Are Inflation differentials converging or diverging in the WAMZ region? Evidence from First and Second Generation Panel Unit Root Analysis.

By

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Abstract

Inflation convergence is a crucial prerequisite for the formation and establishment of a monetary union. Over the years, it has been relatively complex for nations to form a monetary union in the West African Monetary Zone (WAMZ) area. There have been numerous studies on inflation convergence, in various monetary unions around the world but none has been discussed in the WAMZ region as extensively as it is discussed in this study. Hence the motivation of this study. On this premise, the study ascertains whether there is inflation convergence in the region. The study utilizes first and second generation unit root tests to ascertain inflation convergence in the region. Our results revealed that there is significant evidence of inflation divergence in the region, using the first and second generations of the panel unit root test. These interesting findings suggest that the West African Monetary Zone doesn't yet have sufficient criteria for take-off or its formation.

1. Introduction

The creation of an economic and monetary union amongst its member nations has always been ECOWAS's long-term goal. The main goals were to promote political collaboration and hasten the development of economic integration. As a result, on December 15, 2000, the West African Monetary Zone (WAMZ), a second monetary zone with five prospective member countries, was created. (The Gambia, Ghana, Nigeria, Guinea and Sierra Leone). A successful WAMZ, according to the idea, would make it easier to join forces with the CFA zone to form the West African Economic and Monetary Union (WAEMU), which would then usher in the ECOWAS unified currency, known as the eco. The currency eco will take the place of the five member countries' national currencies.

In 2002 a mid-term assessment was carried out and it revealed that most member countries didn't have enough support to take off the monetary union by January 2003, despite having some notable achievements. The main issue was that not all member nations were sufficiently committed to back the course with concrete actions. In order for the shared Central Bank and the common currency to launch in July 2005, the WAMZ program was further extended until June 2005. The global financial and economic crisis of 2008/2009, which made it difficult for member countries to achieve the convergence criteria both individually and collectively, was one of many factors that contributed to the postponement of kick off (Mogaji, 2014).

In order to create a single currency union, member countries must first manage to attain comparable levels of inflation, interest rates, and sustainable budget deficits. Macroeconomic policy convergence is a prerequisite for this to happen. Saka, Onafowokan, and Adebayo (2015). So many debates on heterogeneity and macroeconomic disparities within the ECOWAS has been triggered by the launch of the process of monetary integration within the region. Inflation convergence happens to be one of the major criteria for the establishment of a single currency and a monetary union. The idea is that is that inflation must be converging for there to be a formation of a monetary union and this forms the basis of this paper, which is to determine whether inflation are converging or diverging in the WAMZ region. To the best of our knowledge, there is very limited study of inflation differentials in the region and this gives us a motivation for this study.

There has been various studies on convergence in different monetary zones across the world and the results show varying outcome about inflation convergence in the various zones. Nkwatoh (2018), asserts that there is no convergence in the ECOWAS countries because none of them matched the macroeconomic convergence criterion. According to the same analysis, convergence requirements are still insufficient and irrelevant to the establishment of a monetary union, even though they might provide regional macroeconomic stability. The study's author go on to argue that the amount of macroeconomic convergence in the region still lags behind the goals that member states set for it.

Haug, Mackinnon, and Michelis (2000) also demonstrated that the convergence criterion may not be a viable yardstick to measure the preparation of nations attempting to join a monetary union, supporting the reasons made by Nkwatoh (2018). The main problem is that no one nation has ever satisfied all prerequisites before the creation of a monetary union. This is strongly supported by

the fact that they looked into a few European countries in the Europe region. Not every one of the 12 nations that were examined in this area met the Maastricht standards necessary to establish the monetary union for the Euro zone.

Balogun (2015) in studying inflationary differentials among WAMZ member countries, found single digit of unweight average regional inflation rates and these vary widely amongst them. The results show divergence of major monetary policy instruments, distorted interest rates, exchange rate overvaluation and expansionary monetary policies. Mensah (2015) bases his argument on the Optimum Currency Area and analyzes trade inside the WAMZ as well as trade between the WAMZ and other nations in Europe, West Africa, and Asia (OCA). Using inflation, real GDP growth rate, and monetary policy rate, the study, which covered five nations in the region, discovered substantial evidence against trade symmetry in the WAMZ and some indications of marginal convergence. According to the report, trade in the region is still very low, and the partial convergence is due to the convergence criteria that were used as a criterion for union membership.

By separating the CFA zone into two homogenous panels based on the CEMAC and UEMOA regions, Asongu (2013) examined a sample of 11 Central and West African countries, contrary to the assumption given above. They used the system GMM technique to select their variables, which was based on two important facts: real economic policies aimed at achieving macroeconomic performance through GDP growth and monetary policies aimed at preventing inflation and enhancing the financial intermediary of money supply and liquid liabilities. According to their conclusions, there should be unconditional convergence throughout the CEMAC zone rather than any form of convergence.

In six (6) West African nations that make up the West African Monetary Zone, Gyamfi, Adam, and Appiah (2019) looked at the convergence of inflation and exchange rates (WAMZ). The consumer price index (CPI), a proxy for monthly inflation data, and nominal exchange rates with the US dollar for the six nations were used in the research. A non-parametric rank and score test was used. The nominal exchange rate's data ranged from 1985M01 to 2017M05, whereas the CPI's data ranged from 2006M01 to 2017M05. The findings indicate that the nominal exchange rates and CPI of Nigeria, which is regarded as the region's largest economy in terms of GDP per capita,

are catching up to those of the Gambia, Ghana, Guinea, Liberia, and Sierra Leone. This means that, if the necessary will and support would be given to its implementation by the individual governments of these countries, the countries in the zone are integrated and prepared for the adoption of the common currency ECO.

Using annual time data for the years 1980 to 2013, Cham, T. (2016) looks into the connections between monetary integration, FDI, and commerce in the West African Monetary Zone (WAMZ). It also looks at the complementarity and substitutability of trade and FDI. The application of several econometric models, such as Ordinary Least Squares (OLS) and fully-modified OLS (FMOLS). Our empirical findings demonstrated that monetary integration has a favorable impact on FDI flows into the WAMZ. The results also imply that while real GDP, a sizable population, and a greater distance all favorably affect FDI flows, a low economic freedom index has a detrimental effect on FDI flows into the zone. The findings back up the claim that monetary unification has a favorable impact on trade. Our empirical results are consistent with the idea that trade and FDI are complimentary. The outcomes are consistent with those of past studies. As a result, any policy that encourages commerce, like monetary integration, also increases FDI inflows. The results provide viewpoints and information for a new policy in WAMZ economies' pursuit of sustainable economic growth.

The degree of cooperation between the fiscal and monetary authorities in the WAMZ countries is examined by Abu, Momodu, Mohamed, and Christian (2013) along with its implications for meeting the inflation and fiscal deficit criteria. The study uses the Set Theoretic Approach (STA) and vector autoregressive (VAR) modelling to determine the level of policy coordination in the Zone in order to meet this goal. For the empirical analysis, annual data from 1980 to 2011 was used. When shocks to policy goals result in sensible policy responses, coordination is said to occur

under the STA. The VAR uses impulse responses of fiscal and monetary policy variables to changes in inflation, output gap, and exchange rate to assess the degree of coordination. The findings show that all of the WAMZ countries had poor policy coordination during the time, which contributed to non-compliance with the inflation and fiscal deficit criteria. The Gambia received a coordination score of 46.6 percent, followed by Ghana (34.5), Guinea (31.8), Liberia (37.9), Nigeria (46.6), and Sierra Leone. The results of the set theoretic models suggest that explicit policy coordination scores in the WAMZ countries are less than 50.0 percent (41.3). Additionally, the fiscal authorities in the WAMZ countries typically adopt policies that are less conservative than the monetary authorities, with the exception of Guinea, where the two are equally prudent. The results of the impulse response also show a lack of strong reaction to shocks brought on by various variables. The variables' convergence to their long-run equilibrium path takes a considerable amount of time. The main advice is for WAMZ countries to improve policy coordination by setting up formal coordination platforms and institutional frameworks for timely and adequate statistics, binding commitments, and efficient monitoring and assessment of policy outcomes.

2. Methods

2.1 Data Source

Data was sourced from the World Development Indicators (2021), and the International Financial Statistics (2021) databases. The study adopted a quarterly time series data from 2000Q1 to 2020Q4. The choice of the year (2000) is as a result of the time when the WAMZ union was formed and the end year (2020) is as a result of the latest data year obtained as at the time of the research. The data used for the analysis was transformed from annual time series to quarterly series from 2000Q1 to 2020Q4. By transforming the yearly time series data into the quarterly series using the maximum observations, the annual time series data were transformed using the quadratic matching technique. The quadratic average matching method employs a local quadratic

interpolation of the low frequency data to fill in the high observations. Table 2.1 represents the definition of the variables employed in the analysis.

Table 2.1. Description of Variables

Variable	Description	Data Source
Broad Money (bmoney)	This variable measures the total volume of money supply in the economy and it captures narrow money plus savings and time deposits with banks of all the countries in the monetary zone, including foreign deposits.	World Development Indicator (2021)
Consumer Price Index (Inflation)	This variable measures the estimated price changes of a basket of goods and services in any economy. It act as a representative of consumption expenditure in an economy. It was used as a proxy for inflation rate for all the countries. The study used IFS (2021) because data for all the countries were found there.	International Financial Statistics (2021)
Interest Rate	This variable, which is frequently established by the Central Bank of any nation, gauges the part of a loan that the borrower is charged as interest. A yearly percentage of the outstanding debt is typically used to indicate it.	World Development Indicator (2021)
Exchange Rate	This variable measures the value of a country's currency for the purpose of conversion to another.	World Development Indicator (2021)
Real Gross Domestic Product	This variable measures the value of all goods and services produced in	World Development Indicator (2021)

an economy in a particular year that is adjusted for inflation. It is usually represented annual in most of the data bases.

3. Model Specification

The panel unit root tests will be carried out in two different groups that is the first and second generation panel unit root tests. In the first generation test, all cross-sections are assumed to be independent, while the second generation test will allow for cross-sectional dependences. The reason for this grouping is to show accurately the difference in inflation convergence or not. For the first generation unit root test, the Levin and Lin (2002) was adopted. This test considers a model with individual effects, no time trend and coefficients of the lagged dependent variable is assumed to be homogenous across all units of the panel.

$$\Delta y_{i,t} = \alpha_i + \rho y_{i,t-1} + \sum_{z=1}^{pi} \beta_{i,z} \Delta y_{i,t-z} + \varepsilon_{i,t}$$

Where i= 1,….N and t=1,…T. The errors are identically independently dependent with a mean zero and a constant variance and are all assumed to be independent across cross sections of the sample. In testing for inflation convergence hypothesis, the Levin Lin alternative restricts every country in the sample to converge at the same rate. Christophe Hurlin & Valerie Mignon (2007) however noted that it is of importance to note that the use of a pooled estimator, even if genuine DGP is heterogeneous, doesn't imply that unit root is not consistent.

The second generation test is based on cross-sectional independence assumption. This test is rightly put by Im, Pesaran and Shin (2003). Contrary to Levin Lin, the test allows for heterogeneity in the value for pi under the alternative hypothesis.

$$\Delta y_{i,t} = \alpha_i + \rho y_{i,t-1} + \sum_{z=1}^{pi} \beta_{i,z} \Delta y_{i,t-z} + \varepsilon_{i,t}$$

The alternative hypothesis under this test allows for some (but not all) of the individual series to have unit roots. Unlike the first generation test by Levin Lin, the second generation test by Im,

Pesaran and Shin use separate unit root tests for the various cross-section units. This test is based on the augmented dickey-fuller statistics average across groups. The IPS statistics can be represented as:

$$t_{\_barNT} = \frac{1}{N}\sum_{i=1}^{N} t_{iT}(pi_{\beta i})$$

As T tends to infinity, each individual statistic $t_{iT}(pi_{\beta i})$ converges to the Dickey-Fuller distribution and are independently and identically distributed.

4. Results

To examine whether there is inflation convergence as a result of policy coordination, the first and second generations panel unit root test were adopted. To achieve this goal, the study examine inflation differentials among the countries in the WAMZ region. The first generation panel unit root test makes the assumption that each cross section is independent. While the panel unit root test of the second generation takes into account cross-sectional dependence. The sample 2000Q1–2020Q4 was utilized for the panel unit root tests for the first generation. According to the homogeneous assumption, the test created by Levin, Li, and Chu (2002) accurately simulates all cross-sections being independent.

Table 4.1 shows results of the Levin, Lin & Chu (2002) approach with common unit root process. The LLC test fails to reject the null hypothesis of unit root, thus suggesting that there is no evidence of inflation convergence in the WAMZ region. The homogeneity assumption of independent cross sections, however, appears to be quite constrictive because in many empirical cases, this is not actually the case. These results differ from those of Dirdi et al. (2017), who used a similar method of first and second generation panel unit root test analysis to find inflation convergence in five East African countries.

Table 4.1 First Generation Panel Unit Root Test for Inflation Convergence

Method (Common Unit Root Process)	Statistic	Prob.**
Levin, Lin, & Chu	1.86948	0.9692

Source: author's computation.

Table 4.2 Second Generation Panel Unit Root Test for Inflation Convergence

Bai and Ng (2004) PANIC

Variable	Number of Common Factors	Idiosyncratic Shocks		Common Trends	
		Value	Prob.	Value	Prob.
CPI (Inflation)	5	-0.1253	0.9002	3.1026	0.9999

Pesaran CIPS

Variable	Level of sign.	CIPS-t-stat	Critical values	Prob.
CPI (Inflation)	1%	-2.04289	-2.54	0.10
	5%	-2.04289	-2.33	0.10
	10%	-2.04289	-2.21	0.10

Source: author's computation. CIPS represents Pesaran (2007) test of the individually cross-sectionally augmented ADF statistics mean of the optimal lag length one for the various level of significance.

5. Discussion

The study therefore adopted the second generation panel unit root test to ascertain inflation convergence in the region. The introduction of the second generation panel unit root test relaxes the assumption of independence. Hence, all cross sections are assumed to be dependent as this is the case in reality. To examine inflation convergence from this angle, the Bai and Ng PANIC (2004), and Pesaran (2007) were adopted and the results are presented in table 4.8.

Table 4.2 shows results of the second generation panel unit root test for both the Bai and Ng (2004) and the Pesaran (2007) test. For the Bai and Ng (2004), the PANIC approach was adopted to test for inflation convergence in the region. The test decomposes the inflation data into two common components, the idiosyncratic and the common trends and then conducts the panel unit root tests for each of these components. The results in both components in table 4.2 suggests the presence of a unit root in units in the panel. This means that we fail to reject the null hypothesis of a unit

root in inflation differentials in country-specific factors in the region. In essence, the results suggests that there are no inflation convergence in the WAMZ region. This conclusion is drawn from the fact that both the idiosyncratic shock component and the common trend components fail to reject the null hypothesis of a unit root. Hence, inflation differentials in this region are not converging (pervasive divergence). The Pesaran (2007) test was run using the CIPS technique to further verify the findings, and the outcomes are also shown in table 4.2. As the CIPS test statistic is smaller than the crucial CIPS value (-2.04289-2.33) at the 5% level of significance, the results show that we are unable to rule out the null hypothesis of a unit root. This further suggests that there is a pervasive divergence of inflation differentials in the WAMZ region. This findings lends credence to that of Fabio et. al, (2006); Jerome Creel & Jacques Le Cacheux, (2003); Patrick H & Philip R. Lane (2014).

6. Conclusion and Recommendation

In conclusion, all of the panel unit root's first and second generation results point to a pervasive divergence in inflation rates among the six WAMZ countries. In other words, the WAMZ region's inflation rates appear to diverge, and the consistency throughout the experiments supports the validity of this finding. First and second generations panel unit root test suggest inflation differentials are diverging pervasively, hence there is no inflation convergence in the WAMZ region. This means that there are not enough criteria for WAMZ take off for countries in the region. This is because inflation must be converging to give enough room for the creation of single currency in the region, which is one of the criteria for take-off.

Various studies on inflation convergence found inflation differentials to be converging in different monetary regions of the world with different econometric methods. However, the evidence from this study points towards a pervasive divergence in inflation differentials in the WAMZ region using the approach of Pesaran (2007) and Bai and Ng (2004) of the first and second generational panel unit root test. This is a remarkable contribution to existing literature for inflation divergence in the WAMZ region.

It is recommended that the monetary policy committee members of the region will have to strengthen traditional channels for inflation convergence such as labour mobility and wage flexibility amongst countries in the zone. This will in turn bring about inflation convergence which is a necessary condition for the adoption of a single currency to be established in the region.

Declarations

All authors have declared their contributions in developing the manuscript and therefore are in agreement with the submission of this manuscript.

Availability of data and material

The data and materials used in developing this manuscript are readily available.

Competing Interests

There is no conflict of interest whatsoever among authors.

Funding

There is no funding received to the development of this manuscript.

Acknowledgements

I wish to thank everyone at the Department of Economics, University of Nigeria Nsukka for their valuable contributions towards the development of my PHD thesis in which part of this article was published.

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