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By Amsalu Dachito & Minyahil Alemu

Ambo University

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Trade Liberalization and Inflation: Econometric Analysis to Ethiopian Economy

Amsalu Dachito [α] & Minyahil Alemu [σ]

Abstract- Of the most commonly celebrated propositions in international trade is the hypothesis that trade liberalization is associated with declining prices, so that protectionism is inflationary. The New Growth Theory is strongly in favor of this view. However, the "Cost-push advocators" claim for the existence of positive correlations between trade openness and inflation variables. Moreover, empirical studies have been confirming inconclusive results regarding the nature of relationships between the two variables. These theoretical and empirical departures are the principal motivations to the current study. This study is aimed to test the relationship between inflation and trade openness variables in Ethiopia, using the time series data set for the period serially ranging from 1976/77 to 2016/77. Augmented Dickey Fuller and Phillips Perron approaches will be employed for testing the stationarity properties of individual variables in the model and the Johnson's maximum likely-hood approach will be employed for cointegration tests. Finally, Vector Error Correction will be estimated in order to determine the relationships among variables entered the inflation model adopted, both in the short and the long run periods.

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I. INTRODUCTION

For the significantly celebrated benefit of international economic integration, no country can afford to isolate itself from the global economy. The highly significant role of this economic integration goes to developing economies as well. The possible economic gains from outward-looking development strategies have been extensively discussed in theoretical and empirical literatures in the world of economics. The benefits of outward-looking policies have been believed to be realized from international trade and capital flows. Following these hypothetical integration-growth ties, a great deal of world economies has resorted to opening up their gates and, a considerable shift has been observed from a closed to open and more flexible economic structure at around 1990s.

The celebrated benefit of openness is that it boosts the level of real output. The associated hypothesis has been also been that, through its positive effect on output higher openness has a reducing effect on the rate of inflation. But, the issue follows that, "has globalization really changed inflation in the way expected?"The issue remained a subject of debate for long in economic literatures. In most countries, even though the relationship between openness and output operates as expected, but takes different forms with inflation due to various structural and country specific factors. However, there is no unique agreement on the interaction between higher trade openness and inflation. Rogoff argues that "globalization has played strong supporting role in the past decade's process of disinflation" (Rogoff, 2003).He evidenced the realized inverse correlation between openness and inflation. However, contrary to Rogoff, Ball (2006) claimed for the existence of only little, probably insignificant impact of openness on inflation. While continuing his argued for the probable existence of only the modest and little relationship between the two macroeconomic variables. Despite the existence of varying views on these links, the pronounced phenomenon in economic theories has been to regard inflation and openness the negatively varying variables. Surprisingly, but not impressive, this theoretical link between the openness and inflation remained a bench mark in national policy setting in for a considerable number of economies even today. Ethiopia is not an exception to this.

Though regarded to serve positive role in rare case, inflation creates obvious costs to economic, social, political and other aspects of the country. The higher rate of inflation has commonly recognized negative effects in any typical economy. It could lead to poor resource utilization by forcing inefficient transactions and speculations, dampens the scope for rational economic decisions, and moreover creating a horrible situation by which the government policies loss credibility. When monetary economy to the largest extent losses power in dealing with macro wise economic aspects, good conditions are created to welcome hyper inflationary situations (see Krugman, 1991). Moreover, with higher inflation rates the economic growth process is also distorted via its reducing effect on domestic propensity to save. That means since inflation is meant to evaporate the purchasing power of money income, people's tendency to save part of their income for future consumption, of course it forms part of domestic investments, diminishes; and hence, economic activities as well.

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*Author α: Lecturer, Ambo University, Economics Department.
e-mail: dachnamo@gmail.com
Author σ: Lecturer, Jimma University, Economics Department.
e-mail: mineecon2008@gmail.com*

Whatever the relationship between openness and inflation is, stability in macroeconomic variables is a key for a sustainable and real economic growth to take place. Inflation, hence, is among the main concern. Fischer (1993) supports the view that a stable macroeconomic environment is conducive element to sustained economic growth. From his empirical observations we see that countries with low inflation have grown faster and vice versa. An important issue for the present analysis could be that stable and moderate growth rate of inflation is inevitable.

The present study is aimed to test the empirical correlation between inflation and openness in Ethiopia. Once the significant role of stable inflation is recognized, there is a need to determine its link with other macroeconomic variables; one is the trade openness variable. Hence, it is intended to test whether the two variables are operating in line with the theoretical claims. From the past experience in the literatures of inflation, inflation has been thought to be influenced by various monetary, fiscal and structural phenomenons; with an economies exposure to international economic and political integration other factors with a potential of affecting home inflation could be introduced. Hence, efforts will be made to incorporate the effects of both the internal and external influences on the domestic price level.

II. Statement of the Problem

The hypothetical claim with the New Growth Theory on the link between inflation and openness has been an important point of macroeconomic debates. The claim with the theory is that higher openness reduces the rate of inflation. In line with this theory (Romer, 1993) investigated a negative relationship between trade openness and inflation, using a large cross-section of 114 countries over the period 1973 to 1988. However, other views and empirical findings exist in contrast to the above cases. For instance, the "Cost-push myth" holds for inflation to vary positively with the degree of openness (Mayer, 2003). The argument is that, an opened up economy is highly subject to imported inflation and weekend domestic macroeconomic policies (particularly of monetary and fiscal policies) with the introduction of external shocks (like exchange rate conditions and other unfavorable happenings in trading partners), see Aron and Muellbaur (2007). Heavy reliance on import of manufactured and industrial goods and intermediate inputs by emerging economies will have higher possibility of importing foreign inflation simultaneously, which can be reflected directly on domestic prices. Hence, given all these possibilities, the 'Cost-Push' advocators claimed that, it is the net effect that determines the level of output and, hence price level; but not only the justified benefits of trade openness. Apart from this theoretical departure, there are also empirical contradictions on the nature of correlations among the two variables. For instance, a study by Sanginabadi et al (2011) and Zakaria (2010) have confirmed a positive and significant effect of trade openness on inflation in the respective economies of Iran and Pakistan. Induced primarily by these theoretical and empirical contradictions regarding the link between inflation and trade openness variables, the present study will be directed to determine the empirical relationship between the two variables; given that no previous empirical study has been undertaken in the country in the sprit at hand. Hence, the motivation could be to which of the hypothetical claim explains the case in Ethiopia; that is; "the New Growth Theory or the Cost Push Myth".

The notion that there are no or little previous studies in the country somewhere in this paper suggests for the desirability of the present study. Therefore, the present study is expected to contribute significantly by adding value to the countries inflation literatures, with the specific reference to openness to trade. In fact, one could find similar previous works in Ethiopia, though are limited too in concerning availability as well as statistical requirements. The only considerable study in the country in exactly similar issue could be a work of Meseret (2014), which is unpublished graduate study. Her control variables include the money supply, gross fixed capital formation as a share of GDP, per capita income and the government's consumption expenditure together with the openness variable (the principal element in the model). The study, even though, related is found to be limited on a number of grounds. In the first place, the government expenditure takes many forms, not only consumption. Government expenditure can be made for consumption of public goods and services, public investment activities and transfer payments. In all the cases, currency is being injected in to the economy thereby creating respective effects on the economy. Hence, the current study will try to incorporate the full effect of government expenditure on inflation model, which is to be discussed latter in this paper. Moreover, her analysis was limited to home side factors except the openness variable, which is the principal variable in the model. Yet, with higher exposure to international trade there could be a possibility that other external factors could have significant role in the domestic economy. For instance, in an opened up economies variables like imported inflation, exchange rates, balance of payments and possibly foreign interest rates affect domestic economy but ignored due consideration in the study by Meseret. Therefore, it will be tried to investigate the monetary, fiscal, structural and external variables in a relation to inflation in the present study.

Moreover, previous studies in Ethiopia have been focusing on the general cause-effect aspects of inflation with no particular attention to money supply and inflation; as opposed to their share in inflation theories and literatures. Even though, a little work has been done, they all commonly share serious limitations: variables employed as well as the number of observations were of limited size. Besides, not a little of them were concerned with food inflation alone. For example, a study by Josef et al (2008) has considered only the short run issues. Demirew (1998) for example used only agricultural and money supply variables in a relation to inflation as cited by Kibrom (2008); and Josef et al (2008) controlled only money supply, exchange rate, agricultural production shocks and foreign price. This study is limited basically on three grounds; by employing small number of variables, observations and considering the short run issue only. Other recent studies are also not out of this limitation: study by (Tsegay, 2014; Meseret, 2014) might exemplify it. Moreover, majority of them used only small size of observations. For instance; Kibrom (2008), Jema and Fekadu (2012); Josef et al (2008); Habtamu (2013) and Temesgen (2013) are mentioned among others. Carrying out analysis in such a way leads to defective conclusions. The present study differs from the previous once on a number of grounds. First, both the size of observations and variables are extended as appropriate as the econometric models employed.

III. Objectives of the Study

The present study is principally intended to empirically investigate the relationship between trade openness and inflation variables in Ethiopia using the time series data set for the period ranging from 1976 to 2016.

Towards attaining the set broad objective, the following specific objectives to be addressed in this study include;

→ Empirically investigating the direction of causality between inflation and openness variables;

→ Examining both the short and long run effects of trade openness on inflation and;

→ Determining the relative magnitude of each exogenous variable employed in explaining the process of inflation in Ethiopia.

IV. Review of Literatures

a) *Theoretical Literature*

i. *New Growth Theory versus Cost-push Myth*

The relationship between inflation and openness has been a subject of research, theoretical as well as empirical. However, the literature on the subject is relatively scant. According to 'new growth theory', openness is likely to affect inflation through its likely effect on output (Jin, 2000). This link could be operating through: a) increased efficiency which is likely to reduce cost through changes in composition of inputs procured domestically and internationally, b) better allocation of resources, c) increased capacity utilization, d) rise in foreign investment which can stimulate output growth and ease pressures on prices (Ashra, 2002). Okun (1981) postulates that the shocks to the domestic price level due to domestic output fluctuation are likely to ease as the economy opens up. However, the "Cost-push advocators" put the case differently. The "Cost-push myth" holds for inflation to vary positively with the degree of openness (Mayer, 2003). The argument is that, an opened up economy is highly subject to imported inflation and weekend domestic macroeconomic policies (particularly of monetary and fiscal policies) with the introduction of external shocks (like exchange rate conditions and other unfavorable happenings in trading partners), see Aron and Muellbaur (2007). Heavy reliance on import of manufactured and industrial goods and intermediate inputs by emerging economies will have higher possibility of importing foreign inflation simultaneously, which can be reflected directly on domestic prices. Hence, given all these possibilities, the 'Cost-Push' advocators claimed that, it is the net effect that determines the level of output and, hence price level; but not only the justified benefits of trade openness.

ii. *The Classical Quantity Theory*

The theory bases its analysis on the Fishers (1911) quantity equation given by $(MV = PY)$: where, M (money supply); V (Velocity of money); P (general price) and Y (real GDP). Assuming V and Y to be constants in the model, the theory claims that $(\%M = \%P)$, implying the existence of equi-proportional relationships between monetary growth and the rate of inflation. Therefore, inflation is always and everywhere a monetary phenomenon and in that no other factor could have a role as money plays in the determination of inflation process; see (Johnson et al, 2000; Hetzel, 2007; Milton, 1971; Nelson, 2007 and Ray and Anderson, 2011).

iii. *Keynesian Theories of Inflation*

In contrast to the case with classical economists, money creates real impact where idle capacities are present for Keynes. He claimed in such an economy that, any additional money balance reduces the rate of interest, increases investment and, hence, output. As a result the initial rise in price could be completely offset by the latter reduced price, hence, no way for it to directly transmit to the general price level (Keynes, 1936). Keynes identified three basic reasons why an economic agents demand money balance; the transaction demand (in line with the traditional economists), the precautionary demand (for emergency cases) and the speculative demand (money even as store of value); with the latter being the key tool in his attack against the *QTM*(Keynes, 1936). He contained these three motives together in his money demand function given by ($\frac{M^d}{P}$ == f (-i, +Y)), and related money demand positively to income and negatively to the level of interest rates: thereby recognizing the role of interest rate in affecting the demand for money. Price being determined by the demand and supply for money, Keynes formulated his own quantity equation given by P $= \frac{M}{D}$, or, $\frac{M}{P} =$ D. Where; M is the nominal stock of exogenously determined money supply; D, the demand for money and P is the general price level (Keynes, 1936).With the nominal interest rate included in his money demand function, Keynes stressed that, changes in the quantity of money affect price level only after impacting the level of interest rate, and hence investment, output and employment (Humphrey, 1974). So that, the transmission mechanism between money and the price level is indirect. The immediate impact of change in the quantity of money rests on the interest rate but not on price. It implies that when interest rate decreases (following positive shock in the quantity of money), the level of investment responds by increasing. Hence, the levels of output, income and employment increase also as well. The additional level of employment, in fact, imposes additional pressure on aggregate demand, and that the rising wage and other costs together induce the price level to rise. Here, the transmission of monetary impact on price is not only indirect, but the effect is not complete, since part of the money balance is held by the speculators (see Krusell P., 2004; Nelson, 2007)

Both versions of the quantity are, however, similar for an economy operating at its full capacity. For Keynes money could impose even a higher than full inflationary effect in the long run being aggravated by inflationary expectations. The Keynes's version reveals that the elasticity of price with respect to any monetary shock be equal to zero ($e_p = 0$) in an economy with idle resources to utilize. According to him, in such an economy, monetary injections would enable utilize idle resources and employment which increases output in a proportion to changing aggregate demand, hence there would be no impact on prices in the short run(see Kenneth and Anthony, 2015). The elasticity becomes one, given the level of output and employment fixed at full capacity and is *'True inflation'* for Keynes. Any monetary growth while the economy is operating at full capacity induces proportional change on price.

Secondly, the constant assumption of velocity was no more guaranteed in Keynes's version of *QTM*. In his Tract, he claimed that velocity of money is rather pro-cyclical (subjected to shocks)by considering the impact of interest rate on demand for money. Capturing velocity by ($V=\frac{PY}{f(i,Y)}$), Keynes argued that velocity is a positive function of interest rate. It works like this; when interest rate increases, money demand decreases and, as a result velocity of money increases. The implication is that, increased interest rate induces cash holders to save more to gain extra benefit from rising rates. So that, they put more of their balance at bank and remain with few and since the amount of balance available in the economy is now less, it frequently changes hands to serve the remaining unsatisfied motives for money. With unstable velocity, no way for money to directly transmit to price and vice versa; i.e. any change in price or income would also be absorbed by the same process as a result no increasing response from money supply (Snowdon and Vane, 2005).

iv. *Demand-Pull Theory of Inflation*

As the name implies this type of inflation is the result of excess demand in the economy. From the Keynesians traditional national income identity (Y = C + I + G), aggregate demand is a function of aggregate consumption (C), investment (I) and government expenditure (G). The demand pull inflation occurs when this sum exceeds the total level of supplies in the economy. Any factor causing aggregate demand to increase above its potential level would result in inflation. According to Oludele et al (2002), Keynesians' had a simple and direct tool to deal with this type of inflation. Their advice is to absorb money back from the public sufficient enough in reducing the extra effective demand imposing adverse shock on the price level.

v. *The Cost-Push Fallacy*

These types of inflation emerge from any negative shocks in the supply side of the economy. Following Lahari (2011), the supply side of the general economy explains output, inflation and the economy's adjustment to equilibrium at the potential level of output. The argument here is that, any factors contributing negatively to the production side of the economy are all inflationary. For example, increasing raw material costs, rising labor costs and indirect taxes could direct reflect in the form of increased prices or induce price to increase thereby reducing outputs. It is frequently stated in theoretical literatures like, Batten (1981) and Humphrey (1976), for this type of inflation to take place in the following manner: to cope up with the rising living costs in a condition of rising aggregate prices, employees may bargain and form a union demanding additional wage income; rising wages in turn can help drive inflation. This type of price surge also is regarded to spread in other sectors of the economy. It implies that, if a given production sector involves the input use of goods and services produced in another sector for which the production costs are increasing; then the prices of the goods produced in the first sector also increases.

vi. *The Structuralist's Explanation*

This theory briefs the causes of inflation particularly in less developed economies by identifying structural rigidities commonly underlying these economies. For instance, Ray and Anderson (2011) have identified three structural factors commonly explaining inflation in under developed economies. These are inelastic supply of agricultural products, insufficient national resource (government budget constraint) and foreign exchange bottlenecks. The implication with the first case is that, the unbalanced growth trends in agricultural sector and urbanization could result in higher rate of inflation in most *LDCs*. That means agricultural productivity is insufficient to meet its growing demand as urbanization is going ahead. Besides, due to weak domestic capacity complemented with loss of trust by external lenders, most LDCs resort to monetization of their deficits which is inflationary in practice in line with the traditional *QTM*. The structuralis' maintain that factors forcing monetization of deficits in LDCs are accounted for this type of inflation but not money supply as it is induced by those structural rigidities. Moreover, Donath and Dima (2000) and Jema and Fekadu (2012) also highly stress the case in line with Olson (2010). Foreign exchange limitations and huge price differentials in the international trade are also among the main headaches of underdeveloped economies. Finally, structuralists' have a message to *LDCs* at least to minimize the effect of inflation resulting from structural rigidities. That is to develop any optimum measure as well as capable institutions enough to avoid structural rigidness and imbalances in various sectors of the developing economies and bring these changes in the economy.

vii. *Theoretical Link between Deficits and Inflation*

Budget deficit is the second important variable in this study *(next to money supply variable)* because of its theoretical link to monetary growth. Via the *QTM* approach, the monetarists argue that monetization of budget deficit is inflationary. There are three ways to finance the public expenditures; borrowing from the public, borrowing from the central bank (Seigniorages) and external borrowing (Sargent and Wallace, 1976; Rebecca, 2014). Relative to the other two methods, the central bank financed deficits impose higher inflationary pressures. That is when money is created to fill deficits, the quantity of money in the economy increases and could result in inflation. Budget deficit affects price only after affecting the level of nominal money growth in an economy. It means, as long as the deficit is not monetized, no link exists between deficits and the price level. Sargent and Wallace (1981) postulate that, following exogenous government spending and taxes, monetization of the deficits would lead to monetary variable induced inflation in the long run. According to them, deficit cause money growth and which in turn causes inflation. Besides, they argue in such a condition, for the existence of feedback effect from inflation to budget deficits in the manner that inflation reduces the value of real revenue to the government, leading to fiscal deficit in the long run. Sargent and Wallace maintain that if monetization of deficits could result in growth of money supply and hence inflation, the situation would be termed as 'fiscal dominance,' due to the fact that the whole process is forced by the initial shocks in the fiscal policy. Lags in the collection of government's tax revenue adversely affect the government's fiscal position thereby reducing the real value of the public's tax revenue; this might further induce monetary creation.

viii. *Empirical Evidences*

From early empirical discoveries, Triffin and Grudel (1962) tested the hypothesis that openness boosts productivity and hence leads to cheaper availability of goods that are costly in the country otherwise and confirmed an inverse relationship between openness and inflation variables in sample of 5 countries in European Economic Community. It, hence, is in line with the claim of New Growth Theory and the Romer's hypothesis. Romer (1993) finds that closed economies tend to have higher inflation. He argues that central banks in economies more open to trade find currency fluctuations caused by money surprises more painful and therefore exercise more restraint than their closed economy counterparts. Empirical findings by Lane (1997), Ashra (2002), Sachsida et al.(2003), Yanikkaya (2003), Gruben and Mcleod (2004), Kim and Beladi (2004), Daniels et al. (2005), Razin and Loungani (2005), Aronand Muellbaur (2007), Badinger (2007), Bowdler and Nunziataz (2007) all validate Romer's argument. However, Terra (1998) only marginally supports Romer's argument by claiming that the negative correlation is only evident in severely indebted countries during the 1980s crisis period. Similarly, Batra (2001) argues that tariffs do not necessarily cause inflation, at least in the US. Gruben and Mcleod (2004) show that there does not exist any significant openness–inflation relationship among OECD economies. Kim and Beladi (2004) have estimated a positive relationship between price level and trade openness for some advanced economies, such as the US, Belgium, and Ireland, while for other countries, both developed and developing, their finding is in line with Romer's (1993) argument. Finally, it is interesting to note that Romer (1993) himself finds no significant openness–inflation relationship among OECD economies.

The country specific case is concerned; a study by Meseret (2014) could be primarily mentioned. She estimated the negative but insignificant impact of trade openness on inflation in contrast to the theoretical claims. Minyahil (2016) has also estimated the dynamics of inflation in a relation with other macroeconomic variables by controlling the openness variable. His finding indicates that the relationship between the two variables is positive and highly significant both in the short and long run. He justified the case to the country specific conditions like rigid economic policies, the prolonged internal and external conflicts with a potential of blocking the suspected benefits of large openness.

V. Methodologies

The quality of any macroeconomic analysis can be determined by the accuracy, consistency and availability of any macroeconomic variables in question. The problem in Ethiopian case is the inconsistency of macroeconomic data from different sources: to cope up with this problem, money sources will be referred as possible. The study uses secondary time series data set for the period serially ranging from 1976/77 to 2016/17, which is for about 41 years. The data are to be sourced from both the domestic and external organizations. The potential domestic sources include; Ministry of Finance and Economic Cooperation (MoFEC), National Bank of Ethiopia (NBE), Central Statistics Agency (CSA) and the Ethiopian Economic Association (EEA). External sources include; World Bank (WB) data base, International Monetary Fund (IMF) and the African Development Bank (AfDB).

a) *Econometric Model Specification*

The inflation variable can be measured in either of the following ways;

- → GDP-Deflator: - computed as the ratio of nominal to real GDP. This ratio at any time (t) indicates the level of inflation.
- → Producer Price Index (PPI):- It measures the positive change in the average price of inputs or raw materials used by producers. Its delinquency is that it considers only raw materials, not finished goods and services.
- → Consumer Price Index (CPI):- It is the change in the average price of consumable goods and services. It measures the positive net change in the average price of consumer goods and services.

No doubt, higher proportion of income in Ethiopia is spent on consumption of final goods and services. According to the Ethiopian 2014/15 third quarter economic report of UNDP, more than 56% of households' expenditure was made on food, beverages and other final consumable goods and services. Therefore, to use CPI is more appropriate and contextual in case of Ethiopian economy. GDP-Deflator is inappropriate since it excludes the impact of imported inflation on domestic prices owing to the definition of Gross Domestic Product. On the other hand, Producer Price Index (PPI) is not effective in representing inflation in Ethiopia compared to CPI, since the proportion of income spent on consumption of final goods and services exceeds spending on the purchase of raw materials and other inputs. Hence, CPI is reasonably a good candidate to measure inflation in Ethiopia, so that, it is a proxy to inflation variable (a response variable) in this study. Hereafter, while using CPI anywhere in this paper, we are referring to the inflation variable in other way round.

Modeling inflation is among the complex phenomenon in Economies as it is subject to various influences. However, it can be possible to determine the key variables the process of inflation in the countries like Ethiopia. The most empirically popular way in examining the relationship between trade openness and inflation variables has been to employ the single equation model, treating openness as the exogenous variable and; obviously, inflation (CPI) is the endogenous variable the model setting.

Hence, based on Solomon (2004), Mukhtar (2010) and Aron and Muellbaur (2007), the dependent and independent variables employed in modeling inflation in the current study are functionally related as follows;

$$CPI_t = f\,(BD_t, GDP_t, RER_t, OT_t, M2_t, GCF_t) \ldots\ldots \ (1)$$

Where; CPI = Consumer Price Index which is a proxy to inflation variable; BD = Budget Deficit; It is the difference between government expenditure and receipts for a given fiscal time period; GDP is Gross Domestic Product and RER is Real Exchange Rate. OT is the openness to trade variable. It is equal to the sum of import and export values divided by nominal GDP; thereby all the exports, imports and the GDP are measured in current price and current exchange rates.

$$\text{Openness} = \frac{\textit{Export value+import value}}{\textit{Nominal GDP}}$$

M2 = Stands for the broad money supply in Ethiopia. It forms the definition of money supply in the operational setting of National Bank of Ethiopia (the central banker of Ethiopia); and, GCF is Gross Capital Formation as a share of GDP; and t, captures any time trend in each case.

Just, the intention here is to determine the elasticity of each of the predictor variables with respect to inflation; and, due to the fact that, not everything is controlled in the model, we need to adopt the econometric model incorporating the identified variables and also considering the effect of other variables not included in the model. The model is set as follows;

$$Ln\ CPI_t = \beta_0 + ln\ BD_t + lnGDP_t + lnRER_t + lnOT_t + ln\ M2_t + lnGCF_t + u_t \quad \ldots (2)$$

Where; *ln* stands for the logarithmic form of each variable, and u is the stochastic white noise error term, distributed with zero mean and constant variance in different observations. The error term (u_t) is assumed to have a normal distribution.

b) *The Unit Root Test*

Since most macroeconomic time series are variables are usually non-stationary (Harry, 2012; Lahari, 2011) and thus leads to spurious regression, the stationarity test will be undertaken at the outset of cointegration analysis, which will be briefed latter on. Testing for unit roots is among the common statistical procedures, several testing procedures have been developed over the year. Many of the latter tests are designed to overcome the difficulties encountered in practice. In this regard, the present study will use the Augmented Dickey Fuller (ADF) and Phillips Perron (1988) methods for stationarity purposes. The ADF procedure is based on the t-ratio of the parameter and, is conducted by extending all the equations under consideration by adding the lagged terms of the dependent variables, and requires estimation of the following regression.

$$\Delta y_t = \alpha_0 + \eta_1 t + \delta y_{t-1} + \sum_{j=1}^{s} \Pi j \Delta y_{t-1} + \sum_{j=1}^{s} \varpi i \Delta y_{t-p+1} + \varepsilon_t \ldots \qquad (3)$$

Where, ε_t; is the usual pure white noise error term, $\delta = \Pi - 1$ and $\Delta Y_{t-1} = (Y_{t-1} - Y_{t-2})$, $\Delta Y_{t-2} = (Y_{t-2} - Y_{t-3})$, & the like. α_0 is the intercept term, $\eta_1$is the trend coefficient, t – the time/trend variable and where; s, are the lag terms. For this test, the hypothesis would be;

H_0: $\delta = 0$; there is unit root→(implying the time series is non-stationary).

H_1:$\delta < 0$; No unit root → the time series is stationary

Decision: reject the null hypothesis of ($\delta = 0$), hence the time series is stationary; if the computed t-statistic (in absolute terms) exceed the ADF critical values; the variable under consideration is stationary.

On the other hand, the test regression for the Phillips-Perron (PP) unit root approach looks;

$$\Delta y_t = \beta L_t + \delta y_{t-i} + u_t \qquad (4.4)$$

But, the error term (u_t) is stationary at level, and may be heterosckedastic and serially correlated. However, the problems will be corrected in PP test by modifying the test statistics of $t_{\delta = 0}$ and$T\hat{\delta}$in the first regression. Based on Harry (2012); Sjo (2008), the new test statistics would be represented by Z_t and $Z_\delta$as;

$$Z_t = [(\frac{\widehat{\sigma 2}}{\hat{\rho} 2})^{½} * t_{\delta = 0} - \frac{1}{2} (\frac{\hat{\rho} 2 - \hat{\sigma} 2}{\hat{\rho} 2}) * (\frac{T * SE\ (\hat{\delta}\ )}{\hat{\sigma} 2})] \text{ and; } Z_\delta = [T\hat{\delta} - \frac{1}{} \frac{T2 * SE\ (\widehat{\delta})}{} (\hat{\rho}^2 - \hat{\sigma}^2)]$$

Where, $\hat{\sigma}^2$ and $\hat{\rho}^2$ are the consistent variance estimates of the following respectively;

$$\sigma^2 = \lim_{T \to \infty} T^{-1} \left(1 + \frac{1}{n}\right) \sum_{t=1}^{T} E[u_t]^2; \text{ and } \rho^2 = \lim_{T \to \infty} \sum_{t=1}^{T} E\ (T^{-1} \sum_{t=1}^{T} u_t)\cdot$$

Under the null of $\delta = 0$ (i.e. unit root exists), the Z_t and Z_δ statistics in the Phillips-Perron (PP) procedure above, assume similar asymptotic distribution as with the conventional DF t-statistic. The PP procedure is advantageous over the ADF mechanism on at least two grounds; 1st, the PP is robust to general forms of heteroskedasticity in the error term; and, 2nd, and it does not need specification of lag length for regression as it is adjusted at length three by default in econometric and statistical software.

a) *Lag Length Determination*

It is also essential at the onset of cointegration analysis that the problem of determining optimal lag length should be considered as multi-variate cointegration analysis is very sensitive to the lag length selection. The two most common way used to determine the optimum lag length are the one where Akaike information criterion (AIC) is minimum and one which is suggested by majority of the criteria.

b) *The Cointegration Test*

The econometric framework to be used for analysis in this study is the Johansson (1998) maximum likelihood cointegration technique, which investigates both the existence and the number of cointegrating vectors. This multivariate cointegration test can be modeled as:

$$Z_t = K_1 Z_{t-1} + K_2 Z_{t-2} + \ldots\ldots. + K_{k-1} Z_{t-k} + \mu + v_t \ldots \qquad (4)$$

Where;

Z_t= (BD, GDP, RER, OT, M2, GCF) i.e. a 5 x 1 vector of variables that are integrated of order one [i.e. I(1)]. $\mu$is a vector of constant and, $v_t$is a vector of normally and independently distributed error term.

Equation (4) can be reformulated in a Vector Error Correction Model (VECM) as follows;

$$\Delta Z_t = \Gamma_1 \Delta Z_{t-1} + \Gamma_2 \Delta Z_{t-2} + \ldots.. + \Gamma_{k-1} \Delta Z_{t-k} + \pi Z_{t-1} + \mu + v_t \qquad (5)$$

$$\text{Where; }_{I} = (I - A_1 - A_2 \ldots\ldots\ldots.. - A_i),\ i = 1, 2, 3$$

K-1 and $\pi = -(I - A_1 - A_2 \ldots - A_i)$. The coefficient matrix$\pi$, provides information about the long-run relationships among the variables in the model. Π can be factored into $\alpha\beta'$, where α will include the speed of adjustment to the equilibrium coefficients while the β' will be the long run matrix of coefficients. The presence of r cointegrating vectors between the elements of Z implies that Π is of the rank r, ($0 < r < 5$). To determine the number of cointegrating vectors, Johnson (1998) developed two likelihood ratio tests: the trace test (λ_{trace}) and the maximum Eigen value test (λ_{max}). If there is any divergence of results between these two tests, it is advisable to rely on the evidence from λ_{max} because it is more reliable in small samples (see Dutta and Ahmed, 1977, and Odhiambo, 2005; Mukhtar, 2010)

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