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MACRO-ECONOMIC INSTABILITY AND INCOME INEQUALITY: A COMPARATIVE STUDY OF NIGERIA AND GHANA

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Abstract

This study examined the relationship between macro-economic instability and income inequality in Nigeria and Ghana. The study covered the period between 1980 and 2016. Data for the study were sourced from the Standardized World Income Inequality Data Base (SWIID), World Bank Online Data Base and Central Bank of Nigeria and Ghana. The study period covered the period between 1980 and 2016 which was contingent upon availability of data from reliable sources. The length of the period enabled the study to take into consideration changes in macroeconomic variables as a result of various policies introduced by Nigerian and Ghanaian governments to reduced income disparity and to stabilize macroeconomic policies. The study employed trend analysis, Autoregressive Distributive Lag Model (ARDL) within an Error Correction Model (ECM) framework, and Autoregressive Conditional Heteroscedasticity (GARCH) as the estimation techniques. The result from the trend analysis revealed the existence of instability in the level of income inequality in the two countries. The result further established by the decision criteria of Autoregressive Conditional Heteroscedasticity (GARCH) which favoured the existence of instability in the macro-economic variables of both countries.

This study also found evidence of long run relationship between the dependent variable (GINI) and independent variables (Macro-Economic Variables) for both countries. The short run relationship was achieved by estimating an Error Correction Model (ECM). For the long-run analysis, the study found different long-run results in the two countries. While the result of Nigeria showed positive relationship between macro-economic variables and income inequality that of Ghana showed negative relationship. Based on these findings, the study recommends that the government and private sectors should collaborate to enhance growth and sustain development in order to reduce income inequality.

Keywords: Income Inequality, Macro-Economic Instability, GARCH, ARDL

INTRODUCTION

The concept of income inequality has become a perennial and persisting issue all over the world because no nation either developed or developing is immured against inequality. Although, its magnitude in the developed countries differs when compare its extent in the developing countries. Inequality is very pronounced in developing countries, this gives reason why continuous widen income gap in these countries remain a hot debate not just among the government official but remained one of the issue bordering every citizen of these countries. The gap between the elite and ordinary labour can be seen all too clearly with the high standard of living juxtaposed amongst the squalor of the many (UNDP, 2013).

In Nigeria for instance, despite various government programmes in curbing poverty and bridging income gap between rich and poor such as National Directorate of Employment (NDE), the Family Support Programme (FSP), National Agricultural Land Development Agency (NALDA), Directorate for Food, Roads and Rural Infrastructure (DFRRI), Family Economic Advancement Programme (FEAP), National Poverty Eradication Programme (NAPEP) and Structural Adjustment Programme (SAP) among others, that stressed greater realization of the need for policies and programmes to alleviate poverty, bridge income gap and provide safety nets for the poor; The slogan that the rich becomes richer and poor becomes poorer is still manifest in every area of these countries (IMF, 2016).

Income inequality in these two countries (Nigeria and Ghana) is so deeply rooted into every area of the countries that many have become desensitized to the problem and lost sight of its genesis. The disparity in income is as a result of a segmented labour market (into the formal and informal sector). Such segmentation also has its roots in the ailing public education system. The direct relationship between educational level, skill, and income follows the basic

principles of demand and supply; as there is a low supply of skilled workers relative to unskilled workers, the price for skilled workers, i.e. wages, are relatively high. “The gap is further exacerbated by the unavailability of jobs and the inaccessibility of credit and financing. Thus, those in the lower class have limited opportunities in getting a part-time job or a loan to help provide the funds needed to finance their educational or vocational training.

Furthermore, despite the fact that significant improvement has been recorded in term of macroeconomic performance in oil exporting countries in Africa (Nigeria and Ghana not in exception) before the recent oil price shocks of 2014, yet this has not translated into reduction in income disparity. It is however, required to know the relationship between macroeconomic instability and income inequality and efforts taken so far by these two largest economies in West Africa sub-region to reduce income inequality in order to improve standard of living of their citizenry.

Macroeconomic stability is required in the process of reducing income disparity and absolute poverty. This is because little or no progress can be achieved in reducing income disparity in the face of macroeconomics instability and fluctuation. (Addison and Cornia, 2001).

The effects of macro-economic variables on inequality is ambiguous as the quantitative importance of different transmission channels can result into an increase or a decrease in the level of income inequality. Take for example, expansionary monetary policy which is one of the components of macro-economic variables can increase income inequality by boosting asset prices and inflation in the first case, however, the effects may depend on the composition of household income and the impact of monetary policy on different asset prices. Top income household receiving higher shares of financial income than low income households tend to benefit more. From another view, expansionary monetary policy increases income inequality through higher inflation as low income households relying primarily on labour earning hold more liquid asset than high income ones. At the same time, there are other transmission channels that would predict that expansionary monetary policy can reduce income inequality. Also, expansionary fiscal policy can reduce inequality through saving redistribution as an unexpected decrease in policy rates will benefit borrower (those with less wealth) and hurt savers. (Doepke and Schneider, 2006) as cited by (David and Sanchez, 2014). Secondly, since labour earning at the bottom of the distribution is the most affected by changes in economic activity. (Heathcote, 2010), a decrease or increase in monetary policy rates would lead to a decline in the level of income inequality. The income inequality and macro-economic instability relationship in Nigeria and Ghana seem to contradict the claim of both theoretical and empirical literature which associates macro-economic stability with low income disparity (Heathcote, 2010).

Several studies have been conducted not only among economists but also among sociologists, demographers, and agriculturists to examine the causal link between income inequality and poverty both in developed and developing nations (Ogundana, 2012), (Aboyade, 1985), (World Bank, 2004) and several others. However, little or no studies have been conducted especially in Nigeria and Ghana to examine the relationship between macroeconomic instability and income disparity. Even findings from the available studies such as (Le, 2008)), (Alesina and Perotti, 1996) and (Aboyade, 2000) generated a conflict results. Most of these studies showed that higher economic growth is associated with lower income inequality. But in Nigeria and Ghana, what both countries experienced most times is higher growth rate with higher level of income disparity.

The broad objective of this study is to examine the relationship between macro-economic instability and income inequality a comparative study of Nigeria and Ghana.

LITERATURE REVIEW

Studies have been conducted on the relationship between income inequality and macro-economic variables. However, some of these studies are presented to guide and provide foundation for the model of this study.

(Shorrocks, 1983**)** examined the relative influence of income components and evaluates the performance of different decomposition rules in the United States of America. The study used US panel data consisting of 2755 households observed for 1967-76 and employed Gini coefficient to decompose income inequality. Findings from the study showed a fair but far from identical degree of correspondence between the inequality contribution and income share of each factor component. In another study, (Bouillon et.al, 2001) used a simulation empirical framework to identify the contribution of microeconomic factors to increasing income inequality in Mexico in 1984 and 1994. Results showed that changes in returns to household characteristics, in particular changes to education are responsible for about 50 percent increase in Gini-coefficients. The deteriorating conditions in rural areas relative to the urban areas and of the southern region relative to other regions account for another 25 percent increase in the Gini. Using Romania data, (Molnar, 2011), analysed the income inequality in Romania, using a set of indicators among which Kuznets index, Gini coefficient, Éltetö-Frigyes indices, Theil index, Atkinson index. She concluded that income gaps between different categories of households have increased between 1995 and 2008, and that, the income distribution in Romania is marked by the general low income level and a relatively high and increasing inequality. In same line of study, (Precupețu, 2013), using NIS and EUROSTAT data of Romania, and using relative and absolute measures of poverty, analyzes three levels of inequality: income, labour market and

education inequality. The conclusion was that in Romania there has been a growing process of inequality and risk of poverty between individuals and households between regions and between ethnical groups as well.

(Anyanwu, 2016) analyzed the principal drivers of market income inequality in Southern African. The study employed dynamic system GMM estimation procedure. His finding showed strong support for a dynamic, non-monotonic, inverted U-shaped, effects of inequality in the model. His finding further revealed the evidence of existence of the Kuznets curve in the sub-region. Also, adopting a Gini decomposition, (Piesse and Thirtle, 1998) analysed the effects of crop, animal and non-farm income on the distribution of total income in the communal lands in Zimbabwe. His results showed that non-farm income decreases inequality in Chiweshe, which is near Harare. Particularly, a substantial part of reduction in equality arises from greater non-farm incomes at the bottom of the scale, so poverty is reduced by access to alternative income sources. In almost same line of study, (Ferreira 1996) found that during the period of structural adjustment in Tanzania, there was a reduction in poverty but income inequality increased between 1983 and 1991 in the rural area. (Elbers et.al, 2003) **a**nalysed micro-level estimation of poverty and inequality in Ecuador, Mozambique and Madagascar, based on the statistical procedure that combined household survey data with population census data. The result showed that the share of within-community inequality in overall inequality was high. Still on the same line of study, (Adams, 1999) analysed the impact of nonfarm income on income inequality in rural Egypt, using household-level data from a nationally representative survey. The decomposition was done using total rural income among five sources of income, which were nonfarm, agricultural, livestock, rental and transfer. The analysis showed that while nonfarm income represents the most important inequality-decreasing source of income, agricultural income represents the most important inequality-increasing source of income.

(Mthuli, Anyanwu and Hausken, 2013) studied the patterns of growth and income inequality in the MENA region between 1985 and 2009. Their empirical results showed that income inequality reduces economic growth and increases poverty in the region. In another cross country study, (World Bank, 2003) showed that in 1996/97; Gini index for Nigeria was 0.506, while Ghana and Cameroon have 0.407 and 0.477 respectively. Using 1998 data, (World Bank, 2003) also estimated Gini-indices of 0.613 and 0.526 for Central African Republic and Zambia respectively. From all these studies, it can be deduced that income inequality is high in many African nations.

(Tanimu and Saifullahi, 2014) studied the relationship between poverty, inequality and economic growth in Nigeria using bound testing approach to cointegration and Granger causality test to determine among poverty, inequality and economic growth in Nigeria. Time

series data were used in the study between 2000 and 2012. Their result showed that there was a unidirectional causal relationship running from RGDP to poverty and inequality, which means that an increase in GDP in Nigeria caused high level of poverty and also created inequality between the rich and the poor. In the same line of study (Aigbokhan, 2008) studied growth, inequality and poverty from 1960-2004 using descriptive analysis and multiple regression as estimated techniques, results showed that growth component did not change much for depth poverty or poverty gap(p1) and the severity of poverty P2 measures while the decomposition analysis further buttressed the view that the distribution of income and pro-poor growth is essential for strong growth to translate into rapid poverty reduction.

(Adigun, 2011) analyzed income growth and inequality elasticities of poverty in Nigeria over a period of time, using the secondary data obtained from National Consumer Survey of 1996 and 2003/2004 Nigeria Living Standard Survey. The study used changes in mean per capita expenditure as a yardstick of economic growth and adopts simple but powerful ratio estimates of Economic Growth and Inequality elasticities of poverty. The result showed that 1 percent increase in income growth leads to 0.624 percent reduction in poverty. The inequality elasticity of poverty shows that a decrease of inequality by 1 percent decreased poverty by just 0.34 percent. (Bernardin, 2007) examined the effects of non-farm income on income inequality in rural Ghana using the secondary data from national representative household survey data of 2006. The study employed Gini-decomposition technique. The results indicated that aggregate non-farm income increased income inequality among rural households in Ghana. In terms of its components, while non-farm self-employment income reduced income inequality, non-farm wage income increased income inequality. A factor-decomposition of inequality revealed that education is the single most important variable contributing to the inequality-increasing nature of non-farm income. (Genevieve and Novignon, 2013), decomposed income inequality across various household income components and estimated the marginal effects of changes in income components on overall income inequality in Ghana. A Gini decomposition procedure was applied to the fifth and sixth rounds of the Ghana Living Standards Surveys. Their results suggested that, in general, income inequality has increased marginally over the years (Gini coefficient of 0.66 in 2013 and 0.62 in 2006). Inequality was, however, higher in urban areas than in rural areas in 2013 with a reverse situation observed in 2006. (Appiah-Kubi,2007) studied multi-dimensional analysis of poverty in Ghana using fuzzy-set theory to compare levels of deprivation in Ghana between 1991 and 1999 using micro-data on poverty line, qualitative and quantitative indicators such as housing conditions, possession of durable goods, equivalent disposable income, equivalent expenditure and some composite human welfare measures. He concluded that the deprivation trend revealed that poverty level scarcely changed in Ghana and

that it even rose slightly in the 1990s contrary to one-dimensional analysis presented by GLLS 4 report in Ghana. (Bhasin and Obeng, 2007) studied trade liberalization, foreign aid, poverty and income distributions of household in Ghana using computable general equilibrium (CGE) model. Finding from this study showed that the elimination of trade related import duties and export duties accompanied by an increase in foreign aid reduces the incidence, depth and severity of poverty on all categories of households. They showed that the income distribution of agriculture households and non- working improved to a large extent when trade related export duties are eliminated in comparison to import duties which are accompanied by increase in foreign aid. (Oduro and Osei-Akoto,2007) studied the relationship between market participation, income redistribution and poverty in the era of economic globalization using four communities, Bom, Kofikromi, Kasic and Kpikpira representing the three ecological zones in Ghana. The study employed pilot tested survey instrument as estimation technique. Findings from the study revealed that rural link with the national and the world economy depend on the quantity and quantum of human capital and skills, physical infrastructure, basic services and utility.

In summary, from the review of empirical literature, the studies on macroeconomic instability and income inequality have always been important ones in the developing countries such as Nigeria, Ghana, and it generates lots of debates not just among economists but also among the policy makers on whether the relationship between economic growth and inequality is positive or negative. Moreover, the theoretical arguments of the relationship between macro-economic growth and income inequality in the above studies was relatively less important. To confirm this claim, studies within Nigeria contradicted themselves as both positive and negative relationship between macro-economic growth and income inequality were found using the same country data. The studies by (Adigun, 2011), (Tanimu and Saifullahi, 2014), were good examples respectively. (Tanimu and Saifullahi (2014), works contradicted Adigun's view and suggested that the so-called "trickle down" phenomenon, underlying the view that growth reduced poverty and inequality, was not supported by developing countrie's data.

However, from the available literature review, it could be seen that few or no studies have been conducted based on comparative analysis between Nigeria and Ghana in the area of macroeconomic instability and income inequality; most literature rather focused on poverty [(Piesse,1998); (Bernardin, 2007); (Adam,1999) (Elbers, 2003)]. Other studies considered inequality as sectorial based. Studies with wider scope were country specific or cross country studies with data as sub-sample. [(Alayande, 2003); (Bernardin, 2007); (World Bank, 2003)]. This has made it difficult to understand how individual country's data behaved when they are analysed separately. On this note, the study endeavoured to close the gaps by considering and analysing the data separately. This helped in understanding how the heterogeneous

characteristics of the two countries explained their growth performance and how this affects their level of income inequality. The study also derived its uniqueness taking into account the flaws left in previous studies by focusing on macro-economic instability and income inequality instead of poverty that most research had focused on. The work also gave divergent views on the subject matter across different shore.

Therefore, this research work examined the relationship between macro-economic instability and income inequality in Nigeria and Ghana; using the more recent Nigeria and Ghana statistics data.

METHODS AND MATERIALS

To investigate the relationship between macroeconomic instability and income inequality in Nigeria and Ghana. The study therefore, adopted the model of (Jorda, 2005) with modification by measuring macro-economic instability through Generalization Autoregressive Conditional Heteroscedasticity (GARCH).

However, the original model of Jorda, 2005 presented thus:

$yi,+ k{-}yi,t{=}\alpha ik + \vartheta tk + \beta kMPi,t{+}\pi kXi,t{+}\varepsilon i,t$……..(3.1)

However, the model is modified thus:

yi,t + k– yi,t =αik + ϑkGDPi,t, + βkMSi,t,+ WkINFi,t,+ CkEXRi,t+ ε_i,t……...(3.2)

Where Y represents the Market Income Inequality

GDP= Gross Domestic Product

MS= Money Supply

INF= Inflation Rate,

EXR= Exchange Rate

i = Country Fixed Effects

t= Time Fixed

K= 0, …, 4

Ut, βk, Wk, Ck = Estimated Coefficients

ε_i= represent Stochastic Error Term

The four variables (GDP, EXR, MS, and INF,) represent macroeconomic variables while (GINI) represent income inequality. The rationale for choosing Gross Domestic Product, Exchange Rate, Money Supply and Inflation as part of the independent variables in this study is based on the fact that these variables plays an important role in determining the macro-economic. Also the decision for using GINI coefficient is borne out of the fact that it is straightforward, easy to understand and not at all complicated to calculate. Another reason can be attributed to the availability of inequality.

Data on income inequality was sourced from the Standardized World Income Inequality Data Base (SWIIP). This include (Gini indices) for Nigeria and Ghana between 1980-2016. The study used data on top income shares from the World Top Income Databases (WTIP) and on the share of wage income in GDP from Nigeria and Ghana. Other sources include World Bank Online Data Base (WDI), Statistical Bulletin of the Central Bank of Nigeria and Ghana.

RESULTS AND DISCUSSIONS

Time series data covering the period 1980 to 2016 was used for analysis. The empirical results were generated using E-view 9.2 econometrics software.

Trend Analysis of Income Inequality in Nigeria and Ghana

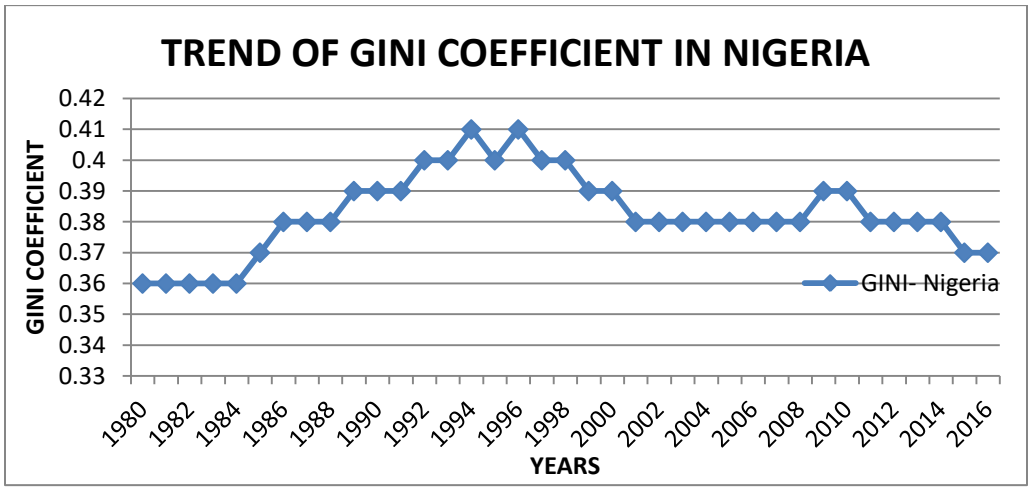

Figure 1a: Trend of GINI Cofficient in Nigeria

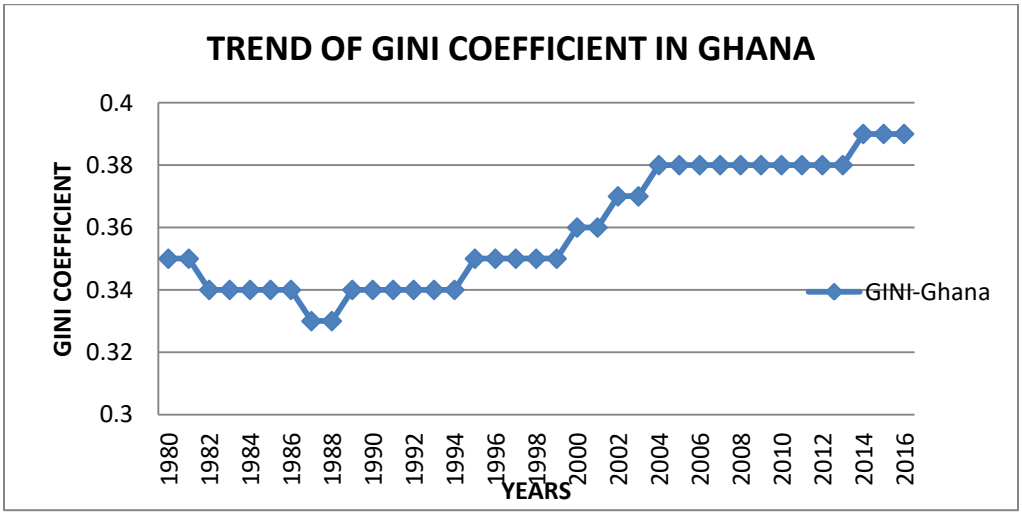

Figure 1b: Trend of GINI Cofficient in Ghana

The trend of Gini Coefficient was shown in Figure 1a and 1b for Nigeria and Ghana respectively. Figure 1a showed Nigeria's GINI Coefficient which maintained an upward slope from 1985 and reached its peak in year 1995. The reason for this upward slope may be due to urban migration that followed the oil boom of the 1970s and it began to fall from 1996. Ghana's GINI Coefficient showed in figure 1b increased from 1986 all through the study period. The major reason for upward trend may be due to wide income gap between rural and urban area of Ghana.

Test for Instability in Macro-Economic Variables of Nigeria

The Autoregressive Conditional Heteroscedasticity (GARCH)

Table 1a: Dependent variable: GDPG

Variables	Coefficient	Std. Error	z-Statistic	Prob.
INF	-0.072448	0.052979	-1.367489	0.1715
M2	0.032351	0.033915	0.953873	0.3401
REER	-0.011051	0.006515	-1.696152	0.0899
C	5.010174	0.627264	7.987341	0.0000
Variance Equation				
C	4.463858	5.020987	0.889040	0.3740
RESID(-1)^2	-0.038302	0.012714	-3.012512	0.0026
GARCH(-1)	0.887260	0.149671	5.928058	0.0000
α + β = 0.85				
R-squared	0.089997	Mean. dependent var	3.544689	
Adjusted R-squared	0.007269	S.D. dependent var	7.505444	
S.E. of regression	7.478115	Akaike info criterion	6.591909	
Sum squared resid	1845.433	Schwarz criterion	6.896677	
Log likelihood	-114.9503	Hannan-Quinn criter.	6.699354	
Durbin-Watson stat	1.686734			

The decision rule after summing the autoregressive model is stated thus;

If α + β is less than 0.5, there is no instability

If α + β fall between 0.5 and 1, there is instability

If α + β is greater than 1, there is a case of overshooting instability

The Autoregressive Conditional Heteroscedasticity (GARCH) result in the Table 1a examined stability in the macro economic variables of Nigeria. The root of the coefficient of arch and garch

α + β (0.848958) indicated that there was presence of instability in the macro-economic variables of Nigeria. The probability of arch and garch were also significant and less than 0.05%. The statistical significance of the coefficient α and β showed the presence of instability clustering in garch (1,1) which means that, large changes tend to be followed by large changes and small changes tend to be followed by small changes.

In the variance section of the table, the probability of resid(-2)ˆ2 [ARCH]term is equal to 0.0026 and [GARCH] 0.0000 term that is, p< 0.05, therefore, instability can be predicted by arch and garch term as its probability is significant.

Test for Instability in Macro-Economic Variables of Ghana

The Autoregressive Conditional Heteroscedasticity (GARCH)

Table 1b: Dependent variable= GDPG

Variables	Coefficient	Std. Error	z-Statistic	Prob.
INF	0.007491	0.012430	0.602659	0.5467
M2	-0.031856	0.006673	-4.773858	0.0000
REER	-0.003775	0.001365	-2.765045	0.0057
C	5.743328	0.456918	12.56972	0.0000
Variance Equation				
C	-0.002564	0.086106	-0.029774	0.9762
RESID(-1)^2	1.647192	0.860986	1.913147	0.0557
GARCH(-1)	0.246654	0.127145	1.939946	0.0524
α + β = 1.89				
	0.446738	Mean. dependent var	4.494054	
R-squared				
Adjusted R-squared	0.396441	S.D. dependent var	3.657977	
S.E. of regression	2.841847	Akaike info criterion	4.225184	
Sum squared resid	266.5111	Schwarz criterion	4.529952	
Log likelihood	-71.16590	Hannan-Quinn criter.	4.332629	
Durbin-Watson stat	0.951800			

The decision rule after summing the autoregressive model is stated thus;

If α + β is less than 0.5, there is no instability

If α + β fall between 0.5 and 1, there is instability

If α + β is greater than 1, there is a case of overshooting instability

The Autoregressive Conditional Heteroscedasticity (GARCH) result in the Table 1b examined the stability in the macro economic variables of Ghana. The root of the coefficient of ARCH and GARCH α + β (1.893846) indicated that there was instability in the macro-economic variables of Ghana. The probability of arch and garch were also significance at 5%. The statistical significance of the coefficient α & β showed the presence of instability clustering in garch (1,1) which means that, large changes tend to be followed by large changes and small changes tend to be followed by small changes.

In the variance section of the table, the probability of resid(-2)ˆ2 [ARCH]term is equal to 0.0557 and [GARCH] 0.0524 term. Therefore, instability can be predicted by ARCH and GARCH term as its probability is significant.

Results of Unit Root Test

The tests were done within the framework of the Augmented Dickey-Fuller (ADF). Each of the variables was tested at levels and in the first difference forms. The automatic lag length selection per the Akaike Information Criterion (AIC) was used for the ADF. The results evidently showed that some of the variables contained unit roots at their levels while other achieved their stationarity at first difference. The combinations of both the I(0) and I(1) therefore, provide a good basis for this study to adopt ARDL Bounds Test as confirmed by (Perasan et al, 2001).

Table 2: Augmented - Dickey Fuller

Variables	**Level**		**First Difference**		
	t* Statistics	Probability	t* Statistics	Probability	Order of int.
Gini –Nig	-1.749906	0.3983	-3.934089	0.0046	I(1)
GDPG-Nig	-4.539182	0.0009	-6.623082	0.0000	I(0)
INF-Nig	-2.906104	0.0545	-5.953406	0.0000	I(1)
M2-Nig	-3.629574	0.0101	-5.752922	0.0000	I(0)
REER-Nig	-1.820255	0.3651	-4.090273	0.0031	1(1)
Gini – Gh	0.205044	0.9691	-3.967991	0.0042	1(1)
GDPG-Gh	-2.984849	0.0459	-6.931630	0.0000	I(0)
INF-Gh	-4.661981	0.0006	-13.92010	0.0000	I(0)
M2-Gh	-0.084116	0.9417	-5.778839	0.0001	I(1)
REER-Gh	-2.781396	0.0710	-4.043854	0.0046	1(1)

The results in Table 2 showed that some of the variables in Nigeria and Ghana achieved their stationarity at level while some achieved their stationarity at first difference. The combinations of both the I(0) and I(1) provide a good basis for this study to adopt ARDL Bounds Test as confirmed by (Perasan et al, 2001).

Table 3: ARDL Bound Test Result for Nigeria

Test Statistic	Value	k
F-statistic	4.937917	4
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	2.45	3.52
5%	2.86	4.01
2.5%	3.25	4.49
1%	3.74	5.06

It is evident from the table 3 that there was a long run relationship between macro-economic instability and income inequality in Nigeria because the value of our F-statistics (4.937917) was greater than the upper bound of our critical value both at 10% and 5%. The study rejected the null hypothesis of no long run relationship and accepted the alternative hypothesis. Therefore, the study concluded that, there was existence of long run relationship between macro-economic instability and income inequality in Nigeria given the value of f-stat significance. That is, if there were shocks in the short run which might affect movement in the individual series, they would converge in the long run.

Table 4: Long Run Coefficients

Variables	Coefficient	Standard Error	T-Statistics	Probability
Gdpg	0.062682	0.029819	2.102117	0.0528
Inf	0.077868	0.007781	10.006871	0.0000
M2	0.034970	0.007196	4.859613	0.0002
Reer	0.000955	0.001410	0.677165	0.5086
C	35.578931	0.492902	72.182638	0.0000

Long Run Result for Nigeria

GINI = 35.58 +0.06(GDPG) +0.08(INF) +0.03(M2) +0.00(REER)

Std. Error: (0.50) (0.03) (0.01) (0.01) (0.00)

T-stat: (72.18)* (2.10)* (10.01)* (4.86) * (0.000)*

The coefficient of the long run estimates indicated that 1% increase in GDPG increase GINI by 0.06%, also 1% increase in INF increases GINI by 0.08% and 1% increase in m2 increases GINI by 0.03% while REER effect on GINI was insignificant.

This result further showed positive relationship between macro-economic variables and income inequality (GINI) in Nigeria.

Table 5: Error Correction Model

Variables	Coefficient	Standard Error	T-Statistics	Probability
D(GDPG)	0.026216	0.003398	7.714529	0.0002
D(INF)	-0.001569	0.002276	-0.689255	0.5164
D(M2)	-0.006547	0.002811	-2.329292	0.0587
D(REER)	5.89E-05	0.000440	0.133649	0.8981
C	0.028087	0.023620	1.189147	0.2793
ECM(-1)	-0.308633	0.051274	-6.019320	0.0009

The result in the Table 5 showed that the coefficient of the error correction term ECM(-1) has the correct sign and significant at 1% level. The value of the coefficient was -0.308633. The result showed that about 31% of the short run inconsistencies were being corrected and incorporated into the long –run equilibrium.

Diagnostic Tests

Table 6: Breusch-Godfrey Serial Correlation LM Test

F-statistic	0.906665	Prob. F(4,11)	0.4931
Obs*R-squared	8.182305	Prob. Chi-Square(4)	0.0851

Null hypothesis: There is no Auto- correlation

Alternative hypothesis: There is presence of Auto-correlation

Decision rule: Reject the null hypothesis when the **p-value** is less than 5%

Since the **p-value (0.49)** is greater than 5%, the study therefore, accepted the null hypothesis and concludes that is no serial correlation.

Table 7: Heteroskedasticity Test: ARCH

F-statistic	0.425662	Prob. F(4,24)	0.7886
Obs*R-squared	1.921077	Prob. Chi-Square(4)	0.7503

Null hypothesis: There is no heteroscedasticity

Alternative hypothesis: There is heteroscedasticity

Decision rule: Reject the null hypothesis when the p-value is less than 5%

Since the P-value (0.78) is greater than 5%, the study therefore accepted the null hypothesis and concludes that there is no arch effect; therefore the result of this study is reliable.

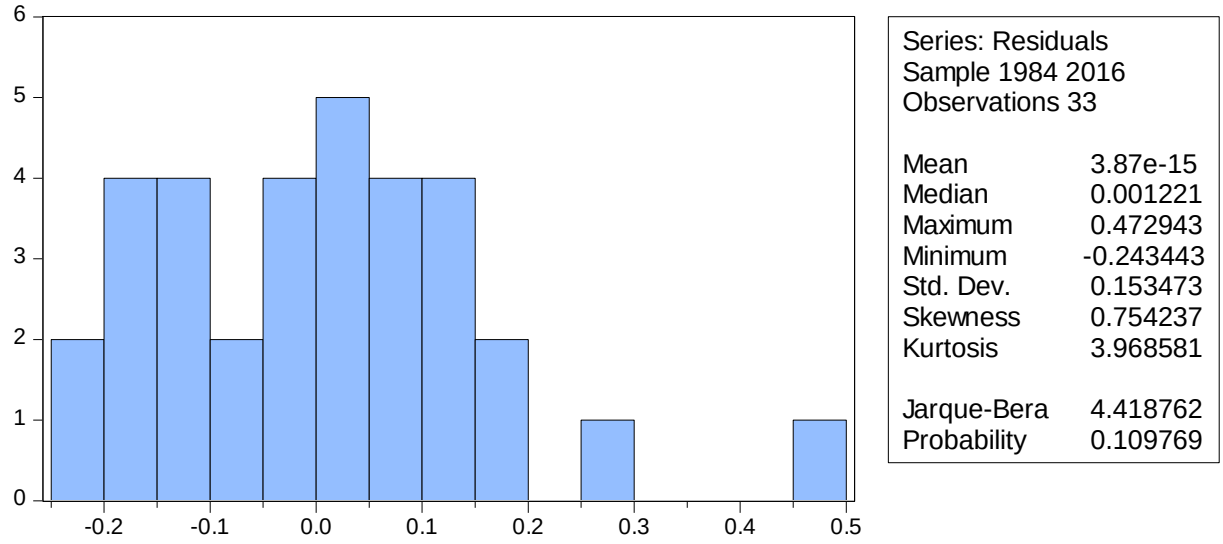

Figure 2: Normality Test

Null hypothesis: residual are normally distributed

Alternative hypothesis: residual are not normally distributed

Decision rule: Reject the null hypothesis when the p-value is less than 5%

Since the Jarque-Bera (4.418762) and the corresponding P-value (0.109769) are greater than 5%, the study therefore, accepted the null hypothesis and concludes that residua are normally distributed

Table 8: Ramsey RESET Test

Equation: UNTITLED

Specification: GINI GINI(-1) GDPG GDPG(-1) GDPG(-2) GDPG(-3) INF INF(-1) INF(-2) INF(-3) INF(-4) M2 M2(-1) M2(-2) REER REER(-1) REER(-2) REER(-3) C

Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	1.080057	14	0.2984
F-statistic	1.166523	(1, 14)	0.2984

Table 8…

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	0.057972	1	0.057972
Restricted SSR	0.753728	15	0.050249
Unrestricted SSR	0.695755	14	0.049697

Null hypothesis: regression model fits the data well

Alternative hypothesis: invalid regression model

Decision rule: Reject the null hypothesis when the p-value is less than 5%

Since the f-statistics (1.166523) and the corresponding P-value (0.2984) are greater than 5%, the study therefore accepted the null hypothesis and conclude that the regression model fits the data well.

Table 9: ARDL Bound Test Result for Ghana

Test Statistic	Value	k
F-statistic	7.528490	4
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	2.45	3.52
5%	2.86	4.01
2.5%	3.25	4.49
1%	3.74	5.06

It is evident from the Table 9 that there was a long run relationship between macro-economic instability and income inequality in Ghana because the value of our F-statistic (7.528490) was greater than the upper bound of our critical value both at all levels. The study rejected the null hypothesis of no long run relationship and accepted the alternative hypothesis. Therefore, the study concluded that there was existence of long run relationship between macro-economic instability and income inequality in Ghana given the value of f-stat significance. That is, if there were shocks in the short run which might affect movement in the individual series, they would converge in the long run.

Table 10: Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDPG	-7.270851	46.619560	-0.155961	0.8795
INF	-0.094132	0.972562	-0.096787	0.9250
M2	4.988426	33.628735	0.148338	0.8853
REER	-0.843194	5.241202	-0.160878	0.8757
C	52.545593	52.216562	1.006301	0.3406

Long run result for Ghana

GINI = 52.55 – 7.27(GDPG) -0.10(INF) + 4.99(M2) -0.84(REER)

Std. Error: (52.22) (46.62) (1.01) (33.63) (5.24)

T-stat: (1.01)* (-0.16)* (-0.10)* (0.15) * (-0.16)*

The coefficient of the long run estimates indicated that 1% increase in GDPG reduced GINI by 7.2 units; also 1% increase in INF pushed GINI down by 0.10%, a 1% increase in REER will also reduce GINI by 0.84 while 1% increase in M2 increased GINI by 4.99 units.

This result indicated negative relationship between three of the macro-economic variables and income inequality. Therefore an increase in these variables reduced inequality.

Table 11: Error Correction Model

Variables	Coefficient	Standard Error	T-Statistics	Probability
D(GDPG)	0.005010	0.006192	0.809093	0.4280
D(INF)	-0.000571	0.001324	-0.431280	0.6709
D(M2)	-0.003166	0.001165	-2.717365	0.0133
D(REER)	0.000249	6.13E-05	4.056759	0.0006
C	0.168556	0.018981	8.880435	0.0000
ECM(-1)	-0.033084	0.010601	-3.120788	0.0054

The result in the table 11 indicated that the coefficient of the error correction term ECM(-1) has the correct sign and significant at 1% level. The value of the coefficient was -0.033084. The result showed that about 3% of the short run inconsistencies were being corrected and incorporated into the long –run equilibrium.

Diagnostic Tests

Table 12: Breusch-Godfrey Serial Correlation LM Test

F-statistic	0.628912	Prob. F(4,5)	0.6631
Obs*R-squared	11.04581	Prob. Chi-Square(4)	0.0261

Null hypothesis: There is no Auto- correlation

Alternative hypothesis: There is presence of Auto-correlation

Decision rule: Reject the null hypothesis when the **F-statistic** is less than 5%

Since the **F-statistic** is greater than 5%, we therefore accept the null hypothesis and concluded, that is, no serial correlation.

Table 13: Heteroskedasticity Test: ARCH

F-statistic	0.225354	Prob. F(4,24)	0.9215
Obs*R-squared	1.049781	Prob. Chi-Square(4)	0.9022

Null hypothesis: There is no heteroscedasticity

Alternative hypothesis: There is a presence of heteroscedasticity

Decision rule: Reject the null hypothesis when the p-value is less than 5%

Since the P-value (0.92) is greater than 5%, the study therefore accepted the null hypothesis and conclude that is no arch effect, therefore the result of this study is reliable.

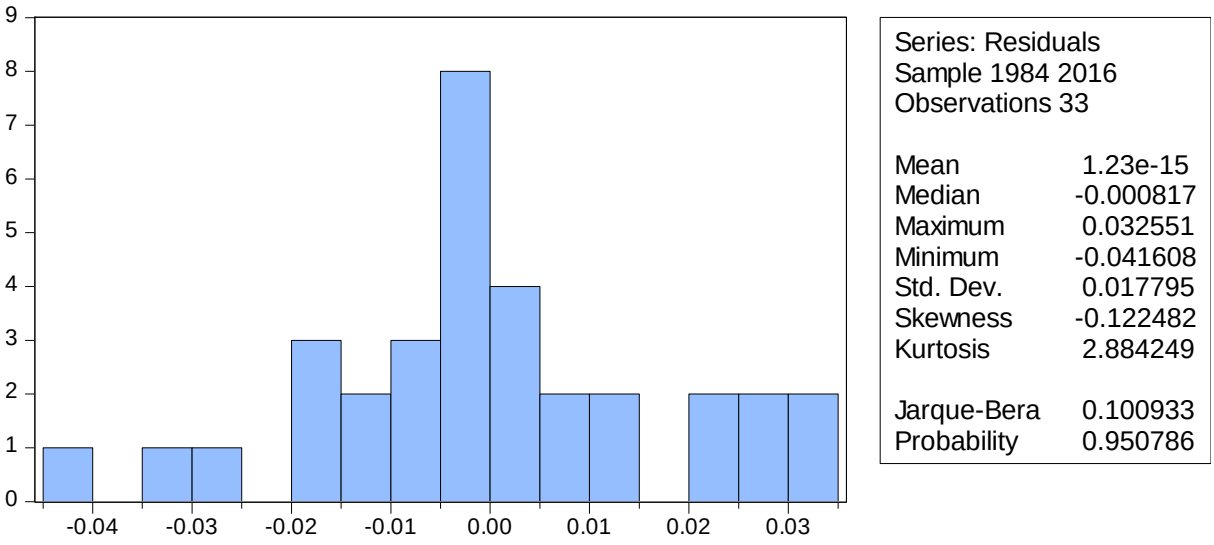

Figure 3: Normality Test

Null hypothesis: residuals are normally distributed

Alternative hypothesis: residuals are not normally distributed

Decision rule: Reject the null hypothesis when the p-value is less than 5%

Since the Jarque-Bera (0.100933) and the corresponding P-value (0.950786) are greater than 5%, the study therefore accepted the null hypothesis and concludes that residuals are normally distributed

Table 14: Ramsey RESET Test

Equation: UNTITLED

Specification: GINI GINI(-1) GINI(-2) GINI(-3) GDPG GDPG(-1) GDPG(-2) GDPG(-3) GDPG(-4) INF INF(-1) INF(-2) INF(-3) INF(-4) M2 M2(-1) M2(-2) M2(-3) M2(-4) REER REER(-1) REER(-2) REER(-3) REER(-4) C

Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	0.850128	8	0.4200
F-statistic	0.722718	(1, 8)	0.4200

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	0.000840	1	0.000840
Restricted SSR	0.010133	9	0.001126
Unrestricted SSR	0.009293	8	0.001162

Null hypothesis: regression model fits the data well

Alternative hypothesis: invalid regression model

Decision rule: Reject the null hypothesis when the p-value is less than 5%

Since the f-statistics (0.722718) and the corresponding P-value (0.4200) are greater than 5%, the study therefore accepted the null hypothesis and concludes that the regression model fits the data well.

Comparative Analysis and Discussion of the Findings

The trend of Nigeria's GINI though fluctuated over time; it was relatively high during 1980-2016 which was the period under review. Both the line trend and summary of statistics confirmed this result. This was an indication that the OECD report on poverty and inequality of developing countries was empirically correct because Ghana's GINI coefficient maintained the same trend pattern as the GINI coefficient of Ghana showed an upward slope from 1985 to 2016. This

upward trend of the two countries results followed the same empirical results shared by (Appiah-Kubi, 2007), (World Bank, 2003), (Genevieve and Novignon 2013) among others.

Finding from E(GARCH) test confirmed the instability in the macro economic variables of the two countries. The GARCH coefficient result was greater than 0.05 in Ghana and Nigeria which favoured the decision criteria of existence of instability in the two countries macro-economic variables.

The result of the bound test for co-integration showed the existence of long-run relationship between the macro-economic variables and income inequality. The result of the short-run analysis showed significance, ECM has correct signs which indicated that any short run inconsistencies were being corrected and incorporated into the long –run equilibrium in the two countries. However, the long-run result of the two countries differs. In the case of Nigeria, the long-run result showed a positive relationship between the macro-economic variables and income inequality. This is in line with some empirical research works, such as (Aigbokhan, 2008), (Tanimu and Saifullahi, 2014), (Appiah-Kubi,2007) and (Alayande, 2003) while the result of Ghana contradicted that of Nigeria and showed a negative relationship between macro-economic variables and income inequality. Ghana's result is in consonance with the work (Anyanwu, 2016) that some African countries economy exhibited the existence of Kuznets curve.

SUMMARY AND CONCLUSIONS

This study examined the relationship between macro-economic instability and income inequality in Nigeria and Ghana between 1980 and 2016. The study employed "Trend analysis, Autoregressive Distribution Lags (ARDL) and Autoregressive Conditional Heteroscedasticity (GARCH) as estimation techniques. Findings from the results showed that, the trends of Gini-coefficient fluctuated in both countries (Nigeria and Ghana) during the study period. The results further showed that there was long-run relationship among the variables of interest. The study therefore concludes that in both countries, there was macro-economic instability. Based on this conclusion, it is obvious that macro-economic instability promotes income inequality in Nigeria and Ghana during the study period. Based on the findings from this study, the study therefore strongly recommends that:

i. Relevant authorities should ensure that macro-economic variables in both countries are effectively and efficiently monitored, managed and controlled so as to enhance, promote and achieve economic stability in the countries.
ii. Both government and its agencies should collaborate to enhance growth and sustain development in order to reduce income inequality in both countries

iii. Since income inequality is not a desirable feature of the two countries, this study supports the urgent need for the government at all levels to formulate policies aimed at improving the welfare of the poor and also improve the lot of low income earners so as to reduce the wide gap between the rich and the poor in two countries.

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