Eco-currency: Proposition of a monetary policy design for a unitary currency program of a frailty economic zone.

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ABSTRACT

Recognizing the frailty nature of the Economic Zone of West African market, and its associated financial system, has contributed to a spirited pessimistic defense by many scholars against the acceptance and uphold to the idea of a single currency union for members [State] to accept the 'Eco' as the proposed currency brand label. The defense argument is based on the reason of lack of clarity to the supposed model for the proposed ECOWAS Central Bank, to administer it currency management that addresses' member countries economic welfare in equal expectations, and guarantees for a competitive trade advantage. This very paper, thereby addresses the problem by proposing a stylish monetary policy theory to act as a framework for the currency management, having into it a model application ingrained in the 'Natural Rate of Interest' as a policy indicator for the 'Eco-currency' management within the Economic Zone of West Africa.

Keywords: Monetary economics, policy, Eco-currency, Kalman Filter, Wicksellian, Fragile economy

Jel Codes: E42, E43, E44, E47, E52

[A] The history and background of unitary currency proposition for the ECOWAS of Africa

Ever since, the idea of establishing a single currency for the Economic Community of West African States (ECOWAS) was first launched in Conakry, Guinea in (1983), after it was founded in (1975), and operationalized from (1979) to bring together fellow Africans of the Portuguese-speaking countries, French-speaking countries, and English-speaking countries together. There has been varied submitted intellectual works to argue 'for' and 'against' the success of a single currency union proposal, which hasn't found the daylight yet. With estimated evidence of (58) % of quality papers on this subject, submitted by independent scholars based in Europe and USA, an estimate of (30) % of the independent scholars from the francophone countries within the ECOWAS region, (10) % among the Anglophone countries within the ECOWAS region led by Nigerian authors and the remaining (2) % from the Asian Universities led by China. When the single currency union was lunched, a monetary cooperation program was proposed, which was subsequently validated in July 1987 according to the account of (Amato & Nubukpo, 2020). In other to implement the idea of a single currency at the level of the entire ECOWAS, the new West Africa Monetary Agency (WAMA) was formed in (1996) to replace the Monetary Cooperation Program (MCP), which was tasked to accomplish the following;

i. In the short term period, the agency (WAMA) was to strengthen the currency payment mechanism of the West Africa clearing house by removing outstanding payment arrears.
ii. Introduction of new payment instrument such as travellers' cheque.

iii. The introduction of credit guarantees funds to support the clearing mechanism and remove all non-tariff barriers that limit the use of national currencies for payments of certain transactions, such as hotel bills, airline tickets, etc.

iv. In the medium term period, the agency was to oversee the 'limited' conversion of national currencies and eliminate, to avoid restrictions in inter-currency exchange.

v. In the long term period, it was the agency's focus to create a single ECOWAS currency monetary area that modifies the use of a single 'convertible currency'.

The Political commitment to renew the monetary cooperation was carried out by Ghana and Nigeria after December 1999, and subsequently accepted by Guinea, the Gambia, Sierra Leone, and Liberia, constituting a new league of Anglophone countries, to transform the idea of an acceleration approach towards monetary integration, into an actualize actions, in a realistic and achievable proposal, and collaborate with the francophone counterpart to create a successful monetary union with a unitary currency agenda.

The crystallization of this idea led to the formation of the West Africa Monetary Zone (WFMZ) on April 20, 2000, in Accra, Ghana. In the 2nd Summit of the African Conference of Heads of State and Government on the 15th December 2000; the statute of the future Central Bank of the West Africa Monetary Zone was drafted. The next effort was to be pooling of foreign reserves, as well as negotiate the convertibility of the foreign currency guaranteed with an appropriate international agency. Which required members' [State] to implement economic reform programs to achieve macroeconomic convergence including political reform agenda.

On the 21st December 2019, this union defined its latest step of execution, which was to conclude the credibility of the monetary integration of the ECOWAS, which was made up of (15) countries as a whole, instead of (16). These countries were Sierra Leone, Ivory Coast, Nigeria, Benin, Ghana, Guinea-Conakry, Gambia, Burkina Faso, Niger, Liberia, Togo, Cape Verde, Senegal, Guinea-Bissau, Mali, and Togo. Which the 16th Country, Mauritania having a minor misunderstand with the Union, redrew from the membership of ECOWAS on 26th December 2000. The author uphold a strong optimism of her return soon as a founding member of this Union. However, the community upheld a unanimous decision with understanding that to attain credibility of the monetary integration of the ECOWAS zone, does highly depends not only on the financial stability of the zone but also on the implementation of the mechanism to support a strong, inclusive, and development centered growth. As a result monetary integration became the integral component of the ECOWAS vision (2020). The aim of the vision was the intensification of the integration process through the promotion of the West African identity and community, within the populations of the continent of Africa, and the world as a whole. Therefore, the regional strategic plan of the ECOWAS was to see the intensification of economic and monetary integration as an important pillar for the development of the community. Meanwhile, (Saxegaard, 2006: Buchs & Mathisen, 2005: Senzu, 2019) were very pessimistic of the achievement of the ECOWAS aims and vision of single currency union in the year (2020), and argued that the success of single currency union of ECOWAS, for the vision (2020) was likely impossible, because the community is having many monetary problems, in particular, the immediate non-convertibility between their currencies, as well as poorly developed financial systems, and payment channels. And finally, ineffective monetary policy's transmission channels. To crown it all, was the observation of strong imbalances between the exchange rates of different

members [State] currencies at play, within the region, including high national debt to GDP effect being an inhibition to growth.

Nevertheless, the single currency union was not a mission impossible beyond ECOWAS (2020) vision, as an extract of (Senzu, 2020c) and in addition posits, it is a mission of possibility, and a must, but dependent on political will of implementation. However, recent papers published from the year (2020) thereof, on the subject of Eco-currency and it legal institutionalization, in an optimistic spirit of a unitary currency community are all striving in charting a new theoretical pathway for ECOWAS (2020) onwards. One of such publications (Senzu, 2020c) submit axioms in accomplishing such an objective in the shortest possible time.

However, the radical empiricists, observing, the fragile nature of the ECOWAS region in terms of internal and external trade imbalances, as well as the weak nature of it financial system development, and very slow to financial market depths, continue to reasonable object the unitary currency union on the basis of sustainability, even if, the convergence of members [State] economy becomes possible. These critics uphold the view on the damage this initiative may cause to the members [State] economy comparable to their current performance as individual sovereign market management in a monetary terms, if the initiated project fails to sustain the unitary currency agenda. A consequence, which they uphold to be irreparable and unrecoverable.

Thereby, studying the pessimistic structure of critique and concerns, it became obvious that the actual cause behind the concerns, which heightens the fear of the objectivists, is lack of clarity in the monetary policy framework to duly follow and administer successfully the proposed Eco-currency, in other to govern the aspired monetary zone, characterized in frailty.

It is believed that the nature of her fragility, makes the Economic zone a difficult circumstance to easily address shocks and risk, while maximizing the potential benefits as advantages to the members' sovereign [State]. Though (Senzu, 2020c) outlined the structural design of how the proposed Central Bank of ECOWAS could function towards convergence of all sovereign members [State] economy, as well as undertake structural management approach in post convergence era successfully. However, the policy framework design for application in the ECOWAS financial market was still under phenomenal study by the author, which the current compositional theory, and the related empirical foundation of this paper is structured to solve the raised question towards the critical management of the financial market, within the unitary currency zone in terms of market contraction and expansion cycle, accompanied with appropriate quantitative easing, which stabilizes the price levels of the open market in favour of production, leading to the promotion of industry within the monetary zone. And in addition present a theoretical guide that will instruct a policy framework in favour of effective monetary channel communication within the financial market, to be adopted as a tool by the ECOWAS Central Bank, yet to be legally institutionalized.

[B] Methodology and monetary policy framework for frailty Economic zone

As the study of (Senzu, 2020c) does outlined the following axioms in favour of primary and secondary convergence criteria, as an operationalize scope for the existence and sustenance of the proposed Central Bank of ECOWAS macroeconomic management. The below stipulations characterize laid down rules for policy design for both pre-convergence and post-convergence of members [State] economy as empirical derived;

i. Public debt nominal GDP ratio should be less than (70) percent.
ii. Tax revenue to nominal GDP ratio should be greater than or equal to (20) percent.

iii. Mean annual inflation rate should strive to stay in the threshold of (3) percent or less.
iv. Public sector wage bill to tax revenue should be less or equal to (35) percent.
v. Primary deficit to nominal GDP ratio should always be greater and equal to (-3) percent.

The above outlined axioms fall within the fiscal management space for members [State] to comply with, as a prerequisite condition. Among the outlined axioms, what it seems impossible in fulfilment by the members [State], hence, heightens the doubt of the possibility of unitary currency union within the ECOWAS region is, how to achieve the targeted mean annual inflation rate for all the members [State], which the rate is empirically pegged at being less than and equal to (3%), and the primary deficit to nominal GDP ratio required to be greater than equal to (-3%). Therefore, the empirical foundation of this paper is to solve that challenge, and offer a recommendation in policy wise.

The paper hereby argue, upon the legal Institutionalization of the ECOWAS Central Bank, the varied policy approaches, which are currently adopted by the Central Banks of individual Members [State] to govern it domestic inflation of the market, which leads to the management of its market via contraction and expansion of the business cycle, as well as the swift approach to quantitative easing to stimulate domestic growth, will all have to be brought to a halt. And adopt a new policy instrument defined herein as 'Natural Rate of Interest' as a recommended hypothetical 'targeting indicator', to become a new form of open market policy gauge, to guide the monetary policy communication and economic zonal quantitative easing.

Wicksell Knut in (1898) defined what he termed as the [natural rate of interest] of a market as the 'interest rate' that is compatible with a stable price level of the market. In the subsequent years, mainstream theories sought after a computational formula to derive (r-star) as the

'natural rate of interest' in a given economic market on a time series data. And the precept of that 'tracking indicator' theory for the financial market was that, it possess a quality of a tool reliable in gauging how the economic market could operate at full employment and stable inflation. The essential of such 'tracking' tool or 'policy regulator' guides the policy administer to moderate the economy to an aggregate price equilibrium for short term target, furthermore, serve as a radar to monitor open market lending as in credit expansion to the Commercial Banks as against the traditional old method of money quantity supply, accompanied with the difficulty to examine the velocity of circulation of the money supply at any given time to ascertain market performance, noted to be imprecise, and requires a lot of rule of thumb in decision making for the accurate assessment of market performance by the Bankers.

In the theoretical exposition of Wicksellian, it postulate that by comparing the 'money rate of interest' of an economy to it 'natural rate of interest', an equilibrium of a credit economy could be ascertained. Which in modern terms could be exemplified as a comparison between the 'Cost of capital' and the 'Return on capital'. This therefore adduce that, in any given economy, where the 'natural rate of interest' becomes higher than the 'monetary rate of interest', credit growth will drive a positive disequilibrium. Then, in a circumstance, where the 'natural rate of interest' becomes lower than the 'monetary rate of interest', the demand for credit dries-up leading to a negative disequilibrium and capital destruction. This proposition leads to a basic 'Wicksellian' differential formula stipulated below;

$$(WD^*) = [\text{Natural rate of interest} - \text{Monetary rate of interest}]$$

For that reason, the paper fundamental premise of exposition will be based on 'Wicksellian' differential formula as stated above. To proceed with the argumentative focus of the paper, it

must be placed on records, the submissions will not be able to elucidate all the latest created econometric models in favour of the computation of 'Natural rate of Interest' but does acknowledge all other sophisticated mathematical models developed over the years in the derivation of [Natural rate of Interest] to serve as a policy guide for advanced economies, especially with the USA Federal Reserve Bank's forecasting Units. Then, further places recognition to exceptional leading papers on effective computational models of 'Natural rate of Interest' from the theoretical works of Hicks (1904-1989) and that of Hansen (1887-1975), which gave birth to the Hicks-Hanson model, with their efforts to show the relationship between 'interest rates' and the 'assets market'. Then followed by the works of J. B. Taylor approach to the measurement of 'natural rate of Interest', Taylor (1993), which became the Taylor rule. Finally, a recent measurement approach for (r-star) by Laubach and Williams (2003), applying 'Kalman filter' to data for empirical deduction, which is uphold by the mainstream academic study. The various empirical evidences brings to a single conclusion, with the estimation of (r-star) of any economy, is a very difficult task to achieve, as in the exact forecasting figure of equilibrium, taken into consideration other none measurable factors, theoretically observed to have effect on the hypothetical (r-star) rate as argued in the report of (Eggertsson et.al, 2015: International Monetary Fund, 2014).

However, with the reliance to the methodical application of 'Kalman Filter' model for (r-star) derivation, for a chosen economic zone, which in this case are the fragile economic countries within ECOWAS region of West Africa, critical concerns for investigation, became prerequisite. Hence, thematically elaborated below;

Q1. Is the existing decomposing variables adopted by the advanced economy as dependency variable of the (r-star) suitable in assessing fragile economies, and is the data of such

variables, reliable and consistent to the dynamic and evolutional [constraint] ⸸ of developing economies for quality deduction?

Q2. If the response to (Q1) is no, is there any replaceable variables as a modification of the existing model, which will depict the (r-star) accurately in a credit based fragile economy?

Q3. If the response to (Q2) is yes, could (r-star) be used as a qualified monetary policy indicator for a credit based fragile economy, which is influenced by both exogenous and endogenous market forces?

Under the instruction of the established premises, the paper does further adopt the definition of a fragile economic zone adducing to the work of (Senzu, 2019b), defining the term, as "any given economy experiencing severe weakness in it currency management, making it difficult to finance its account deficits towards growth projections, thereby resulting into a market performance slow down, with the consequence of imposing vulnerability to her welfare functioning".

⸸ *Adopting, the definition content of [Constraint] as applied in the study work of Senzu (2021a), which state "Is any action or behaviour of the economy that creates a limitation or restriction towards a purposive economic action for an expected progressive result."*

In spite of the exclusive focus of the paper to address the technical questions raised in the introductory section of the paper for monetary policy guidance and implementation, the advance objective of the paper boisterously thrive on a central tenet, succinctly posits by Lubik and Mathes (2015), that state, 'it should be the desire of monetary policymakers to have a deep appreciation to the level of the [natural rate of interest] because it presents a guide post as to whether a monetary policy is too tight or loose. In that essence, the 'Wicksellian' view as policy implication does adduce that, an increase of the market interest rate (real interest rate) above its 'natural rate (r-star)', causes the activity of that economic zone to contract and lower prices as an expectation. Whereas, a decline of the market 'interest rate' below the 'natural interest rate', the activity of such an economic zone expand, resulting to higher prices. Therefore, when the 'interest rate' of the market is hypothetically in equilibrium with the 'natural interest rate', the exact economic zone is expected to attain to a stable price system and progressive growth, as an observable real market indicators.

As it is studied based on the *ex-post* factor of any economic zone and a fundamental macroeconomic theory, the movement of real interest rate in the context of inter-temporal choice does affect 'consumption' and 'investment' allocation, therefore based on such premise, the study thereby uphold such postulation as a basic assumption to guide the new model development and hypothetical prediction of [natural rate of interest] for the ECOWAS market. The second assumption for the predictive model, which is expected to instruct (r-star) calculative design, is the data determining the thresholds of foreign exchange reserve level of the Central Bank, within such a fragile economic zone. Which in most cases serves as a policy rule guiding the Central Bank on the limit for quantitative easing, as well outlaying the

foundation for the monetary stock level of the targeted economic zone, reference to the work of (Senzu, 2021a)

In an effort to establish an empirical basis for the premise (Q1) raised by the paper, a controlled 'Normality test' was conducted on the [independent] variables relative to the [dependent] variable (r-star), in accordance to the theoretical proposition of Laubach and Williams (2013), upon which they adopted the 'Kalman filter' approach for (r-star) prediction in the advanced economy like USA and Canada. However, the adoption of such model by the author and it objective application was carefully designed to fit the characteristics of countries that fall within a fragile economic zone. A careful *posterior* evidences from a fragile economic setting of the Individual members [State] constituting the fifteen (15) countries that form the ECOWAS region, were relied upon as the sample population of Africa to establish the empirical basis. The 'R-square' study outcome was certain with a 90% degree of confidence interval in the choices of [independent] variables adopted by the original model for the dependent variable (r-star), and observed, some of the variants does have a weak correlation test, inferring to a fragile economic settings. Therefore, the author proceeded to improve on the choices of [independents] variables as best fit for the (r-star) prediction for fragile economic settings, with a 95% degree of confidence interval, as a goodness of fit for the prediction of hypothetical [natural rate of interest] and a response to premise (Q1) investigative study.

In the experimental study to respond to premise (Q2) of this paper, the decomposing variables, as a goodness of fit for (r-star) prediction for fragile economic zone, and above 95% confidence interval, taken into consideration both exogenous and endogenous factor

implication of real economic system, the following variables, became ideal for modelling and determination of the formula for (r-star) best for fragile economic settings;

i. Central Bank base rate (Monetary Interest rate)

ii. Exchange rate of the adopted legal currency of the Economic zone against it accepted base currency

iii. Consumer Price Index

iv. Gross Domestic Product

v. Credit to the private sector per percentage of GDP

vi. Real interest rate of the open market

The essence of the application of advanced level statistical testing to the various variables, which were observed to be relevant and objective to the study, is to obtain a very sensitive formula, which has the efficacy to determine the hypothetical [natural rate of interest] from a frailty economic zone, having a high degree of confidence level for policy application as an inference on available data from any given market settings. Below is the submission of the brief explanation of the adopted variables to form the basis of the model formation.

[C] Model derivation and empirical analysis of (r-star) in frailty economic zone

The reasons of the paper adoption of [Kalman Filter] method as the theoretical guide for the model design, and the calculation of hypothetical [natural rate of interest] in frailty economic zone, is the admission to the fact that (r-star) derivation is a model premised to be a tracking indicator of the open market, hence, requires a methodical approach appropriate to track it hypothetical location, as an inference of appropriate data available. Secondly, the [Kalman

filter] is an unbiased estimator and linear in observed measure. Thirdly, it holds the lowest variance among all other estimators. And fourthly, it systemic error fall within the Gaussian distribution.

The paper hereby submit a prior estimation model in conformity to the methodical rule of 'Kalman filter' as follows;

An *apriori* estimation model of the hypothetical [natural rate of interest]

$$\hat{r}_k^* = \alpha_k \hat{x}_{k-1} + \beta_k U_k + \omega_k \ldots\ldots\ldots\ldots\ldots\ldots Eq.1$$

Holding the assumption that the stochastic noise of the system (ω_k) obeys the Gaussian distribution, then the formula of $(\hat{r}_k^*)$ becomes;

$$\hat{r}_k^* = \alpha_k \hat{x}_{k-1} + \beta_k U_k \ldots\ldots\ldots\ldots\ldots\ldots\ldots Eq.1a$$

Experimental measurement or estimation of the hypothetical [natural rate of interest] present the formula as follows;

$$\ddot{r}_k^* = C_k \hat{r}_k^* + \varepsilon_k \ldots\ldots\ldots\ldots\ldots Eq.2$$

The 'C_k' in the (Eq.2) represent [CPI] Consumer Price Index, which act as a factor of transition $(\hat{r}_k^*)$ in other to generate the accurate value of $(\ddot{r}_k^*)$. Hence, the stochastic noise of the actual measurement of the hypothetical [natural rate of interest] will be $\varepsilon_k = (\ddot{r}_k^* - C_k \hat{r}_k^*)$

When the theoretical estimation error and the experimental estimation error are assumed to be equal as in performance tracking tool, then $\varepsilon_k = \omega_k$

Then, Eq. (1 and 2) will merge as a correctional process approach for accurate and complete system estimation using the 'Kalman Gain' index to generate equation (3) below, as an algorithm or recursive estimation of [natural rate of interest] in the open market, performing the role, as a tracking system for monetary policy guidance.

$$\bar{\bar{r}}_k^* = \alpha_k \hat{x}_{k-1} + \beta_k U_k + KG\,(\ddot{r}_k^* - C_k \hat{r}_k^*) \ldots\ldots\ldots\ldots Eq.3$$

In other for the paper to conduct model evaluation, a sample population framework has to be adopted for the empirical estimations. Hence, the author relied on the economic structure of Nigeria as a sovereign nation for the data modeling and analysis, based on the following conditions; "The current population of West Africa, as a subset economic zone for empirical study, has a population estimate, according to the United Nations report, as at February 2021 was (408,375,454). Out of this figure, Nigeria as a sovereign nation holds (50.48) % as the highest populous nation, and the highest weighted economic average among the (17) West Africa countries. Followed by Ghana as the second highest populous nation of (7.61) %. Finally, the third ranking is Cote d'Ivoire with (6.46) %. Therefore, considering the varied choices available, Nigeria as a nation became an ideal sample framework for the designed model evaluation and estimations for a unitary currency economic zone, since it has (36) Federal State as the architecture of it economic zone.

The following are [independent] variables relied upon for the (r-star) model computation and evaluation based on Eq.(1), (2) & (3): As well outlined below;

$\bar{\bar{r}}_k^* \ldots\ldots hypothetical\ [Natural\ rate\ of\ interest] for\ a\ fragile\ economic\ system\ tracking\ and\ policy\ guidance.$

$\hat{r}_k^* \ldots\ldots theoretical\ [Natural\ rate\ of\ interest]\ estimation\ guide$

$\ddot{r}_k^* \ldots\ldots Experimental\ [Natural\ rate\ of\ interest]\ measurement, taken\ as\ the\ (Base\ rate\ of\ the\ Central\ Bank)$

$\alpha_k \ldots\ldots GDP\ growth\ rate\ annually\ as\ a\ model\ 'State'\ transition$

$\hat{x}_{k-1} \ldots\ldots Real\ Interest\ rate\ annually\ of\ the\ open-market$

β_k ….. $Credit\ to\ the\ private\ sector\ percentage\ in\ GDP\ annually$

U_k ….. $Annual\ percentage\ change\ of\ the\ Exchange\ rate\ of\ a\ domestic\ currency,$
$with\ the\ base\ currency(USD)\ of\ the\ Economic\ Zone$

C_k ….. $Annual\ percentage\ change\ in\ the\ Consumer\ Price\ Index\ of\ the\ Economic\ Zone$

KG ….. $'Kalman\ Gain\ Index'\ for\ dynamic\ and\ evolving\ economic\ market\ system$

ω_k ….. $Stochastic\ noise\ of\ the\ theortical\ estimation\ model$

ε_k ….. $Stochastic\ noise\ of\ the\ experimental\ estimation\ formula$

Table [1]. A raw data extract of (10) years on the Nigeria economy from the Nigeria Bureau of Statistics and World Bank for model computation

Years	α_k GDP growth rate in percentage annually	$\hat{x}_{k-1}$ Real interest rate of the open market	β_k Credit to the Private sector in percentage of GDP annually	U_k Annual percentage change in Exchange rate of the zone currency against it base-currency	C_k Annual percentage change in Consumer Price Index	$(\hat{r}_k^*)$ Theoretical r-star estimate	$(\ddot{r}_k^*)$ Experimental r-star measurement in a form of Central Bank base rate	(KG) Kalman Gain index of an economic system
2019	2.21%	4.52%	10.47%	0.008%	0.27%	10.07%	15.38%	0.4
2018	1.92%	6.06%	10.25%	0.003%	0.26%	11.67%	16.90%	0.5
2017	0.81%	5.80%	12.85%	0.523%	0.30%	11.42%	17.55%	0.4
2016	-1.62%	6.69%	14.61%	0.611%	0.25%	-1.91%	16.87%	0.1
2015	2.65%	13.60%	13.08%	0.339%	0.13%	40.47%	16.85%	0.8
2014	6.31%	11.36%	13.30%	0.013%	0.11%	71.85%	16.55%	0.9
2013	6.67%	11.20%	11.53%	-0.002%	0.11%	74.47%	16.72%	0.9
2012	4.23%	6.23%	10.61%	0.036%	0.14%	26.73%	16.79%	0.7
2011	5.31%	5.69%	11.04%	0.036%	0.11%	30.61%	16.02%	0.7
2010	8.01%	1.07%	13.49%	0.014%	0.12%	8.76%	11.59%	0.8

E. T. Senzu, (2021), statistical computation and model prediction

Since, any given economic market deals with non-static agents, dynamically evolving in their interactions as a process for decision-making and choices, which uphold a lot of uncertainties towards the future, the Kalman Gain (KG) performance mechanism of an economic system, should range between (0 and 1) binary, as the state of economic system performance, and a definition of uncertainty minimization, based on the quality of systemic structures instituted within a given economic zone.

The formula for Kalman Gain (KG)

$$KG = \left(\frac{\hat{r}_k^*}{\hat{r}_k^* + \varepsilon_k} \right) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots Eq.4$$

Therefore, the above Table (1), estimate the (KG) performance of the Nigeria Economy from 2010 to 2019.

In reference to Eq.(3), which, the r-star ($\bar{\bar{r}}_k^*$) is the tracking model for determining the hypothetical [Natural rate of Interest] in a fragile economy zone, to serve as sign-post for monetary policy administering, the equation is;

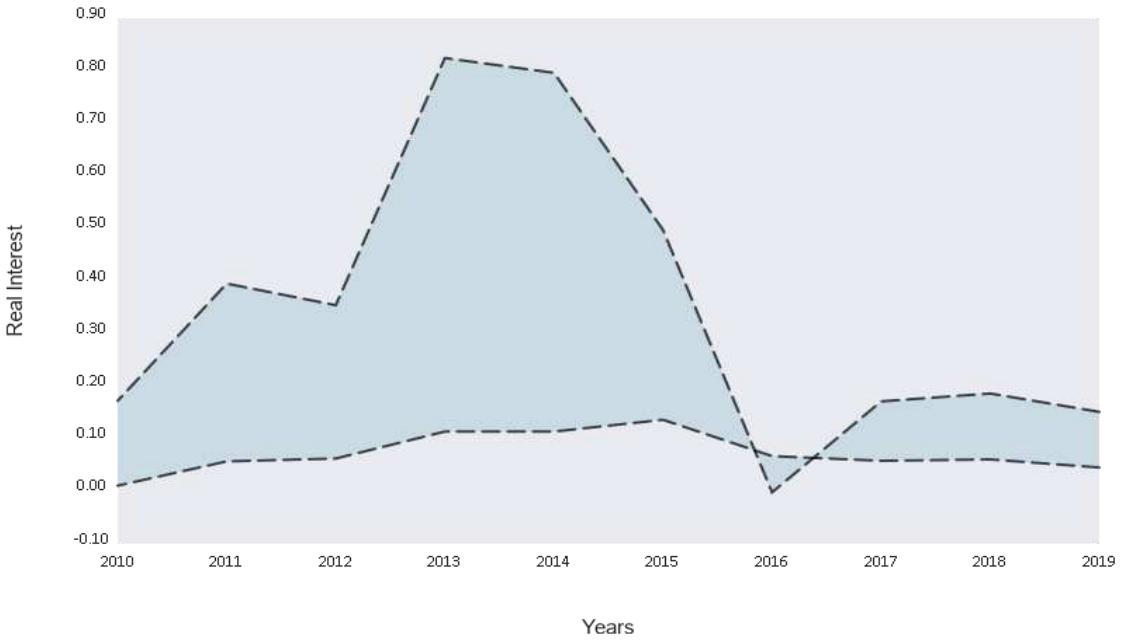
$$\bar{\bar{r}}_k^* = \alpha_k \hat{x}_{k-1} + \beta_k U_k + KG\ (\ddot{r}_k^* - C_k \hat{r}_k^*) \ldots\ldots\ldots\ldots Eq.3$$

Table [2] Model Computation, Estimation and Empirical Analysis

Year	$(\alpha_k \hat{x}_{k-1})$	$(\beta_k U_k)$	(KG)	$(\ddot{r}_k^* - C_k \hat{r}_k^*)$	$(\bar{\bar{r}}_k^*)$ Hypothetical Natural rate of interest prediction in a fragile economic zone
2019	9.99	0.08	0.4	12.66	15.1%
2018	11.64	0.03	0.5	13.87	18.6%
2017	4.70	6.72	0.4	14.12	17.1%
2016	-10.84	8.93	0.1	17.35	-0.2%
2015	36.04	4.43	0.8	11.59	49.7%
2014	71.68	0.17	0.9	8.65	79.6%
2013	74.70	-0.02	0.9	8.53	82.4%
2012	26.35	0.38	0.7	13.05	35.9%
2011	30.21	0.40	0.7	12.65	39.5%
2010	8.57	0.19	0.8	10.54	17.2%

E. T. Senzu, (2021), statistical computation and model prediction

Fig.3. Graphical Analysis of (r-star) performance relative to price level of Nigeria Economy

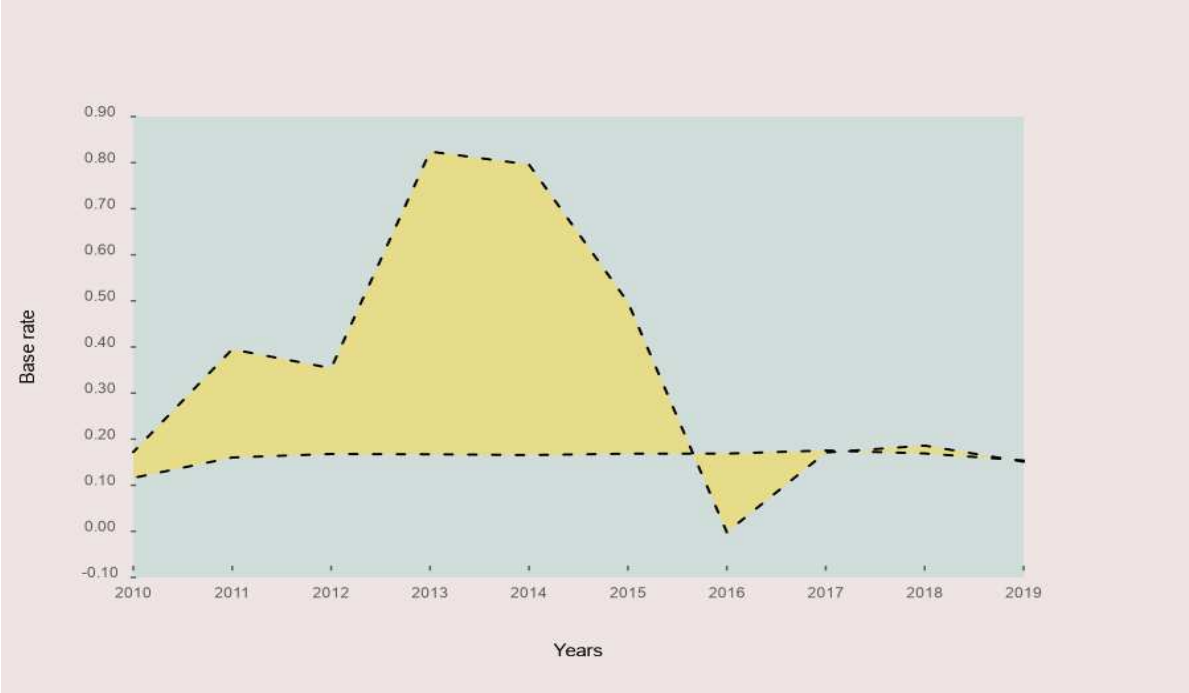


E. T. Senzu, 2021; data analysis

The above fig. (3) Is a graphical representation of static (r-star) tracking indicator, and the [real interest rate], which both are presented in a form of 'short-dash-lines'. The graphical display, picture out the (r-star) relative to the [real interest rate] within the Nigeria economy, as at (2010) to (2019). This thereby concludes, the [real interest rate] was above the hypothetical [natural rate of interest (0.00)], which is the 'short dash-lines' stationed at (0.00) in the graph. The observation to the graph depicts, the economic market was generally in a progressive price fall, with expected weak business cycle performance, and high rate of unemployment circumstance from (2010) to (2013), yet with relative good standard of living conditions, due to the low inflation per the indicator, however, after (2013) there was a steep fall of the 'real interest rate',

until it crossed the [natural rate of interest] in the year (2016), as the peak of business market recovery process, which is an indication of change of the monetary policy stance, given rise to credit expansion, price level rise, and the scale-up of industrial production, until the threshold was achieved, in terms of industrial expansions at a cost of a high inflation, which later demanded a market correction in reversal in terms of inflationary control by minimizing the gap between the [natural rate of interest] and that of the [real interest interest] to allow the threshold of price control, to favour the consumption market as well as the business operating cycle, as shown in the graph from the year (2017) to (2019).

Fig.4 Graphical analysis of r-star performance relative to Base rate of fragile economy



E. T. Senzu, 2021; data analysis

Since (2010) according to the fig.(4) above, the business market performance of Nigeria economy has been in contraction state, and maintained such condition up to the year (2013) because the 'base rate' policy stance of the Central Bank of Nigeria was at the increasing rate within the year (2010) to (2013) until it began to fall after the year (2013) up to (2016), which in that year (2016) according to the graph, the 'base rate' reduction has met the upper threshold, which resulted in the change of monetary policy stance, again. After the year (2016), leading to the year (2017), an efforts was made by the Central Bank of Nigeria to correct the state of the market inflation with the naira, which was at a cost to the consumer as well as the standard of living by citizens at that time. This action was taken by relaxing the reduction level of 'base rate' as a new monetary policy stance, to attain an equilibrium state with the [natural rate of interest], which, such policy stance was maintained up to the year (2019), as depicted in the graph presentation. And the implication of such policy action was a steady stabilization of price level of the market, under a controlled inflation, favouring a managed credit expansion, and business cycle growth.

The graphical presentation of Fig (3) and (4), as well as it corresponding interpretation above confirms to the higher degree, the exact historic developmental action of the real economic market of Nigeria from the year (2010) to (2019).

This makes the adoption of the (r-star) indicator a better market gauge for monetary policy stance by the Central Banks operating within a wide range of Federal State markets. And makes it theoretical adoption for 'Eco-currency' management by the aspired ECOWAS Central Bank, an ideal method for the members [State] financial market governance.

[D] Conclusion

The study thereby conclude, a reliable data inference for (r-star) derivation, for a frailty economic zone, as a structured equational model, defined in the empirical analysis in the section 'C' of this paper, is capable to produce a tracking indicator as a sign post for monetary policy in that same economy. Which becomes a perfect tool to guide quantitative easing towards market contraction and expansion, while becoming a monitoring tool for inflationary management.

Therefore, the paper recommends the hypothetical [natural rate of interest] established on the proposed model above as an open market tracker, which is a reliable policy indicator or a 'sign post' for a proposed unitary currency economic zone of ECOWAS, expected to be adopted by the proposed Central Bank of ECOWAS towards its price stabilization of the open market, to promote a consistent GDP growth rate among its members [State], if only, the disciplinary requirement of the zone fiscal management, will be strictly complied with.

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