CTSMSR VOL. 2 ISSUE 1, (2023) e-ISSN: 2814-1687

Current Trends in Social and Management Sciences Research

The Official Publication of the College of Postgraduate Studies
Babcock University, Ilishan-Remo, Ogun State, Nigeria.

Email: CTSMSR@babcock.edu.ng

https://doi.org/10.61867/pcub.v2i1a.051

RESEARCH ARTICLE

Macroeconomic Fundamentals, Economic Growth and Poverty in Ecowas Franc Zone: Does Single Currency Matter?

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Abstract

The paper investigated the role of single currency macroeconomic variables (exchange rate, central government tax and grant revenue, central government fiscal balance, inflation rate, external public debt stock, and gross capital formation) on output, poverty, international trade volume and unemployment in ECOWAS Franc zone. The question was about the state of symmetry of these factors and its effects on economic growth. The core objective was to examine the pattern of relationship these variables have with economic growth. The paper covered the period 1980 to 2019 and countries in the zone. Romer endogenous growth model, optimum currency theory (OCA) and PMG-ARDL methodology were used. From the group coefficients, fiscal balance (0.03) and inflation (0.15); exchange rate (-0.29) and inflation (-4.50); GCF (0.01); and tax/grant revenue (4.10e-10) were significant at the 5% level in the output, poverty, international trade volume and unemployment models, respectively. While the poverty model indicated two OCA groups in the region, the output, international trade and unemployment models showed four OCA groups each. The long run error correction terms in the output, poverty, international trade volume and unemployment models were 0.61, 0.11, 0.10, and 0.093 respectively and significant at the 5% level, meaning divergence from long run equilibrium. A minimum of two OCAs and a maximum of four OCAs were found. The paper

therefore concluded that the zone does not fulfill OCA requirements and recommended that appropriate policy mix should be developed to align these single currency macroeconomic factors towards achieving sustainable economic growth in the zone.

1. Introduction

Pursuit of economic growth is one of the key macroeconomic objectives in every nation. Melizia (1986) stated that economic growth implies short-term changes in an economy's quantity of production, consumption, income, employment or trade under a given economic structure and identified growth measures as GDP, employment, personal income/earnings which complement employment and economic stability. Poverty is the condition of having less income and/or material possessions than is required to satisfy needed basic necessities of life or meet the set minimum living standards (absolute or relative poverty). Skare & Prziklas Druzeta (2016) noted that poverty and unemployment accompanied the high growth rates of certain past periods and concluded that little is known about the nature of economic growth and poverty. Single currency related macroeconomic factors influences economic growth through macroeconomic policy impact on some key economic indicators. That impact breeds cost and benefit implications (Okoro, Ujuwa, Umar & Ukemenam, 2020; Arizala, Gonzalez-Garcia, Tsagarides & Mustafa, 2017; Bolton, 2018 and European Central Bank, 2015). Economic growth is dissected into output, unemployment, poverty and international trade volume components in this study.

At issue is whether these components of economic growth succinctly provide incisive explanation of the impact of single currency factors and lack of it in the franc zone of ECOWAS, on economic capacity. As of two decades ago, some developing economies in the world have turned to emerging economies but countries in ECOWAS have not progressed to that category. The quest for single currency in a region revolves on its appeal in advancing regional trade and economic growth and in providing unity amongst people of the region around a common objective (African Development Group, 2020). The Franc zone ECOWAS member countries have adopted the CFA Franc as common national currency at a fixed rate against each other for well over four decades and, as a group, are working towards meeting the convergence criteria for implementation of common currency with rest of ECOWAS countries in 2027, after years of delays/postponement. Debates on advantages of currency union focuses essentially on the mechanism through which monetary integration could engender macroeconomic integration, poverty reduction, economic growth and development in respective member states and the region. Not much evidence has been found that covers the franc zone in ECOWAS in a single study on single currency and economic growth, regarding its impact on output, employment, poverty and trade volume as key indicators of economic growth. Oladunjoye, Olagbaju & Akinbobola (2017); Omolehinwa, Alwell & Sylva (2020) and Ekpo (2020) works touched on growth effect of economic integration in ECOWAS, not necessarily based on single currency fundamentals.A few studies have focused on benefits and costs implications of single currency (Okoro, Ujuwa, Umar & Ukemenam, 2020 and Bolton & Huang, 2018).

The research questions was: what are the possible effects of common currency macroeconomic indicators (inflation, fiscal deficit, tax and grant revenue, exchange rate, external debt stock and gross capital formation) on output, international trade volume and unemployment growth component in zone? The broad objective was to examine the effect of single currency macroeconomic fundamentals in the convergence criteria on economic growth performance. The specific objectives were to examine the effect of these variables on output, poverty, and international trade volume and unemployment Franc zone countries. The paper hypothesized no significant relationship between these single currency macroeconomic convergence variables and output, poverty, international trade volume and unemployment in Franc zone countries. The paper covered 1980 to 2019. The eight member countries in ECOWAS Franc zone were included in the analysis.

The paper provides an update in the literature on single currency and economic growth in ECOWAS Franc zone, and benefits to the academia for researchers, teachers and students across disciplines. Professionals, management practitioners and business people stands to benefit from the outcome of this study, as it potentially illuminates mechanisms essential to formulation of effective business strategies. Most importantly, the results of this study will broaden the understanding of policy makers, economic and political leaders of issues involved in monetary union adoption and, then possibly speed up necessary decision processes to either implement or abandon its pursuit.

2.0 Literature Review

This section covers the conceptual, theoretical, empirical and methodological aspects. Siddiqi (2000) distinguished between two forms of monetary integration: currency union as involving fixing of exchange rates and a unification of financial institutions and markets to facilitate free capital mobility, which he concluded were interwoven. This implies that in currency union, countries could maintain the domestic currencies and link such currencies through a permanent exchange rate, at par (Salvatore, 1983). Linking a set of currencies at par, as it is within the ECOWAS Franc zone, in monetary union helps in the determination of optimal currency area, OCA. Mundell (1961) viewed OCA as the optimal geographical area for a single currency, or for several currencies, with exchange rates irreversibly pegged to each other, and convertibility is unlimited for current and capital transactions, but whose exchange rates fluctuate collectively against the rest of the world.

National output measure in macroeconomic is as reflected by Keynes (1936) in consumption model of national income, mathematically reflected as: National output (GDP) = C + I + G + X – M, where C = consumption, I = investment, G = government expenditure, X = export and M = import. The output level suffers variations through time due to changes in inflation rate, foreign exchange rate, external reserve level, external debt stock, tax/grant revenue and fiscal deficit arising from fiscal and monetary policy changes aimed at economic stabilization and transitional convergence. Apart from that, structural policies and institutions and external conditions could also affect output levels, a key indicator of economic growth (Loayza, Faynzylber & Galderbin, 2005).

As defined by the International Labour Organization, “unemployed workers” are those who are currently not working but are willing and able to work for pay, currently available to work, and have actively searched for work (ILO,http”//www.ilo.org/public/English/bureau/ stat/res/index/htm). Trade volume was computed as average of total export and total import in each country. Foreign exchange rate is a term for the value of one country’s currency in relation to another currency (O’Sullivan & Sheffrin, 2003). As Cruz-Rodriquez (2013) pontificated, the three foreign exchange rate regimes approaches under which choice is considered include performance of the economy criterion, optimal currency area criterion and currency crisis criterion. Fiscal deficit arises from excess of imports over export, a negative net export and the reverse generates surplus. In this paper, the central government fiscal balance measure was used as proxy for fiscal deficit. The endogenous school of thought, using endogenous growth model, states that a relationship exists between tax policy and economic growth and welfare over time (Lucas, 1988).

Some economists measure inflation by using the rate at which prices overall are changing, consumer price index (Labonte & Makinen, 2008), while some economists use a measure that reflects essentially the systemic factors that raises price (GDP deflator). Of these two measures, the GDP deflator measure was used in this paper. Some studies indicate that external debt creates positive effect on economic growth where the funds are utilized in productive economic activities. Other studies found that external debt breeds negative impact on economic growth where funds are not allocated in efficient manner. See Edo, Osadolor & Dading (2019), Mohamed (2018) and Onakoya & Ogundade

(2017). Capital formation connotes the part of present income saved and invested in order to produce future output and income. That, according to Odo, Nweke & Anoke (2017) and Bakare (2011), usually results from acquisition of new factory along with machinery, equipment and all productive capital goods.

Theories reviewed were theory of optimum currency area (Mundell, 1961); new theory of optimum currency area (Bolton, 2018), and the endogenous growth theory. Mundell (1961) viewed OCA as the optimal geographical area for a single currency, or for several currencies, with exchange rates irreversibly pegged to each other, and convertibility is unlimited for current and capital transactions, but whose exchange rates fluctuate collectively against the rest of the world. While he emphasized on the positives (lower transaction costs), Bolton & Huang (2018) new OCA theory came up with tradeoffs. The latter argued that there are lower transaction costs, but in return, countries give up a certain amount of sovereignty. Their work showed that while a monetary union can control inflation, the loss of each country's individual currency eliminates the ability for them to issue money to service debt obligations in times of financial upheaval.

Various growth theories have been advanced to explain the concept of economic growth, development and diversification in a multi-sector context. In this paper, emphasis is on endogenous growth theory developed by Arrow (1962) and refined by Romer (1986), and Lucas (1988). Infusing the concept of increasing return to scale, rather than the neoclassical constant return to scale, into growth analysis, the proponents explained the main models of endogenous growth on: 1.) learning by doing (Arrow, 1962); spillover effect of learning as the sources of knowledge which has a 'non-rival' character across all firms in the economy (Levhuri, 1966 and Sheshinski, 1967); learning by venturing (King & Robson, 1989) and learning by investment (Romer, 1986), 2) investment in human capital (Romer, 1986), and 3.) endogenous technical change based on ideas (Romer, 1990). Given these scenarios and coupled with its assumptions, a modification of the neoclassical postulate, the Romer's endogenous growth model production function states that increase in technology is a function of capital investment in producing new design, labour in research and development of new design, stock of technology used in design, and development of new design.

From theoretical view point, gravity model has largely been used to study the effect of currency union on trade (Oyekwenea & Oloko (2016); Ma.Kresna & Navarro, 2015; Balima, Barhoum, Govbanyov &Versilles, 2018).The application of macroeconomic stabilization factors to the determination of OCA and symmetric and asymmetric behaviour, based on the endogenous growth theory have recently become widely used, as seen in the works of Ekpo (2020); Okoro, Ujumwa, Umar &Ukemenam (2020); Edo, Osadotor & Dading (2019); Omolehinwa, Alwell & Sylva (2020); Hamdaoui& Samir (2018) and Oboh, Chonyelum & Edeme (2018). These works did not address the core issue of determining the suitability of currency union in the region but on selected factors' effects on economic growth.

In the literature there are various channels through which monetary union macroeconomic factors influences economic growth. Ehigiamusoe and Lean (2019) provided trade, inflation, exchange rate fiscal deficit, capital accumulation, unemployment level, population growth and productivity growth as some of the channels. Onyekwena & Oloko (2016) used descriptive statistics to investigate the effects of volatility on economic growth and the regional trade influence in facilitating the achievement of inclusive development in the West African region. They observed large movement of terms of trade and high negative shocks correlation with respect to investment, primary and manufactured product prices and output volatility in the contest of rising economic growth without inclusive development in many ECOWAS countries. Also, non-significant reduction in poverty level and higher inter-regional trade than intra-regional trade were observed. Onyekwena & Oloko (2016) stated that monetary union could be costly in West Africa, Ogunkola & Jerome (2005) using a global import trade approach, pooled regression technique and quarterly data for the 1985 to 2012 period,

concluded that monetary integration could enhance inter and intra-regional trade in ECOWAS, including the Franc Zone. The findings of Dabla-Norris, Kochlar, Ricka, Suphaphiphat, & Tsounta (2015); Mevel, De Alba & Olumane (2016); and Jooji & Oguchi (2017) were similarity to those findings.

Edo, Osadolor & Dading (2019) used economic growth theory and Linear Autoregressive Distributed Lag panel model which is suitable for examining short-run and long-run impacts to investigate growing external debt and declining export on economic growth and found insignificant positive impact of both variables. Trade theory and descriptive analysis techniques were used by Oyekwenenea & Oloko (2016), while Balima, Barhoumi, Govbanyov, Versilles&Towfighian (2018) included Logit, probit and linear probability and they found varied results. Also, while Bolton & Huang (2018b) applied overlapping generation (OLG) model in a monetary theory on two advanced economies and indicated that a monetary union eliminates excess inflation cost, but cause loss of monetary sovereignty, Ngepah (2019), applied prospect theory and principal components and instrumental variables regression, panel PMG regression and probit to examine fragility in African economies and stated that poverty and inequality were the main determinant of fragility in the short run, not per capital income, economic growth and other variables in the literature.

These approaches have not sufficiently explained the group and individual heterogeneous characteristics of the sample for this study as would MG, PMG, DFE-Autoregressive Distributed Lag technique, even though most of these studies concentrated on trade effect of economic growth and some mainly on advanced economies. These gaps provide the bases for the choice of this paper.

3.0 Methodology

This study utilized the ex-post facto research design to examine the potential effect of single currency on economic growth in the ECOWAS Franc zone. This design rests was chosen due to the ability of the time series elements to offer insight into macroeconomic dynamics after the facts without interference from the researcher. Eight countries (Benin Republic, Burkina Faso, Cote D'Ivoire, Guinea-Bissau, Mali, Niger, Senegal, Sierra Leone and Togo) of the ECOWAS Franc zone were studied using descriptive and inferential analysis.

3.1 Model Specification

The model specification was anchored on the Romer endogenous growth model. The gravity model (Rose, 2000; Miron, Miclaus &Vamvu, 2013) variant, based on OCA theory and where trade volume is replaced with real gross domestic product as a better measure of economic activity level was applied in addition to the former. On the basis of the learning by doing model, Romer made the following expression of the model:

$$Yi = A(K)F(Ki, Li) \qquad (3.1)$$

where Yi = output of firm i, Ki = stock of capital, Li = stock of labour, K = aggregate stock of capital and A = technology factor. The a priori expectation was that if the stock of labour is kept constant, growth ultimately seize since very little gets invested and produced. However, it was not extended to imply a lead to sustained endogenous growth.

Romer (1986) in his work on 'learning by investment' incorporated knowledge as input in the production function in the expression:

$$Y = A(R)F(Ri, Ki, Li); \qquad (3.2)$$

where Y = aggregate output, A = public stock of knowledge from research and development, Ri = stock of results from expenditure on research and development by firm I, Ki = capital stock and Li = labour force of firm I respectively. The function F was assumed to be homogenous of degree one

in all its inputs. Input Ri was treated as a rival good. Note that this was based on spillover effect of knowledge across firms in industry.

The MG, PMG and DFE-ARDL estimation techniques was deployed in the econometric assessment of relevant parameters and test results. Stata 15 software was used to obtain the pairwise Pearson panel correlation, unit root, co-integration tests and parameter estimates alongside the Eviews version 12 used for some of the pre and post estimation tests. The hypothesis was that there is no relationship between economic growth indicators and the aforementioned single currency criteria.

Based on the above, the following dynamic heterogeneous panel factor models in an ARDL framework were specified. This builds on previous studies like Edo, Osadolor & Dading (2019); Rose (2000) and Oladunjoye, Olagbaju & Akinbobola (2019).

Output model

$$Y_{it} = f(INF_{it}FD_{it}, TREV_{it}, ExR_{it}, EPDS_{it}, GCFPGDP_{it}) \quad (3.3)$$

$$Y_{it} = b_o + b_1 INF_{it} + b_2 LFDit + b_3 LTREV_{it} + b_4 ExR_{it} + b_5 LEPDS_{it} + GCFPGDP_{it} + e_{it.} \quad (3.4)$$

where $Y_{i;t}$*is real GDP growth rate,* IFL is inflation rate, FD is fiscal deficit (fiscal balance, FB), TREV is tax/grant revenue, ExR is exchange rate, EPDS is external public debt stock (current USD), *GCFPGDP* is gross capital formation as a percentage of GDP, *e is the error term,* b_0 is a constant representing the intercept, b_1, b_2, b_3, b_4 *and* b_5 *represent the partial slope coefficients of the respective variables;* $_i$ *represents the country and* $_t$ *is the time period.*

Logarithmic transformation (L) is carried out on FD, TREV, EDS and *GCFPGDP* so as to have constant variance for the series. To obviate potential bias activated in the mean-differenced explanatory factors and the error term, standard ARDL a mix with PMG, MG and DFE estimator by Pesaran, Shin & Smith (1999) is utilized.

Unemployment Model

$$\text{UNEPr}_{it} = f(INF_{it}FD_{it}, TREV_{it}, ExR_{it}, EDS_{it}. GCFPGDP_{it}) \quad (3.5)$$

$$\text{UNEPr}_{it} = \delta o + \delta_1 INFit + \delta_2 LFD_{it} + \delta_3 LTREV_{it} + \delta_4 ExR_{it} + \delta_5 LEDS_{it} + GCFPGDP_{it} + e_{it} \quad (3.6)$$

where UNEPr is unemployment rate (age 15 and above), *δo is a constant representing the intercept,* δ_1, δ_2, δ_3, δ_4 *and* δ_5 *represents the partial slope coefficients of the respective variables.* Also UNEPgr is a proxy for welfare improvement necessitated by Melitz, 1995; Grubel (1970), and Demopoulos and Yannacopoulos (1999) contributions on determination of size of optimal currency area, as related in 2.1.2 above.

International trade volume

$$\text{ITV}_{it} = f(INF_{it}FD_{it}, TREV_{it}, ExR_{it}, EDS_{it}, GCFPGDP_{it}) \quad (3.7)$$

$$\text{LITV}_{it} = \alpha o + \alpha_1 INFit + \alpha_2 LFD_{it} + \alpha_3 LTREV_{it} + \alpha_4 ExR_{it} + \alpha_5 LEDS_{it} + GCFPGDP_{it} + e_{it} \quad (3.8)$$

where ITV is the log of total goods and services traded (exports plus imports), *αo is a constant representing the intercept,* α_1, α_2, α_3, α_4 *and* α_5 *represent the partial slope coefficients of the respective variables.*

Poverty model

$$\text{GNIpc}_{it} = f(INF_{it}FD_{it}, TREV_{it}, ExR_{it}, EDS_{it}) \quad (3.9)$$

$$Y_{it} = \lambda o + \lambda INF_{it} + \lambda LFD_{it} + \lambda LTREV_{it} + \lambda ExR_{it} + \lambda LEDS_{it} + GCFPGDP_{it} + e_{it} \quad (3.10)$$

where GNIpc isPoverty, *λo is a constant representing the intercept, λ_1, λ_2, λ_3, λ_4 and λ_5 represent the partial slope coefficients of the respective variables.*

Adopting the Pool Mean Group-Autoregressive Distributed Lag (PMG-ARDL), the model expression is:

$$\Delta y_{it} = \mu_i ECT_{it} + \sum_{j=1}^{p-1} \Delta X_{it-j} \Theta ij + \sum_{j=1}^{p-1} \infty ij \Delta X_{it-j} + eit \quad (3.11)$$

$$ECT_{it} = y_{it-1} - X_{it} л \quad (3.12)$$

In equations 3.11 and 3.12, y represents the variables explained, x is the vector of the list of explanatory variables (INF, FD, TREV, ExR, EDS and GCFPGDP) with equal lag p which spans the countries i in time t. Δ reflects the difference operator for variables differenced in the model; л represents the coefficient of the long run which yield estimates of Θ and ∞ at convergence. Besides descriptive statistical analysis, pre- and post- estimation diagnostic tests, all listed under the decision criteria in section 3.6 were conducted, and presented in the next chapter.

The appropriateness of Standard ARDL estimation method is ascertained upon conduct of unit root test for order of integration. It is applied if it is I(0) and I(1). The parameters of interest are the long-run effects and the speed of adjustment to the long-run. ARDL presents three types of estimation methods, namely DFE, MG and PMG on a continuum. Dynamic Fixed Effect, DFE, allows the intercept to differ across groups while all other coefficients and error variances are constrained to be the same, at one extreme. At the other extreme, the MG estimator separate equations for each group and examine the distribution of the estimated coefficients across groups. Key concern is the mean of the estimates, called the Mean Group (MG) estimator which is assumed to produce consistent estimates of the average of the parameters (Pesaran& Smith, 1995) but ignore possibility of certain parameters being same across groups. The PMG (Pooled Mean Group), an intermediate estimator, involves pooling and averaging. It allows the intercepts, short-run coefficients and error variances to differ across groups but the long run coefficients are constrained to be the same. The appropriateness of MG or PMG estimator is determined post estimation by Hausman test. *The dataset utilized in this paper was collected from African Development Bank (AfDB) database and World Bank Development Index (WDI).*

4.0 Results and Discussion

This section is in four main sections namely, descriptive statistics, pre-diagnostic tests, model estimation results and discussion of findings, and post estimation tests. The original analysis results are provided in appendix 1- 7a-d.

4.1 Descriptive statistics

From table 4.1, the mean and the median are wide apart in all the variables, except for total revenue, TREV. The variables dispersed from the mean, as shown by the standard deviations. The range is large for each variable relative to size. The variables are positively skewed (greater than zero), except for real GDP growth rate, Y2; exchange rate and inflation, INF1 which are negatively skewed (less than zero). The variables GNIPC, UNEPR, GCFPGDP, Y2, ITV, FB2, TREV, and EPDS) showed leptokurtic distribution, as it displayed greater kurtosis than the usual + or -3 standard deviation from the mean that is predicted by the normal distribution (indicative of outliers – long tails). EXR, and INF1 were platokurtic as it displayed lesser kurtosis than the usual + or -3 standard deviation from the mean that is predicted by the normal distribution (indicative of outliers – low tails). Therefore, none is mesokurtic (the extreme values characteristic of the distribution are not similar to that of a normal distribution). Jacque-Bera statistics shows that the variables were not normally distributed given $p \leq 0.05$, except in the case of inflation, which was normally distributed with a

p≥0.05. Number of observations is 320, except for unepr and gcfpgdp that were 232 and 315 respectively. The total number of data point is 3,107.

Table 4.1: Descriptive Statistics - Franc Zone

	Y2	GNIPC	ITV	UNEPR	EXR	TREV	EPDS	FB2	INF1	GCFPGDP
Mean	2.14	577.31	4.15E+09	4.01	471.45	1.22E+09	2.63E+09	4.00	1.53	18.57
Median	2.64	485.00	1.96E+09	3.28	494.34	5.41E+08	1.44E+09	2.57	1.51	17.93
Maximum	3.58	2290.00	2.72E+10	11.71	732.4.0	9.01E+09	1.51E+10	19.77	3.06	48.39
Minimum	0.00	150.00	48274837	0.32	211.28	0.00	1.31E+08	1.26	0.04	3.15
Std. Dev.	1.06	363.88	5.26E+09	2.42	133.11	1.44E+09	2.97E+09	4.67	0.62	6.66
Skewness	-1.22	1.48	2.39	0.84	-0.19	2.32	2.09	2.61	-0.26	0.77
Kurtosis	2.96	5.85	9.28	3.32	2.18	9.99	6.50	8.02	2.91	4.43
Jarque-Bera	79.65	224.383	831.17	28.01	10.69	938.0187	394.5821	700.66	3.73	57.99
Probability	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.00
Sum	684.97	184740.0	1.33E+12	930.45	150864.7	3.90E+11	8.43E+11	1282.46	490.85	5851.10
Sum Sq. Dev.	358.97	42238089	8.82E+21	1355.53	5652442	6.60E+20	2.82E+21	6948.01	123.91	13908.88
Observations	320	320	320	232	320	320	320	320	320	315

Source: Authors' computations (2022)

4.2 Unit Root and Cointegration Tests

The unit root test results is tabulated in table 4.3. It revealed that real GDP growth rate, exchange rate, fiscal balance, inflation and gross capital formation as a percentage of GDP were stationary at levels while GNI per capita, international trade volume, unemployment rate, government revenue, and external public debt stock were integrated at first difference.

Table 4.3: Results of unit root tests for the Franc zone

Test Variable	**IPS (lag 1)** **H_0: All panels contains unit roots.** **H_1: Some panels are stationary.** **w-t-bar**		**ADF-FISHER (lag 1)** **H_0: All panels contains unit roots** **H_1: Some panels are stationary** **Z**		**Harris Tzavalis (HT) (demean trend)** **H_0: Panels contains unit roots** **H_1: Panels are stationary** **Z**		**Decision**
	Level	Δ	Level	Δ	Levels	Δ	-
y_2	-3.44*	-15.87*	-3.65*	-15.66*	-7.69*	-28.14*	I(0)
Gnipc	4.57	-5.90*	4.52	-7.21*	3.901	-63793*	I(1)
Itv	7.05	-8.93*	6.26	-94854*	0.30	-15.41*	I(1)
Unepr	-0.35	-4.29*	-0.27	-4.77*	4.22	-5.68*	I(1)
Exr	-1.37***	-9.19*	-1.43***	-9.83*	-19.54*	-18.98*	I(0)
Trev	7.14	-9.43*	5.06	-10.01*	0.44	-17.32*	I(1)
Epds	3.48	-5.73*	3.13	-6.18*	1.74	-19.13*	I(1)
fb_2	-7.05*	-15.72*	-7.62*	-15.59	-11.97*	-25.71*	I(0)
Inf_2	-.658*	-16.15*	-8.68*	-16.14*	-14.16*	-27.93*	I(0)
Gcfpgdp	-1.47***	-12.54*	-1.56***	-12.90*	-	-	I(0)

Legend: *is 1% ; ** is 5%, and *** is 10% level of significance.

Source: Authors' computations (2022)

4.4 Results of the MG, PMG, DFE-ARDL, Findings and Interpretations

This section gives the study results of MG-ARDL, PMG-ARDL and DFE ARDL estimation. Dynamic common correlation takes care of DV (I[0]) – IDV I(0) or I(1). However in a multi-model study for comparison of outcomes it becomes inevitable to apply the same estimation technique to the set of models in the study. These estimation techniques takes cognizance of cross-sectional heterogeneity filtering through the short run parameters and permits both long run and short run causality inferences to be elicited, not minding whether the variables are I(1) or I(0).

The Hausman test was used to test the null hypothesis (H_0) that both the MG and PMG are consistent, but MG is inefficient, and the alternate hypothesis, (H_a) that PMG is inconsistent. The Hausman tests showed a p-value greater than 5% in each of the four models estimated and hence, the null hypothesis could not be rejected which means the PMG is preferred. Relying on the values of the Akaike Information Criterion and Bayes Schwart Information Criterion, the PMG estimates were found preferred as well (see table 4.1 and appendix table 4.1 below), as against DFE estimates. Pesaran, Shin & Smith (1999) stated that the PMG estimator enhances parameters estimates efficiency as compared to the MG estimator in respect of the long run homogeneity.

With respect to post estimation tests conducted, from the Jacque Bera statistics and probability values, using the Breuch Godfrey LM Normality Test, the hypothesis of normal multivariate residuals or absence of serial autocorrelation up to order three, with a $p>0.05$, could not be rejected. Also, from the individual components Chi-sq statistic and probability values ($p>0.05$), the hypothesis of no VAR residual heteroskedasticity could not be rejected. Stability test Results for VAR using the Inverse Roots of AR Characteristic Polynomial indicates fulfillment of the stability conditions as each point lie within the circle. For these results, see the post estimation tests results attached for confirmation.

The long run and short run MG, PMG, DFE-ARDL results for the four models in the ECOWAS Franc zone is presented in table 4.1. It shows the error correction terms with the signs, magnitudes and levels of significance. The error correction terms of the poverty model, international trade volume model and unemployment model, using the PMG results, were close in magnitude, .11, .10 and .093 respectively, model 1 (economic growth model) error correction term was found to be large, being .61. The values of the error correction term for the four models were found to be positive, less than 1 and significant at the 5% level of significance for models 1, 2 and 3 as well as at 10% level of significance for model 4. Based on this result, in the case of shock or structural change, about 61%, 11%, 10% and 9% of the disequilibrium of model 1, model 2, model 3 and model 4 respectively diverge from rather than converge to the long run equilibrium.

The first model, the economic growth model parameter estimates reveals that in the short run, foreign exchange rate, central government tax and grant revenue, central government fiscal balance, inflation (real GDP deflator), external public debt stock, and gross capital formation as a percentage of GDP were not significant at the 5% level of significance: central government fiscal balance, inflation (real GDP deflator) were significant at the 10% level of significance. Based on the explanatory variables' coefficients, a 1% increase in the central government revenue, external public debt stock and gross capital formation as a percentage of GDP worsens the real GDP growth rate by 10.6%, 13 % and 1% respectively.

The economic implication of this finding is that central government tax revenue reflects the downward part of the U shaped Laffer curve that is theoretically associated with crowding out effect on investments with a corresponding negative impact on output. With respect to the external public debt stock negative impact on output, the theoretical neoclassical view is upheld while the Keynesian proposition of a positive impact and the Ricardian equivalence neutral effect notions failed to hold. In the case of gross capital formation, the negative impact could be a result of misapplication of funds.

Models 1 – 4

Table 4.3: Franc zone MG, PMG, DFE – ARDL model parameters estimates

Franc zone mg pmg dfe growth (y2) model estimates	Franc zone mg pmg dfe poverty (gnipc) model estimates	Franc zone mg pmg dfe international trade volume (itv) model estimates	Franc zone mg pmg dfe unemployment (unepr) model estimates
Variable mg pmg dfe	**Variable mg pmg dfe**	Variable mg pmg dfe	Variable mg pmg dfe
ec excr D1 .3.277e-17 .253 -.097 trev1 D1. -6.822e-17 .0452 -.294 fb4 D1. -5.171e-18 .0325 .050 inf2 D1. -1.266e-17 .0480 -.074 epd D1. -1.628e-17 .095 .3973 gcfpgdp D1. -1.114e-18 .0004 .0223	ec exr D1. -4.442e-17 -.215 .004 trev D1. -4.035e-24 .000* .000* inf2 D1. -9.789e-16 .625 -2.464 gcfpgdp D1. 2.988e16 5.815 -.612	ec excr D1. -4.863e-17 -.087 .043 trev1 D1. -3.259e-17 1.09*** .90*** fb4 D1. 2.183e-18 -.096 -.047 inf2 D1. 4.27e-19 -.907*** -.843** epd D1. -8.933e-18 -.442* -.274 gcfpgdp D1. 1.618e-18** .003 .005	ec exr D1. -2.415e-19 .001 -.010 trev D1. -.0 1.5e-09*** .000*** fb2 D1.1.180e-18* -.049*** .006 inf2 D1. 1.229e-17 -.05 2.670 epd D1. -1.258e-16 .223** -.927 gcfpgdp D1. -2.986e-18 -.011 -.087
SR ec 1*** .609*** .321*** excr D1. -3.277e-17 .095 .251 trev1 D1. 6.822e-17 -.106 -.046 fb4 D1. 5.171e-18 .032* .002 inf2 D1 1.266e-17 .150* .089 epd D1. 1.628e-17 -.133 -.104 gcfpgdp D1. 1.114e-18 -.007 -.008 _cons -7.644e-18 1.320*** .02	SR ec 1*** .105*** .028 exr D1. 4.442e 17 -.3*** -.27*** trev D1. 4.0e 24 .0** 2.3e-08* inf2 D1. 9.79e-16 -4.498* -2.596 gcfpgdp D1. -2.98e-16 3.11** 2.6*** _cons -2.6e15 -34.026* -3.392	SR ec 1*** .100*** .093*** excr D1. 4.86e-17 -.393** -.328*** trev1 D1. 3.26e-17 .208** .207*** fb4 D1. -2.18e-18 -.033 -.023 inf2 D1. -4.27e-19 -.006 -.015 epd D1. 8.93e-18 -.093 -.018 gcfpgdp D1.-1.62e-18** .014** .013*** _cons -6.1e-18 -1.01*** -.87*	SR Ec 1*** .093* .068** exr D1. 2.42e-19 -.001 -.0001 trev D1. 2.3e-26 4.1e-10* .000*** fb2 D1. -1.18e-18* -.013 -.008 inf2 D1. -1.229e-17 .132 .122 epd D1. 1.258e-16 -.373 -.11 gcfpgdp D1. 2.99e-18 -.035 -.028** _cons -8.24e-18 .241* -1.638

Legend: * p<.05; ** p<.01; *** p<.001. In each group, Hausman (1978) test result indicated PMG. Except in model 2, where dfe performed better judging by AIC and BIC values.
Source: Authors' computations (2022)

On the contrary, 1% increase in foreign exchange rate, central government fiscal balance and inflation rate improves economic growth by 9.4%, 3.2% and 15% respectively. While the signs of foreign exchange rate and central government fiscal balance coefficients conforms to *a priori* expectations through the export boost and import containment window as well as the fiscal surplus and deficit potentials on growth, the sign of the inflation coefficient negates the *a priori* expectation of dampening effect on growth. Impliedly, more inflation will bring about increase in economic growth of countries in this region. However, inflation and exchange rate have been relatively stable in countries in this region.

The second model shows the results of the effects of foreign exchange rate, central government total tax revenue, inflation and gross capital formation as a percentage of GDP on GNI per capita (poverty model). Central government fiscal balance and external public debt stock were removed from the model to eliminate multicollinearity problem. All other things being equal, a unit increase in exchange rate worsens GNI per capita at 1% level of significance by 29%; a percentage increase in central government tax revenue generates a 0.00000048% improvement in poverty measure, GNI per capita at the 5% level of significance; inflation dampens poverty level as high as 449% given a 1% increase in the former at 10% level of significance, and a 1% increase in gross capital formation as a percentage of GDP reduces poverty by as high as 311% at 5% level of significance.

In this case, the signs of the coefficients shows conformity with *a prior* expectations: rising exchange rate dampens disposable income per capita, application of tax revenue through income redistribution and other ways enhances disposable income per capita, inflation erode purchasing power of economic agents, and enhances disposable income.

Model 3 results indicate that exchange rate depreciation, inflation, fiscal balance and external public debt increase by 1% generates a corresponding 39%, 3.3%, 1% and 9.35% decrease respectively in international trade volume. By reverting to domestic products as alternatives to import where prices of imports become more expensive in the domestic market given foreign exchange rate increases, international trade volume falls. Note that most countries in the sub-region still remains largely import dependent, such that a little switch generates noticeable effects. The effect of inflation is understandable in the context of weakening effect on purchasing power while the negative sign on the external public debt stock factor could be explained by improvement in products production diversification in the domestic market with additional replacement and new investments, fulfilling the neoclassical behavioural expectation.

An equivalent rise in government total revenue and gross capital formation produces 21% and 1.4% improvement respectively. The implication of this is that there is absence of crowding out effect following rising government tax revenue and additional investments in capital assets is efficient.

On model 4, the study results confirms that raising foreign exchange rate, government fiscal balance, external public debt stock and gross capital formation reduces unemployment rate whereas increases in government total revenue and inflation raises unemployment rate. None of the six explanatory variables was found to be significant at the 5% level of significance. However, central government total revenue was significant at the 10% level. All the explanatory variables in this case show consistency with *a priori* expectations. In this model, government revenue exerts a crowding out effect on new investment, inflation raises the cost of labour (wages) and inputs, forcing down required man hours and workers. Although theoretically, the Phillips curve for industrial countries shows an inverse relationship between inflation and unemployment (as inflation increases, unemployment decreases) up to the 1960's, evidence from the 1970's and 1980's onwards have predicted an unstable relationship between the two variables. The literature on the relationship between exchange rate and unemployment shows divergent views, regardless of the level of development of countries studied.

The paper also takes a look at comparative analysis between countries in the Franc zone and gives a summary of the major findings.

5.0 Comparative Analysis between Franc Zone Countries

In order to underscore the similarities and differences between the countries in the zones, table 4.5 below in which models 1 to 4 short run and long run PMG-ARDL results of individual countries (see Appendix 4.1) were paired and assessed was created with a view to verify the currency convergence symmetry. In the consideration, the sign, not necessarily the level of significance and magnitude of the estimated coefficients were paramount as it points to equivalence in the direction of impact arising from shocks, whether induced or extemporaneous. This was viewed pertinent to malleability of central control or management by a single monetary authority and/or political authority over a number of countries within the ECOWAS Franc zone.

In order to facilitate readers' easy understanding of Appendix 4.1 below, it was considered necessary to provide further legend depicted in Table 4.5 below which links the id-codes to the associated countries in the zone and was used jointly with the legend provided under Table 4.7. Table 4.7 pairs countries studied based on similarity in exchange rate and inflation coefficients symmetry.

Table 4.5: Legend for country codes used in the study

Country code	**Franc zone country**
id_1	Benin
id_2	Burkina faso
id_3	Cote D'Ivoire
id-4	Guinea-Bissau
id_5	Mali
id_6	Niger
id_7	Senegal
id_8	Togo

Table 4.7: ECOWAS Franc Zone countries grouped on exchange rate and inflation asymmetry/symmetry

Model 1		**Model 2**	
Green:	Blue: Benin and Niger.	Green: Benin, Burkina-Faso, Cote-D'Ivoire, Guinea-Bissau, Mali and Senegal.	Blue: Togo and Niger.
Red: Cote D' Ivoire, Senegal, Togo and Guinea-Bisasau	Brown: Burkina Faso and Mali	Red: -	Brown: -
Green: Benin, Burkina-Faso, Cote-D'Ivoire and Mali.	Blue: Niger, Senegal and Togo	Green: Guinea-Bissau	Blue: Benin, Cote-D'Ivoire, Niger and Senegal
Red: Guinea-Bissau.	Brown:	Red:	Brown: Burkina-Faso, Mali and Togo

Model 3	**Model 4**

Source: Authors' computations (2022)

From table 4.13 above, the paper found that at no point, based on the four models used in this study taken jointly, is any uniformity found amongst countries in the ECOWAS sub regional in support of currency union. However, were a choice to be made to apply any of the four models in the determination of single currency feasibility amongst the countries from the options provided in table 4.13 which is based on exchange rate and inflation symmetry, analogous to the impossible-trinity, often referred to as the Mundell-Fleming trilemma, model 2 (the poverty model) provides a parsimonious decision.

5.1 Summary of Finding, Conclusion and Recommendations

For the franc zone, the error correction terms of the output model, poverty model, international trade volume model and unemployment model, using the PMG results, were found to be 0.61, 0.11, 0.10 and 0.093 respectively. Based on this result, in the case of shock or structural change, about 61%, 11%, 10% and 9% of the disequilibrium of these models respectively diverged from rather than converge to the long run equilibrium. It was significant at 5% level for the output, poverty and international trade volume and unemployment models. For the output model, in the short run, of the EXR, TREV, FB4, INF2, EPDS, and GCF explanatory variables only FB4 and INF2 were significant at the 5% level. However, the coefficients were 0.09, -0.11, 0.02, 0.15, -0.13 and -0.01 respectively. For the poverty model, in the short run, of the EXR, TREV, INF2 and GCF explanatory variables, only EXR and INF2 were significant at the 5% level. However the coefficients were -33.94, -1.75. -24.05 and 0.43 respectively.

For the international trade volume model, in the short run, of the EXR, TREV, FB4, INF2, EPDS, and GCF explanatory variables, only GCF was significant at the 5% level. However, the coefficients were -0.39, 0.21, -0.03, -0.01, -0.09 and 0.01 respectively. For the unemployment model, in the short run, of the EXR, TREV, FB4, INF2, EPDS, and GCF explanatory variables, only TREV was significant at the 5% level. However, the coefficients were -0.0005, 0.00, -0.01, 0.13, -037 and -0.04 respectively.

Based on the individual short run parameter estimates and the Mundell-Fleming "trilemma", the zone does not satisfy OCA requirements. While the poverty model portrays two OCA groups in the region, the output, international trade and unemployment models depicts four OCA groups each.

In ex-raying the macroeconomic fundamentals bothering on single currency, output growth, poverty, international trade and unemployment were the chosen outcomes in this study. Existence of room for gains and losses was found in the region, as it could be under similar circumstances elsewhere in the world. America and European Union have leveraged on economic and political wealth to arrange bedrock of speedy fiscal responses to resource gaps in its states in steadying the course of monetary policy and other extraneous effects on output, people's wellbeing, trade and unemployment. Evidences from this study could help government leaders/technocrats and business leaders in the region to marshal appropriate initiatives to narrow the level and effects of observed asymmetries.

The study emphasizes the need for leaders in the respective countries to monitor and evolve monetary and fiscal policies to reduce observed asymmetry of these explanatory factors to economic growth. Policy makers should pay close attention to fiscal balance and inflation due to its significant impact on output. On poverty, more policy efforts should be exacted to address inflation and exchange rate asymmetry due to its significant effect on economic growth. In addition, increasing the gross capital formation or investment would enhance international trade expansion in the zone. The study

also recommends that raising government tax and grant revenue could help expand infrastructure and reduce unemployment in the short run. Following from '5' above, the mono-product nature of most national economic region requires diversification to increase economic activities, promote trade, and reduce incidences of poverty and unemployment.

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