integration test and vector error correction model to achieve their objective. The findings showed that, in Iran, inflation is largely caused by money supply.

Sumaila and Laryea (2001) employed quarterly time series data ranging from 1992 to 1998 to assess the determinants of inflation in Tanzania. The authors used consumer price index as a proxy for inflation. Using the Ordinary Least Square (OLS), the researchers found evidence that, exchange rate and money supply are positively associated with inflation in Tanzania whereas gross domestic product is negatively associated with inflation.

Maliszewski (2003) employed a monthly data for the period (1996-2003) to assess the determinants of inflation in Georgia. The findings of his study revealed that inflation in Georgia was predominately caused by exchange rate and oil prices.

Khan et al (2007) examined the determinants of inflation in Pakistan between the periods (1972-2005). The researchers employed Ordinary Least Square estimation method and found that real demand, government borrowing, import prices, private sector borrowing, exchange rate, wheat and previous year consumer price index are the major determinants of inflation in Pakistan.

Mosayed and Mohammad (2009) adopted Autoregressive Distributed Lag (ARDL) model to assess the

determinants of inflation in Iran. The findings revealed that, in Iran, gross domestic products, exchange rate and money supply are the key determinants of inflation. The researchers also found that, changes in both domestic and foreign prices, which impacted the Iran war, had some strong positive impact on the rate of inflation in Iran.

Abdulallah and Khalim (2009) used a Johansen cointegrated technique to explore the main determinants of food price inflation in Pakistan from 1972 to 2008. The result of their study revealed that food export, food import, money supply, agriculture support price and GDP per capita are the main determinants of inflation in Pakistan.

Olatunji et al (2010) analyzed the factors contributing to inflation in Nigeria. For this purpose, the authors adopted the Johansen Cointegration technique and error correction model. The findings revealed that exchange rate, government spending, imports and lag of consumer price index are negatively associated with inflation whilst export and agricultural output are positively associated with inflation.

Abidemi and Malik (2010) looked at the dynamic and inter relationship between inflation and its most likely determinants in Nigeria. The researchers employed Johansen Cointegration and error correction model to assess the determinants of inflation in Nigeria. The results of the study showed that interest rate, Gross Domestic Product, import, money supply and the 1st lag of inflation are the main determinant of inflation.

Hossain and Islam (2013) examined the determinants of inflation in Bangladesh using data from 1990 to 2010. The authors used Ordinary Least Square (OLS) method to explain the relationship between inflation and several explanatory variables. The results from the estimation revealed that money supply and one-year lagged value of interest rate have positive relationship with inflation in Bangladesh whereas one-year lagged value of money supply and one-year lagged value of fiscal deficit have negative relationship with inflation. The results also show that, interest rate, fiscal deficit and nominal exchange rate are insignificantly related to inflation.

The above empirical studies have revealed different determinants of inflation in several countries. This suggests that the determinants of inflation are country-specific, hence the need for this study.

3.0 Methodology

The overarching objective of this study is to determine the factors that drive inflation in Liberia over the study period (Jan. 2014 to Aug. 2018). To achieve this objective, this study follows the structuralists approach. Unlike the Monetarists who hold the view that inflation is squarely a monetary phenomenon (i.e., growth of money supply), the structuralists believe that inflation is influenced by structural rigidities. Several researchers in developing countries including Appiah & Boahene (2003), Abdoulie (2004), and Bashir et al (2011) have confirmed the structuralists' argument. Given the above mentioned, the empirical model of this study is specified in a multiplicative form below;

$$INFLATION = f (FOREX, IMPORT, GST, OILPRICE, NEWMONEY) \qquad (1.0)$$

Where, **INFLATION** represents monthly average rate of prices (proxied by consumer price index), **FOREX** represents foreign exchange rate (the monthly rate of exchange between the Liberian dollar and the United states dollar), **IMPORT** is the total volume of import into Liberia in CIF (Cost, Freight and Insurance) value, **GST** is Good and service tax (a surrogate variable for customs tax levied on commodity importation), **OILPRICE** represents international oil price (world average monthly crude prices in US$/ barrel) and **NEWMONEY** is a dummy variable intended to capture the impact of the unauthorized printing and infusion of over US$15 billion of new banknotes into the Liberian economy. It takes the value 1 for the period (Aug. 2016 - Aug. 2018) the new banknotes were printed and infused into the economy and 0 otherwise.

Equation (1.0) can be specified in an econometric form as stated in equation (2.0) below;

$$INFLATION_t = \beta_0 + \beta_1 FOREX_t + \beta_2 IMPORT_t + \beta_3 GST_t + \beta_4 OILPRICE_t +$$
$$\beta_5 NEWMONEY_t + U_t \qquad (2.0)$$

Where, U is the disturbance term and t represent time. All other variables remain as previously defined. For ease of computation in succeeding sections, equation (2) is condensed into equation (3.0). Henceforth, we can adopt the convention of letting $INFLATION = Y_t;$ $\beta = (\beta_0 \beta_1 \beta_2 \beta_3 \beta_4 \beta_5)$ and $X_t = (FOREX_t, IMPORT_t, GST_t, OILPRICE_t, NEWMONEY_t);$

$$Y_t = \beta X_t + U_t \qquad (3.0)$$

Where Y_t is the endogenous variable, β is a vector of parameters to be estimated and X_t is a vector of the exogenous variables employed in this study.

3.1 Data and Measurement of Variables

The study uses monthly time series data for the period (Jan. 2014- August 2018) obtained from the International Financial Statistics (IFS), Central Bank of Liberia (CBL) and Liberia Revenue Authority (LRA). Table 1 shows the name of variables that this study adopted, followed by names of some researchers who used them. In addition, the table shows the sources of the data used as well as the expected signs.

Table 1. Data sources and expected signs

Variable	Empirics	Data Sources	Expected sign
INFLATION	Hossain and Islam (2013), Patrick & Havi (2014)	CBL	
FOREX	Reyes (2007), Sanusi (2010) and Anfofum et al (2015)	CBL	(+)
GST	Pitchford and Turnovsky (1976)	LRA	(+)
IMPORT	Odusola & Akinlo (2001) and Hashim et al (2014)	LRA	(-)
OILPRICE	Patrick & Havi (2014)	IFS	(+)
NEWMONEY	N/A	N/A	(+)

Author's Computation

3.2 Unit root test
Ascertaining the stationarity of variables is paramount in time series analysis. This is because, when nonstationary time series is regressed on other nonstationary series, spurious result may occur. Enders (2015) posits that spurious regression is associated with high t-statistics, low Durbin Watson statistics and High R-squared. This study, therefore, uses the Augmented Dickey Fuller (ADF) and the Phillips-Perron (PP) tests for unit root to ascertain the stationarity of the variables used.

3.2.1 Augmented Dickey Fuller Test (ADF)
ADF is a modified version of the Dickey Fuller test which, in the presence of serial correlation of unknown form, ensures that the unit root test is valid. To do this, the ordinary Dickey Fuller equation with lagged values of the differenced dependent variable is augmented. This illustration is shown below:

$$\Delta Y_t = \alpha_0 + \alpha_{1t} + \rho Y_{t-1} + \sum_{i=1}^{m} \beta_i Y_{t-i} + u_t \tag{4}$$

Y_t is the time series being tested, m represents the optimal lags, u_t is the error term. The null hypothesis for the ADF test is that, $\rho=0$ (i.e., series has a unit root) against the alternative that $\rho<0$. The null hypothesis is rejected if the computed tau statistic is less than the critical dickey fuller values at a given level of significance (1%, 5% 0r 10%).

3.2.2 Phillips-Perron (PP)
Phillips and Perron (1988) proffered a nonparametric statistical method which, without adding lagged difference terms, takes care of the serial correlation in the error term. The PP test is more robust to general form of heteroskedasticity and autocorrelation in the error term. When using PP, there is no need to specify lag length. PP is based on the following first order auto-regressive process.

$$\Delta Y_t = \alpha_0 + \alpha_1 Y_{t-1} + U_t \tag{5}$$

3.3 Cointegration and Error Correction Model
Pesaran and Pesaran (1997), Pesaran and Shin (1999) and Pesaran, Shin and Smith (2001) advanced the Autoregressive Distributed Lag (ARDL) Bounds testing approach to cointegration which has some good econometric advantages over other estimation techniques. Basically, the results of the ARDL model are valid whether the estimated variables are integrated at different orders [i.e., I(1), I(0), or mutually integrated]. Additionally, it has superior small sample properties and produces short run and long run relationships between the endogenous and exogenous variables. Given these plethora eye-catching econometric properties, this study employs the ARDL approach to ascertain the key determinants of Inflation in Liberia. The basic ARDL model can be specified as:

$$Y_t = \beta_0 + \sum_{i=1}^{p} \phi_i y_{t-i} + \sum_{i=0}^{q} \psi_i X_{t-i} + u_t \tag{6}$$

Where, ψ_i represents the coefficients of the current and lags of the independent variables and ϕ_i is the coefficient of the lags of the dependent variable. The re-parameterization of the model in equation (6) produces the error

correction version of the ARDL model which is specified as:

$$\Delta Y_t = \beta_0 + \sum_{i=1}^{p-1} \gamma_i \Delta Y_{t-i} + \sum_{i=0}^{q-1} \lambda_i \Delta X_{t-i} + \varphi ECT_{t-1} + e_t \qquad (7)$$

Where, γ and λ represent the short run coefficients, φ is the speed of adjustment towards long run equilibrium, which must be negative and significant statistically. The optimal lag orders p and q can be obtained by using the Akaike information criterion (AIC) or the Bayesian information criterion (BIC). The Wald test (also known as the Bounds testing approach to Cointegration) is used to verify the existence of long run relationships among variables used in the estimated model. The null hypothesis of no cointegration among the variables in the model is rejected if the computed F-statistic exceeds the upper critical bound value. If the computed F-statistic is lower than the lower bound critical value, then the null hypothesis is rejected. If the computed F-statistic falls within the upper and lower bounds, then the test is inconclusive.

3.4 Diagnostic tests
After estimation of the model, the following diagnostic tests are carried out: serial correlation, heteroskedasticity, normality, specification test (Ramsey reset test). This is done to see whether the model satisfies the assumptions of the classical linear regression model.

4.0 Results and Analysis
The empirical results emanating from the estimation of the model used in this study are presented in this section.

4.1 Descriptive Statistics
Table 2 indicates the descriptive statistics of the variables employed in this study. The sample size of the study is small as evidenced by the 56 observations shown in the table. The results also show that the mean values lie midway between the maximum and minimum values, indicating a good measure of central tendency. In addition, the results suggest that the variables exhibit high level of consistency given that the mean and median values are concentrated between the maximum and minimum values. Inflation rate, for example, ranges from 6.0 to 26.10 with mean of 11.40 and median of 9.90.

Table 2: Descriptive Statistics

Variable	Mean	Median	Maximum	Minimum	Observations
INFLATION	11.40357	9.900000	26.10000	6.000000	56
GST	8.071429	7.000000	10.00000	7.000000	56
IMPORT	106.2684	101.8400	219.0600	62.15000	56
FOREX	100.2264	90.92000	153.8800	80.88000	56
OILPRICE	61.93732	54.34500	108.3700	29.78000	56
NEWMONEY	0.446429	0.000000	1.000000	0.000000	56

Author's computation

From table 2, Good and Service Tax (GST) ranges from 7 percent to 10 percent with mean of 8 and median of 7. It is important to stress that following Liberia ascendancy to ECOWAS Common External Tariff (CET) in 2017, GST rose from 7 percent to 10 percent. Import (in CIF value) ranges from 61.15 to 219.06 with mean of 106.26 and median of 101.84. Furthermore, foreign exchange rate (FOREX) ranges from 80.88 to 153.88 with mean of 100.22 and median of 90.92. International Oil Price (OILPRICE) ranges from 29.78 to 108.37 with mean of 61.93 and median of 54.34. Lastly, 'NEWMONEY' is a dummy variable which captures the inflationary impact of the illegal printing and infusion of new banknotes into the Liberian economy. The minimum value is 0 (representing period that new banknotes were not printed) and the maximum value is 1(representing the period that new banknotes were printed).

4.2 Tests for Stationarity
This study employs the Augmented Dickey Fuller (ADF) and Phillips-Perron (PP) tests of stationarity (with intercept and trend) to determine the order of integration of the series employed in this research. In addition, the study adopts the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test to resolve contradictions (if found) between the ADF and the PP. The results of the ADF, PP and KPSS unit root tests are reported in table 3 below.

The ADF and PP results show that series used in this study are integrated at different orders. Specifically, INFLATION and IMPORT were found to be stationary at level or I(0) whereas GST and OILPRICE were found to be stationary at first difference or I(1). However, the two tests contradicted on FOREX. The ADF reported that

the FOREX is non-stationary whilst PP reported that FOREX is stationary at level. To resolve this contradiction, KPSS was applied and the result indicates that FOREX is stationary; thus, confirming the PP test result. These results are reported in table 3.

Table 3: Stationary tests

	ADF (level)	PP (level)	KPSS (level)	Decision	
Variable	Constant & trend	Constant & trend	Constant & trend	Decision	
INFLATION	-0.032224***	-0.032224***		Stationary	I(0)
FOREX	-0.183879	-0.027802*	70.76906*	Stationary	I(0)
IMPORT	-0.531281***	-0.531281***		Stationary	I(0)
GST	-0.135802	-0.135802		Nonstationary	
OILPRICE	-0.055219	-0.055219		Nonstationary	
	ADF (1st Diff.)	PP (1st Diff)	KPSS (1st Diff)	Decision	
INFLATION	1.392969***	-1.099710***		Stationary	I(1)
FOREX	-2.382764***	-0.978156***		Stationary	I(1)
IMPORT	-2.378515***	-1.524917***		Stationary	I(1)
GST	-1.023954***	-1.023954***		Stationary	I(1)
OILPRICE	-0.696203***	-0.696203***		Stationary	I(1)

Note: *, ** and *** represents 10%, 5% and 1% significance levels respectively

Source: Author's computation using Eviews 9

4.3 The ARDL Bounds Test for Cointegration

Having found that the variables used in this study are a mixture of both I (0) and I (1) and none of the variables is I(2), this study adopts ARDL approach to co-integration to verify the existence of a level relationship between the variables. Optimal lag is selected based on AIC given its accuracy in small sample, which can be likened to this study. The ARDL Bound test result is reported in table 4 below.

Table 4: ARDL Bounds Test

	Null Hypothesis: No long-run relationships exist		
F-Statistic	Significance	Lower Bound	Upper Bound
14.98347	10%	2.45	**3.52**
	5%	2.86	**4.01**
	2.5%	3.25	**4.49**
	1%	3.74	**5.06**

Source: Author's computations using Eviews 9

From the above table 4, the value of the F-statistic **(14.98347)** is obviously greater than the upper bound at all conventional confidence levels, suggesting that there is a level relationship between the dependent variable and the independent variables.

4.4 Short Run, Long Run and ECM Estimations

The study employs ARDL error correction model to estimate the short run and long coefficients. The model selected by AIC is ARDL (4, 3, 2, 3, 1). The results of the estimation are presented in table 5 below.

Table 5: Short run and Long run coefficients, ANOVA, and Diagnostic tests

DEPENDENT VARIABLE (INFLATION)				
	Variable	Coefficient	T-Statistics	P-value
LONG RUN	FOREX	0.663459***	5.558144	0.0000
	IMPORT	-0.037886**	2.287419	0.0287
	GST	-3.591306***	-3.860505	0.0005
	OILPRICE	0.143721***	5.858592	0.0000
	NEWMONEY	1.630646*	1.834163	0.0757
SHORT RUN	D(FOREX)	0.147126*	1.815441	0.0786
	D(IMPORT)	-0.010709**	-2.103718	0.0431
	D(GST)	0.330198***	3.144050	0.0035
	D(OILPRICE)	0.000979	0.031892	0.9748
	D(NEWMONEY)	0.778380**	2.300561	0.0279
	Constant	-6.890927***	-5.676104	0.0000
	ECT	-0.477345	-3.629944	0.0009
ANOVA	R-squared	0.784346		
	Adjusted R^2	0.666716		
	F-stats (p-value)	6.667922 (0.000001)		
DIAGNOSTIC TESTS	**Test**	**Test statistic**	**P-value**	**Null Hypothesis**
	Heteroscedascity	F(18,33)=0.775635	0.7115	Constant Variance
	Serial correlation	F(2,31)=0.363622	0.6981	No serial correlation
	Normality	Jarque-Bera=0.05828	0.971280	Normal Distribution
	Ramsey RESET	F(1,32)=0.687043	0.4133	No Omitted Variable

Note: *, ** and *** represents 10%, 5% and 1% significance levels respectively

Source: Author's computation

4.5 Interpretation and discussion of the results

4.5.1 Diagnostic tests

The diagnostic tests results are reported in the final panel of table 5. The result of the Breusch Pagan heteroscedasticity test indicates that the estimated model does not suffer from heteroscedasticity, which is evidenced by the high p-value of 0.7115. Such large p-value proposes the acceptance of the null hypothesis of "constant variance". On the other hand, the residuals of the estimated model do not suffer from serial correlation. This is evidenced by the high p-value of 0.6981 from the Breusch Godfrey test which is higher than all conventional confidence levels (i.e., 1%, 5% & 10%). Therefore, the null hypothesis of "no serial correlation is accepted. Furthermore, the Jacque-Bera test for normality shows that the residual of the model is normally distributed as evidenced by the high p-value of 0.971280. Lastly, the result of the Ramsey RESET test indicates that the estimated model is properly specified. This is evidenced by the high p-value of 0.4133, suggesting that there are no omitted variables.

4.5.2 Goodness of fit (R^2) and overall significance of the model

The coefficient of determination (goodness of fit, R^2) indicates the variation in the dependent variable that is explained by the independent variables. In this model, the R^2 is 0.784346 suggesting that 78 percent of the variation in inflation is explained by the independent variables included in the model. The Adjusted R^2 is 0.666716 0r 66 percent, which is higher than 0.50 or 50 percent thus indicating a good fit. The F-statistic, which shows the overall fit of the model, is 6.667922 with p-value of 0.000001. This result suggests the rejection of the null hypothesis that "all coefficients are statistically equal to zero". In particular, the F-test result implies that the independent variables (foreign exchange rate, international oil price, Customs GST, import, and Newmoney) jointly determine inflation in Liberia.

4.5.3 Error Correction Term

The Error Correction Term (ECT) captures the speed of adjustment towards the long run equilibrium. In this model, ECT estimates the speed at inflation return to equilibrium after a change in the independent variables. The coefficient of the ECT has the correct sign (-0.477345) and is highly significant at 1% confidence level; implying that 48 percent of adjustment towards long run equilibrium takes place in the first quarter.

4.5.4 Regression coefficients

The model satisfies the assumptions of the classical linear regression and passes all diagnostic tests; suggesting that meaningful and/or irrefutable discussions and interpretations can be done about the results. Consequently, the Long run and short run coefficient results are discussed below.

4.5.4.1 Inflation and foreign exchange rate (FOREX)

Foreign exchange rate is found to have a strong positive relationship with inflation in Liberia. The coefficient of 0.663459 implies that a unit increase in forex increases inflation by 66 percent in the long run, holding other factors constant. This suggests that the depreciation of the Liberian dollar against its counterpart, the United States dollar, is a key determinant of inflation in Liberia. This result is in line with prior expectations and economic theory; and is well aligned with the empirical studies of Bawumia & Abradu-Otoo (2003), Reyes (2007) and Sanusi (2010).

4.5.4.2 Inflation and imports

The results found imports to be a weak determinant of inflation in Liberia. According to the findings, a 1 percent increase in importation will cause inflation to decline by 1.1 percent in the short run and 3.7 percent in the long run. This can be explained by the fact that, an increase in imports will lead to goods being surplus on the domestic market and thus causing a decline in the general price level. This result is consistent with prior expectation and is well aligned with the empirical study of Odusola & Akinlo (2001) and Hashim et al (2014) but contradicts the findings of Mohamed (2000), Cheng & Tan (2002), Olatunji et al (2010), and Crowley (2010).

4.5.4.3 Inflation and Customs Taxes (i.e., GST)

Goods and Service Tax (GST) was used a proxy variable for customs taxes levied on importation of goods into Liberia. The findings of this study found that, GST has a positive relationship with inflation in the short run. The study found that a 1 percent increase in GST will lead to a 33 percent increase in inflation in the short run. This result is in line with apriori expectation and Pitchford and Turnovsky (1976). Surprisingly, however, in the long run, GST was found to be negatively associated with inflation in Liberia. According to the findings, a 1 percent increase in GST will lower inflation by 3.59% in the long run. Possible explanation could be that increase in taxes will lower income and aggregate demand, thus lowering inflation.

4.5.4.4 Inflation and international Oil price

The price of Oil on the world market was found to be another key determinant of inflation in Liberia. The results show that a one percent increase in the price of oil on the world market will increase inflation in Liberia by 14.4 percent in the long run. This result is consistent with our apriori expectation and is well aligned with other empirical studies such as Tang (2011) and Patrick & Havi (2014). Conversely, the short run results indicate that international oil price is insignificantly related with inflation in Liberia, although its coefficient is positive.

4.5.4.5 Inflation and Printing of New Banknotes

This study uses a dummy variable "NEWMONEY" to capture the inflationary impact of the over 16 Billion Liberian dollars that were illegally printed and infused into the Liberian economy over the period (2016 - 2018). The finding shows that the illegal printing of new banknotes, by the Central Bank of Liberia, has a significantly positive impact on the current rate of inflation in Liberia. In particular, the result indicates that the printing of additional banknotes will cause inflation to increase by 77 percent and 1.6 percent in the short run and long run respectively. This result is however not surprising since, according to macroeconomic phenomenon proffered by classical economists in the quantity theory of money, an increase in money supply leads to a proportionate increase in price levels, holding all other factors constant. This result is consistent with a host of other empirical studies, Lim and Papi (1997), Liu and Adedeji (2000), Laryea and Sumaila (2001), Abdullah and Kalim (2009), Khan and Grill (2010) and Bashir et al (2011). The findings of these studies revealed that money supply is a key determinant of inflation.

5.0 Conclusion and Policy Implications

This study used Autoregressive Distributed Lag (ARDL) model to ascertain the determinants of inflation in Liberia, using monthly data gathered from the Central Bank of Liberia, Liberia Revenue Authority and International Financial Statistics for the period (January, 2014 – August, 2018). The Augmented Dicky Fuller (ADF), Phillips-Perron (PP) and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) unit root tests results showed that the variables employed in this study are integrated of different orders [i.e., I(0) & I(1)], which justified the use of the ARDL model. The short run and long run results of the ARDL model showed that, the current rate of inflation in Liberia is largely caused by International oil price (OILPRICE), Customs taxes (i.e. GST), foreign exchange rate (FOREX) and the illegal printing and infusion of new banknotes by the Central Bank of Liberia. The model employed in this empirical study passed all diagnostic tests, affirming that the empirical results obtained in this research are irrefutable. Given the above results, plethora of policy recommendations can be suggested.

First, given the significance of the dummy variable "NEWMONEY" which captures the inflationary impact of the illegal printing of new banknotes, this study recommends the demonetization of the current Liberian dollar banknotes (both old and new). This will provide the central bank of Liberia with reliable data regarding the total quantity of Liberian dollars in circulation, thereby enabling the bank to promulgate salient contractionary monetary

policies to control the current rate of inflation.

Second, the results showed that international oil price (OILPRICE) is a key determinant of inflation in Liberia. However, since this variable is exogenous, little can be said about what the Liberian government should do. Nevertheless, the government is currently charging extra fee (¢30 road user fee) in addition to the ¢45 and ¢40 sales levy taxes on Premium Motor Spirit (PMS) and Automotive Gas Oil (AGO) respectively. This study therefore recommends that, in order to control the current rate of inflation, charging of such fee (¢30 road user fee) halted until there is a drop in international oil price on the world market.

Third, according to the findings, foreign exchange rate (FOREX) is statistically significant, suggesting that the depreciation of the Liberian dollar against the United States dollar, occasioned by persistent balance of payments deficits, has contributed greatly to the current rate of inflation in Liberia. This study recommends that the government of Liberian embark upon diversification policies with greater emphasis placed on value addition in manufacturing and agricultural production for domestic consumption.

Lastly, there is a need to reduce taxes on imported goods. Moreover, efforts should be asserted to address the bottlenecks and/or bureaucracies associated with clearing of goods from customs ports. These efforts will help to lower the cost of importation of goods and thus provide importers the incentives to lower prices on the market.

5.1 Areas for further research

A similar study can be done to complement the findings of this study. This study didn't capture all the variables that are possibly influencing the rate of inflation in Liberia. Other studies should capture the impact of UNMIL drawdown, Central Bank financing of government fiscal deficits, government spending, gross national income and change of political regime.

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Appendices

Appendix A: Graph for series in level