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The Impact of Common Fund on the Economic Growth in Ghana: An Empirical Evidence

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Abstract:
This paper examines empirically the impact of Common Fund on Economic Growth, the long run equilibrium relationship and the direction of causality among the variables using annual time series data spanning 1994 to 2013 and by using the newly developed approach to cointegration by Pesaran et al. (2001) that performs well with small data and regardless of the order of integration, that is, whether the series are I (0) or I (1). First, the order of integration is tested using the Augmented Dickey-Fuller (ADF) and Phillips Perron (PP) unit root tests. The second stage involves testing for the existence of a long- run equilibrium relationship among the variables and their respective impact on Economic Growth in Ghana. The final stage involves testing for the direction of causality augmentedwith a lagged error-correction term where the series are cointegrated. The results of ADF and PP unit root test confirmed that while some of the variables are stationary at level, others are at first differencing. Also, long-run relationship is established among the variables and there exists unidirectional causality running from Common Fund to Economic Growth. Finally, Common Fund has insignificant positive impact on the Economic Growth in Ghana.

Keywords: *Fiscal decentralization, Common Fund, Cointegration, ARDL*

1. Introduction

1.1. Background

The Bretton Wood era development emphasized on the need for powerful and unifying central government to harness all the natural and human resources of the country for development(Ebel and Yilmaz, 2002). However, the inability of many central governments to realize the dreams for which they were created called for overwhelming support for fiscal decentralization which is believed could help accelerate grassroot growth and development which could in turn impact on the national development (Awortwi, 2010 and Tanzi, 1996). While Prud'homme (1995) criticized fiscal decentralization and vividly explained some of the inherent dangers of the system, most international organisations such as Word Bank, IMF, UN and some donor countries support fiscal decentralization to an extent that it is made one of the conditions for advancing aids and grants to the developing and transitional economies(Bardhan,2002). The theoretical rationale for undertaking fiscal decentralization is that, transfer of some of the central government's authority, resources, responsibilities and accountability to subnational governments empowers local institutions and organisations to undertake more effective self-governance and development appropriate to local conditions (Awortwi, 2010).

Economists in recent time shift their focus away from the efficiency argument made in favour of fiscal decentralization and begin to look at the direct relationship between fiscal decentralization (measured by using either revenue or expenditure) and economic growth. While the works of Xie et al (1999), Zhang and Zou (1998) Berthold(2001), Behnisch (2002) and Dagwom (2013) reveal that fiscal decentralization has either insignificant or even negative impact on economic growth in the US, China, Germany and Nigeria, the findings of Lin and Liu (2000), Akai and Sakata (2002), Marta and Toni (2001) and Usman (2011) assert that fiscal decentralization has significant positive impact on economic growth in China, US, Spain and Nigeria. These conflicting findings support the fact that relationship between fiscal decentralization and economic growth is ambiguous and inconclusive (White, 2011).

This study is warranted due to the fact that most of the studies relating to fiscal decentralization and economic growth in Ghana examinedonly the impact of District Assemblies Common Fund (DACF) on poverty alleviation with few trying to explore qualitatively the role of fiscal decentralization in achieving sustainable development in Ghana. There has not been any empirical work

on the causal relationship between Common Fund and economic growth in Ghana using econometric model. This study therefore seeks to examine empirically the causal relationship between Common Fund and Economic Growth in Ghana using annual time series data spanning 1994 to 2013.It again examines the long run association among the variables and it finally examines the direction of causality between Common Fund and Economic growth in Ghana. The findings of this study reveal that Common Fund has insignificant positive impact on economic growth in Ghana. The study further reveals that there is long run relationship among the variables and unidirectional causality running from Common Fund to Economic Growth is discerned.

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2. Review of Related Literature

2.1.Theoretical Framework and Empirical Study

Though there are several definitions of decentralization in use, Dick-Sagoe (2012) cites United Nations (1996) which defines decentralization as the transfer of authority on a geographic basis whether by deconcentration of administrative authority to field units of the same department or level of government or by political devolution of authority to local government units or by delegation to special statutory bodies. Crawford (2003) on the other hand cites Robot (2001) who defines decentralization as any act in which a central government formally cedes powers to actors and institutions at the lower levels in a political administrative and territorial hierarchy. Antwi-Boasiako (2010) however defines decentralization as the electoral devolution to enable citizens at the grassroot to elect their leaders devoid of any direct input from the centre.

There are different types of decentralization as explained by Dick-Sagoe (2012), White (2011) and Rondinelli (1983). The major types include Deconcentration, Delegation and Devolution. Rondinelli (1983) added Privatisation as another form of decentralization

This study however concerns itself with devolution (fiscal decentralisatio). Fiscal decentralization is the constitutional creation of autonomous subnational governments with the powers to raise tax revenue and the responsibility to expend the revenue in a way that will bring about desired level of local development. Devolved powers emanate from the constitution and only the constitution can increase or decrease such powers (White, 2011; Rondinelli, 1983). Fiscal decentralization concerns four main issues that include assignment of expenditure responsibilities to the subnational government, assignment of revenue sources to the subnational government, requirement on the central government to transfer grant to the local government units and finally establishment of framework for local borrowing and debt management (Shah, 1997).

There has been age-old debate on the relevance of fiscal decetralisation with one school asserting that fiscal decentralization promotes economic development throughallocative efficiency, production efficiency, and competition among the subnational governments andit alsoreduces national cost of embarking on new projects and innovation through experimentation (White, 2011; Smoke, 2003; Bardhan, 2002; Martinez and McNab, 2001; Yilmaz, 1999; Tanzi, 1996 and Oates, 1993). The other school of thought criticize fiscal decentralization on the grounds that it has the potential of breeding corruption, serving the interest of few local elites, the mismatch between revenue powers and expenditure responsibilities can create chaos, conflict and crises, the system is characterized by unhealthy competition and finally the local governments lack competent manpower and bureaucrats to effectively and efficiently formulate and implement growth-related decisions (Prud'homme, 1995; Tanzi, 1996; Crook, 2003; Jin and Zou, 2005; MLGRD, 2010). Again, in Africa, politics can be read into the demarcation of electoral constituencies and revenue allocation can be politically-motivated (Michael, 2014; Banful, 2011).

Decentralisation in Ghana (Gold Coast) started as far as 1878, but fiscal decentralization is only felt during the fourth republican constitution (Ankamah, 2012; Awortwi, 2010; Crawford, 2003). In 1994, it was felt that the local government units needed to be resourced in order to live up to expectation. In this regard, a special fund known as Common Fund into which 5% (now 7.5%) of the total tax revenue is kept to cater for the development needs of the MMDA's. Technically speaking, Common Fund is the statutory creation of special fund out of the total national tax revenue, which is made available to the MMDA's to supplement their meager internally generated fund and to enable them achieve the desired level of local growth and development.

Lack of qualified bureaucrats, corruption, embezzlement, inefficiencies, lackadaisical attitude to work of some local government staff, politicization of local government activities and unnecessary deductions (at source) on the Common Fund adversely affect the proper functioning of local government units in Ghana (King et al., 2003; Adam, 2010; MOFEF, 2011). The relevance of local government units in Ghana as far as local development is concerned will ever remain a hypothetical postulation if corrective measures are not taken.

2.2. Empirical Study

Empirical works reveal conflicting findings regarding the impact of revenue allocation to the subnational governments and economic growth. While Xie et al (1999), Zhang and Zou (1998), Berthold (2001), Behnisch (2002) and Dagwom (2013) assert that the relevance of fiscal decentralization is blown out of proportion and that they do not believe that fiscal decentralization has much impact on economic growth in the US, China, Germany and Nigeria.

Lin and Liu (2000), Marta and Toni (2001), Akai and Sakata (2002) and Usman (2011) hold contrary view that fiscal decentralization is growth-enhancing. Zhang and Zou (1998) reveal that fiscal decentralization in China has negative impact on provincial growth while Lin and Liu (2000) reveal that fiscal decentralization has positive impact on the growth of Provinces in China. Jin and Zou(2005) use two data sets, one from 1979 to 1993 (period under contract revenue system) and the other from 1994 to 1999 (period under tax assignment system). The period from 1979 to 1993 (contract revenue system) reveal that expenditure decentralization has negative impact on the Provincial growth in China while revenue decentralization has positive impact. Again, Jin and Zou (2005)

reveal that for the period 1994 to 1999 (tax assignment system), expenditure decentralization has no significant impact on the provincial growth in China while revenue decentralization has significant negative impact all suggesting that centralization would better enhance growth in China for now.

Xie, Zou and Davoodi (1999) assert that fiscal decentralization has no impact on the US growth suggesting that the US has reached decentralization equilibrium and further decentralization would impact negatively on its growth. Akai and Sakata (2002) however refute the above assertion that fiscal decentralization contributes to the growth of US.

The work of Berthold (2001) and Behnisch (2002) hold that fiscal decentralization in Germany impacts negatively on growth. This view is held by Dagwom (2013) who declares that fiscal decentralization in Nigeria impacts negatively on its growth, though earlier work by Usman (2011) asserts that fiscal decentralization has insignificant positive impact on Nigeria's economic growth.

The rest of the paper is organized as follows: Section 3 presents the model and the empirical methodology used in the study. Section 4 discusses the empirical results while section 5 concludes the study.

3. The Model, Data and Empirical Methodology

Though ARDL model does not require test of stationarity, it is performed to make sure that none of the variables is stationary at second differencing, that is, I(2). ADF and PP unit root tests were used because there was no any structural reform or adjustment in Ghana within the periods under consideration and the result of the tests are shown below in Table 1. The Augmented Dickey-Fuller(ADF) model is as below:

$$\Delta Y = \beta_1 + \beta_{2t} + \delta Y_{t-1} + \sum_{i=1}^{k} \gamma_i \Delta Y + \varepsilon_t \quad \text{.....(1)}$$

Where

$\varepsilon_{t=}$ A pure white noise error term

$Y_{t=}$ (each of the variable to be checked)

$\Delta Y_t = (Y_t - Y_{t-1})$ = the first difference operator

k= the lag length

The economic model for this work is as below:

RGDP = f (CF, TBR,EXR,TGE, INV andPOP)……(2)

This means that RGDP is a function of revenue allocated to the MMDA's (CF), Treasury bill rate(TBR), Exchange rate (EXR),Total government expenditure(TGE) and Population(POP). Theoretically speaking, Common Fund is an injection and is supposed to have positive impact on economic growth (RGDP), Exchange rate(EXR) affects economy growth through export. Those countries that are net importers are likely to experience decline in growth when their currencies depreciates while those countries that are net exporters are more likely to experience decline in growth when their currencies appreciate. Also, Treasury bill (TBR) replaces interest rate because it is one of the key determinants of the changes in interest rate. It has the tendency of crowding private sector out of the market causing decline in investment and for that matter economic growth. Furthermore, Total government expenditure (TGE) influences economic growth because expansionary fiscal policy increases aggregate demand which stimulates investment and economic growth. Again, investment (INV) is used as proxy for capital formation which theoretically is supposed to impact on economic growth. Also, Population (POP) stands for the quantity and quality of labour force. The theory of economic growth has it that Y=f (K and L), where L stands for labour force. Increase in labour force reduces cost of production (ie maximizes production) through cheap labour and increase in the quality of labour force increases production through labour efficiency. The econometric model is as follows:

$\ln GDP_t = \beta o + \beta_1 \ln CF_t + \beta_2 lnTBR_t + \beta_3 lnEXR_t + \beta_4 lnTGE_t + \beta_5 lnINV_t + \beta_6 lnPOP + \beta_7 ECT_t + \varepsilon_t$, .(3)

whereln GDP = log of Real GDP; lnCF= log of revenue allocation to the Metropolitan, Municipal and District Assemblies, lnTBR= log of Treasury bill rate, lnEXR= log of exchange rate, lnTGE= log of total government expenditure and lnINV= log of public investment and lnPOP= log of population. Bo is a constant; β_1, β_2, β_3,β_4, β_5, β_6 and β_7 are the coefficients to be estimated ; ECT is the Error Correction Term; ε is the error term or disturbance term and t is time.

3.1. Hypotheses Testing

The following hypotheses are tested:

- Hypothesis No.1

Ho: Revenue allocations to MMDA's(CF), treasury bill rate (TBR), exchange rate (EXR), total government expenditure (TGE), public investment (INV) and population (POP) have no significant causal relationship with economic growth (RGDP) in Ghana.

H_1: CF, TBR and EXR, TGE, INV and POP have a significant causal relationship with economic growth (RGDP) in Ghana.

Where Ho: $\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = 0$

H_1: $\beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq \beta_6 \neq 0$

- Hypothesis No.2

The study wanted to examine whether there exists long run relationship among the variables using the ARDL model. The ARDL model used in this study is expressed below:

$$D(\ln(GDP_t) = a_{01} + b_{11}\ln(GDP_{t-1}) + b_{21}\ln(CF_{t-1}) + b_{31}\ln(INV_{t-1}) + b_{41}\ln(TBR_{t-1}) + b_{51}\ln(EXR_{t-1}) + b_{61}\ln(TGE_{t-1}) + b_{71}\ln(POP_{t-1}) + \sum_{i=1}^{p} a_{1i}D(\ln(GDP_{t-1})) + \sum_{i=1}^{q} a_{2i}D(\ln(CF_{t-1})) + \sum_{i=1}^{q} a_{3i}D(\ln(INV_{t-1})) + \sum_{i=1}^{q} a_{4i}D(\ln(TBR_{t-1})) + \sum_{i=1}^{q} a_{5i}D(\ln(EXR_{t-1})) + \sum_{i=1}^{q} a_{6i}D(\ln(TGE_{t-1})) + \sum_{i=1}^{q} a_{7i}D(\ln(POP_{t-1})) + \varepsilon_{1t} \dots\dots (4)$$

$$(\ln(CF_t) = a_{02} + b_{12}\ln(GDP_{t-1}) + b_{22}\ln(CF_{t-1}) + b_{32}\ln(INV_{t-1})\, b_{42}\ln(TBR_{t-1}) + b_{52}\ln(EXR_{t-1}) + b_{62}\ln(TGE_{t-1})\, b_{72}\ln(POP_{t-1}) + \sum_{i=1}^{p} a_{1i}D(\ln(CF_{t-1})) + \sum_{i=1}^{q} a_{2i}D(\ln(GDP_{t-1})) + \sum_{i=1}^{q} a_{3i}D(\ln(INV_{t-1})) + \sum_{i=1}^{q} a_{4i}D(\ln(TBR_{t-1})) + \sum_{i=1}^{q} a_{5i}D(\ln(EXR_{t-1})) + \sum_{i=1}^{q} a_{6i}D(\ln(TGE_{t-1})) + \sum_{i=1}^{q} a_{7i}D(\ln(POP_{t-1})) + \varepsilon_{2t} \dots\dots (5)$$

$$(\ln(INV_t) = a_{03} + b_{13}\ln(GDP_{t-1}) + b_{23}\ln(CF_{t-1}) + b_{33}\ln(INV_{t-1}) + b_{43}\ln(TBR_{t-1}) + b_{53}\ln(EXR_{t-1}) + +b_{63}\ln(TGE_{t-1})\, b_{73}\ln(POP_{t-1}) + \sum_{i=1}^{p} a_{1i}D(\ln(INV_{t-1})) + \sum_{i=1}^{q} a_{2i}D(\ln(CF_{t-1})) + \sum_{i=1}^{q} a_{3i}D(\ln(GDP_{t-1})) + \sum_{i=1}^{q} a_{4i}D(\ln(TBR_{t-1})) + \sum_{i=1}^{q} a_{5i}D(\ln(EXR_{t-1})) + \sum_{i=1}^{q} a_{6i}D(\ln(TGE_{t-1})) + \sum_{i=1}^{q} a_{7i}D(\ln(POP_{t-1})) + \varepsilon_{3t} \dots\dots (6)$$

$$(\ln(TBR_t) = a_{04} + b_{14}\ln(GDP_{t-1}) + b_{24}\ln(CF_{t-1}) + b_{34}\ln(INV_{t-1}) + b_{44}\ln(TBR_{t-1}) + b_{54}\ln(EXR_{t-1}) + +b_{64}\ln(TGE_{t-1})\, b_{74}\ln(POP_{t-1}) + \sum_{i=1}^{p} a_{1i} D(\ln(TBR_{t-1})) + \sum_{i=1}^{q} a_{2i} D(\ln(GDP_{t-1})) + \sum_{i=1}^{q} a_{3i} D(\ln(CF_{t-1})) + \sum_{i=1}^{q} a_{4i} D(\ln(INV_{t-1})) + \sum_{i=1}^{q} a_{5i} D(\ln(EXR_{t-1})) + \sum_{i=1}^{q} a_{6i} D(\ln(TGE_{t-1})) + \sum_{i=1}^{q} a_{7i} D(\ln(POP_{t-1})) + \varepsilon_{4t} \dots\dots\dots (7)$$

$$(\ln(EXR_t) = a_{05} + b_{15}\ln(GDP_{t-1}) + b_{25}\ln(CF_{t-1}) + b_{35}\ln(INV_{t-1}) + b_{45}\ln(TBR_{t-1}) + b_{55}\ln(EXR_{t-1}) + +b_{65}\ln(TGE_{t-1})\, b_{75}\ln(POP_{t-1}) + \sum_{i=1}^{p} a_{1i} D(\ln(EXR_{t-1})) + \sum_{i=1}^{q} a_{2i} D(\ln(GDP_{t-1})) + \sum_{i=1}^{q} a_{3i} D(\ln(CF_{t-1})) + \sum_{i=1}^{q} a_{4i} D(\ln(INV_{t-1})) + \sum_{i=1}^{q} a_{5i} D(\ln(TBR_{t-1}) + \sum_{i=1}^{q} a_{6i} D(\ln(TGE_{t-1})) + \sum_{i=1}^{q} a_{7i} D(\ln(POP_{t-1})) + \varepsilon_{5t} \dots\dots\dots (8)$$

$$D(\ln(TGE_t) = a_{06} + b_{16}\ln(GDP_{t-1}) + b_{26}\ln(CF_{t-1}) + b_{36}\ln(INV_{t-1}) + b_{46}\ln(TBR_{t-1}) + b_{56}\ln(EXR_{t-1}) + b_{66}\ln(TGE_{t-1}) + b_{76}\ln(POP_{t-1}) + \sum_{i=1}^{p} a_{1i} D(\ln(TGE_{t-1})) + \sum_{i=1}^{p} a_{2i} D(\ln(GDP_{t-1})) + \sum_{i=1}^{q} a_{3i} D(\ln(CF_{t-1})) + \sum_{i=1}^{q} a_{4i} D(\ln(INV_{t-1})) + \sum_{i=1}^{q} a_{5i} D(\ln(TBR_{t-1})) + \sum_{i=1}^{q} a_{6i} D(\ln(EXR_{t-1})) + \sum_{i=1}^{q} a_{7i} D(\ln(POP_{t-1})) + \varepsilon_{6t} \dots\dots (9)$$

$$D(\ln(POP_t) = a_{07} + b_{11}\ln(GDP_{t-1}) + b_{27}\ln(CF_{t-1}) + b_{37}\ln(INV_{t-1}) + b_{47}\ln(TBR_{t-1}) + b_{57}\ln(EXR_{t-1}) + b_{67}\ln(TGE_{t-1}) + b_{77}\ln(POP_{t-1}) + \sum_{i=1}^{p} a_{1i}\,D(\ln(POP_{t-1})) + \sum_{i=1}^{p} a_{2i}D(\ln(GDP_{t-1})) + \sum_{i=1}^{q} a_{3i}\,D(\ln(CF_{t-1})) + \sum_{i=1}^{q} a_{4i}D(\ln(INV_{t-1})) + \sum_{i=1}^{q} a_{5i}\,D(\ln(TBR_{t-1})) + \sum_{i=1}^{q} a_{6i}\,D(\ln(EXR_{t-1})) + \sum_{i=1}^{q} a_{7i}\,D(\ln(TGE_{t-1})) + \varepsilon_{7t} \dots \dots (10)$$

where

H_O: $b_1i=b_2i=b_3i=b_{4i}=b_{5i}=b_{6i}=b_{7i}=0$(ie no cointegration), against the alternative hypothesis of the presence of cointegration, given as, H_1: $b_1i\neq b_2i\neq b_3i\neq b_{4i}\neq b_{5i}\neq b_{6i}\neq b_{7i}\neq 0$ where i= equations 4,5, 6,7, 8, 9 and 10 .

- Hypothesis No.3

The study went further to test for the direction of causality since the ARDL model used could not discern direction of causality in the long run. Since the variables are cointegrated, there must exist causality between any two variables. The causality could be unidirectional or bidirectional. In testing for the causality, VEC Granger causality test was conducted by using the following model. The cointegrated variables, therefore appear with the ECT_{t-1}. The Vector error correction model for this work takes the following standard form:

$$\Delta GDP_t = \alpha_0 GDP + \sum_{i=1}^{k}\delta_1\Delta GDP_{t-i} + \sum_{i=1}^{k}\delta_{2GDP}\Delta CF_{t-i} + \sum_{i=1}^{k}\delta_{3GDP}\Delta INV_{t-i} + \sum_{i=1}^{k}\delta_{4GDP}\Delta TBR_{t-i} + \sum_{i=1}^{k}\delta_{5GDP}\Delta EXR_{t-i} + \sum_{i=1}^{k}\delta_{6GDP}\,\Delta TGE_{t-i} + \sum_{i=1}^{k}\delta_{7GDP}\Delta POP_{t-i} + \varepsilon \dots (11)$$

$$\Delta CF_t = \alpha_0 CF + \sum_{i=1}^{k}\delta_1\Delta CF_{t-i} + \sum_{i=1}^{k}\delta_{2CF}\Delta GDP_{t-i} + \sum_{i=1}^{k}\delta_{3CF}\Delta INV_{t-i} + \sum_{i=1}^{k}\delta_{4CF}\Delta TBR_{t-i} + \sum_{i=1}^{k}\delta_{5CF}\Delta EXR_{t-i} + \sum_{i=1}^{k}\delta_{6CF}\,\Delta TGE_{t-i} + \sum_{i=1}^{k}\delta_{7CF}\Delta POP_{t-i} + \varepsilon \dots (12)$$

$$\Delta INV_t = \alpha_0 INF + \sum_{i=1}^{k}\delta_1\Delta INV_{t-i} + \sum_{i=1}^{k}\delta_{2INF}\Delta CF_{t-i} + \sum_{i=1}^{k}\delta_{3INF}\Delta GDP_{t-i} + \sum_{i=1}^{k}\delta_{4INF}\Delta TBR_{t-i} + \sum_{i=1}^{k}\delta_{5INF}\Delta EXR_{t-i} + \sum_{i=1}^{k}\delta_{6INF}\,\Delta TGE_{t-i} + \sum_{i=1}^{k}\delta_{7INF}\Delta POP_{t-i} + \gamma ECT_{t-1} + \varepsilon \dots (13)$$

$$\Delta TBR_t = \alpha_0 TBR + \sum_{i=1}^{k}\delta_1\Delta TBR_{t-i} + \sum_{i=1}^{k}\delta_{2TBR}\Delta CF_{t-i} + \sum_{i=1}^{k}\delta_{3TBR}\Delta INV_{t-i} + \sum_{i=1}^{k}\delta_{4TBR}\Delta GDP_{t-i} + \sum_{i=1}^{k}\delta_{5TBR}\Delta EXR_{t-i} + \sum_{i=1}^{k}\delta_{6TBR}\,\Delta TGE_{t-i} + \sum_{i=1}^{k}\delta_{7TBR}\Delta POP_{t-i} + \varepsilon \dots (14)$$

$$\Delta EXR_t = \alpha_0 EXR + \sum_{i=1}^{k} \delta_1 \Delta EXR_{t-i} + \sum_{i=1}^{k} \delta_{2EXR} \Delta CF_{t-i} + \sum_{i=1}^{k} \delta_{3EXR} \Delta INV_{t-i} + \sum_{i=1}^{k} \delta_{4EXR} \Delta TBR_{t-i} + \sum_{i=1}^{k} \delta_{5EXR} \Delta GDP_{t-i} + \sum_{i=1}^{k} \delta_{6EXR} \Delta TGE_{t-i} + \sum_{i=1}^{k} \delta_{7EXR} \Delta POP_{t-i} + \varepsilon \dots (15)$$

$$\Delta TGE_t = \alpha_0 TGE + \sum_{i=1}^{k} \delta_1 \Delta TGE_{t-i} + \sum_{i=1}^{k} \delta_{2TGE} \Delta CF_{t-i} + \sum_{i=1}^{k} \delta_{3TGE} \Delta INV_{t-i} + \sum_{i=1}^{k} \delta_{4TGE} \Delta TBR_{t-i} + \sum_{i=1}^{k} \delta_{5TGE} \Delta EXR_{t-i} + \sum_{i=1}^{k} \delta_{6TGE} \Delta GDP_{t-i} + \sum_{i=1}^{k} \delta_{7TGE} \Delta POP_{t-i} + \gamma ECT_{t-1} + \varepsilon \dots (16)$$

$$\Delta POP_t = \alpha_0 M2 + \sum_{i=1}^{k} \delta_1 \Delta POP_{t-i} + \sum_{i=1}^{k} \delta_{2M2} \Delta CF_{t-i} + \sum_{i=1}^{k} \delta_{3M2} \Delta INV_{t-i} + \sum_{i=1}^{k} \delta_{4M2} \Delta TBR_{t-i} + \sum_{i=1}^{k} \delta_{5M2} \Delta EXR_{t-i} + \sum_{i=1}^{k} \delta_{6M2} \Delta TGE_{t-i} + \sum_{i=1}^{k} \delta_{7M2} \Delta GDP_{t-i} + \varepsilon \dots (17)$$

Where

i. GDP_t =lnGDP, CF_t=lnCF, INV_t=lnINV, TBR_t=lnTBR,TGE=lnTGE and POP=lnPOP
ii. ECT_{t-1} is the lagged error correction term. As equations 11,12 13, 14, 15, 16, and 17 indicate, Granger causality among lnGDP, lnCF and lnINV, lnTBR, lnEXR, lnTGE and lnPOP can be revealed by testing the following hypothesis:
iii. For short-run Granger causality**:**

(Ho:$\delta_{GDP}=\delta_{CF}=\delta_{INV}=\delta_{TBR}=\delta_{EXR}=\delta_{TGE=}\delta_{POP=}0$)that is, there is no short-run causality against the alternative hypothesis that**:(** H_1: $\delta_{GDP}\neq\delta_{CF}\neq\delta_{INV}\neq\delta_{TBR}\neq\delta_{EXR}\neq\delta_{TGE}\neq\delta_{POP}\neq0$).

iv. For the long-run Granger-causality: **(H_0:$\gamma_1=\gamma_2=\gamma_3=\gamma_4=\gamma_5=\gamma_{6=}\gamma_{7=}0$)** against the alternative hypothesis that **(H_1:$\gamma_1\neq\gamma_2\neq\gamma_3\neq\gamma_4\neq\gamma_5\neq\gamma_6\neq\gamma_7\neq 0$)** where 1 to 7 represent lnGDP, lnCF, lnINV, lnTBR and lnEXR,lnTGE and lnPOP .

The H_0 suggests that there is no causality while H_1 suggests otherwise.

The Δ *is the difference operator, while*δ and γ measure the short run and long run causality respectively. The ECT_{t-1} is only included in those equations that show long run relationshipsuch as lnINV and lnTGE (Mounir, 2014, Narayan and Narayan, 2005).

4. Empirical Results

4.1. Unit Root test

	Augmented Dickey-Fuller(ADF) test				**Phillips-Perron(PP) test**		
Variables	t-test	AIC(lag)	Critical value	Decision	t-test	Critical value	Decision
$lnGDP_{(I/T)}$	-8.82* (0.00)	1	-4.66	I(1)	-11.85* (0.00)	-4.61	I(1)
$lnCF_{(I)}$	-6.20* (0.00)	1	-3.85	I(0)	-8.31* (0.00)	-3.85	I(0)
$lnINV_{(I/T)}$	-4.33* (0.00)	1	-3.88	I(0)	-5.12* (0.00)	-3.85	I(0)
$lnTBR_{I/T}$	-4.11* (0.00)	1	-3.88	I(0)	-4.68* (0.00)	-3.85	I(0)
$lnEXR_{I/T}$	-5.25* (0.06)	1	-4.61	I(1)	-11.85* (0.07)	-4.61	I(1)
$LnTGE_{I/T}$	-5.03* (0.00)	1	-3.88	I(0)	-17.99* (0.00)	-3.85	I(0)
$lnPOP_{I/T}$	-7.53* (0.00)	1	-3.85	I(0)	-11.44* (0.00)	-3.60	I(0)

Table 1

Numbers in parentheses are probability values of the t-test. *, ** and *** denote rejection of the null hypothesis at 1%, 5% and 10% respectively. (I) denotes differencing using intercept only while (I/T) denotes differencing with both intercept and trend. AIC means Akaike information criterion.

4.2. Estimated Long-Run Coefficients using the ARDL-OLS technique

Variable	Coefficient	t-statistic	Prob
Constant	4.818	1.143	0.277
@Trend	0.001	1.592	0.139
lnCF	0.019	1.085	0.300
LnTBR	0.033	2.239	0.046
LnEXR	-0.071	-2.054	0.064
LnTGE	-0.102	-1.643	0.128
LnINV	0.074	2.040	0.066
LnPOP	-187.924	-1.125	0.284
R-squared	**0.68**		
F-statistic	3.44		**0.03**
DW-statistic			**1.98**

Table 2: Normalising on D(lnGDP), the following results are obtained

It can be seen from Table 2 that Common Fund has insignificant positive impact on the Economic Growth in Ghana. The t-statistic of 1.085 and P-value of 0.3 suggest that Common Fund has very insignificant impact on the economic growth in Ghana. 1% point increase in Common Fund leads to a 0.01% point increase in Economic Growth in Ghana.

4.3. Cointegration Test: ARDL approach

Dependent Variables	Cointegration-Wald F-test	AIC	Decision on H_O
F(lnGDP)	3.58	2	Accept
F(lnCF)	1.79	2	Accept
F(lnINV)	4.58	2	Reject
F(lnTBR)	1.30	2	Accept
F(lnEXR)	0.96	2	Accept
F(lnTGE)	57.64	2	Reject
F(lnPOP)	3.23	2	Accept

Table 3

	I(0)	(1)
1%	5.155	6.265
5%	3.538	4.428
10%	2.915	3.695

Table 3b: BOUNDS TEST CRITICAL VALUE

Note: Lower and Upper critical values are taken from Narayan and Narayan (2005)
There is presence of cointegration when we normalize on lnINV and lnTGE because their respective Wald F-statistic is greater than the upper bounds critical value of 4.428 at 5%. This means that Vector Error Correction model could be used to discern the direction of causality.

4.4. VEC Granger-causality
The Long-run relationship and short-run dynamics among the variables are examined using VEC Granger-causality. The F-statistic measures the short-run causality while the t-statistic measures the long-run causality. The P-value of 5% is significant, 6% to 10% is considered weak significant while P-value of more than 10% is considered insignificant.

Variables	F-statistic	t-statistic [ECT(t-1)]
GDP Granger-cause CF	1.03 (0.59)	0.59 (0.12)
CF Granger-cause GDP	5.27 (0.07)*	-0.01 (0.00)

Table 4

(*) denotes significance at 10%. The values in ( ) are the P- values for the various F and t- tests.

There is unidirectional causality running from Common Fund to GDP in the long run as can be seen from Table 4 above.

5. Conclusion and Policy Implication

This study examines the the causal relationship between Common Fund and Economic Growth in Ghana by using the newly developed ARDL model. The study reveals that Common Fund has vey insignificant impact on the Economic Growth in Ghana. The study further reveals that there is a long run relationship among the variables and there exists unidirectional causality running from Common Fund to Economic Growth. The policy implication is that for Common Fund to have a desired effect on Economic Growth in the long run, it should be increased substantially and corrupt practices and embezzlements should be nibbed in the bud.These results should however be interpreted with caution because the findings might be slightly different if large data is used.

6. Diagnostic test

	P-value of F-statistic
Serial correlation: Breusch-Godfrey test	0.72
Heteroscedasticity: Breusch-Pagan-Godfrey ARCH(1) effect	0.36 0.35
Jarque-Bera test of normality	0.71
Cusum (stability) test	See Fig 1 below

Table 5: Result of Diagnostic test

The regression for equation 4 passes all the diagnostic tests. There are no presence of serial correlation (Breusch-Godfrey test) and heteroscedasticity (Breusch-Pagan-Godfrey and ARCH 1 effect). These facts are attested by the insignificant P-values of the serial correlation and heteroscedasticity in Table 5 above. Again, the residuals of the error term are found to be normally distributed as shown by the Jarque-Bera P-value of 0.71 in Table 5 above. Also, the stability of the long-run coefficients is tested using the cumulative sum of recursive residuals (CUSUM) test. The Figure 1 below shows the result for the CUSUM test which indicates that there has been stability of the coefficients because the plot of the CUSUM statistic falls inside the critical bands of the 5% confidence interval of parameter stability.

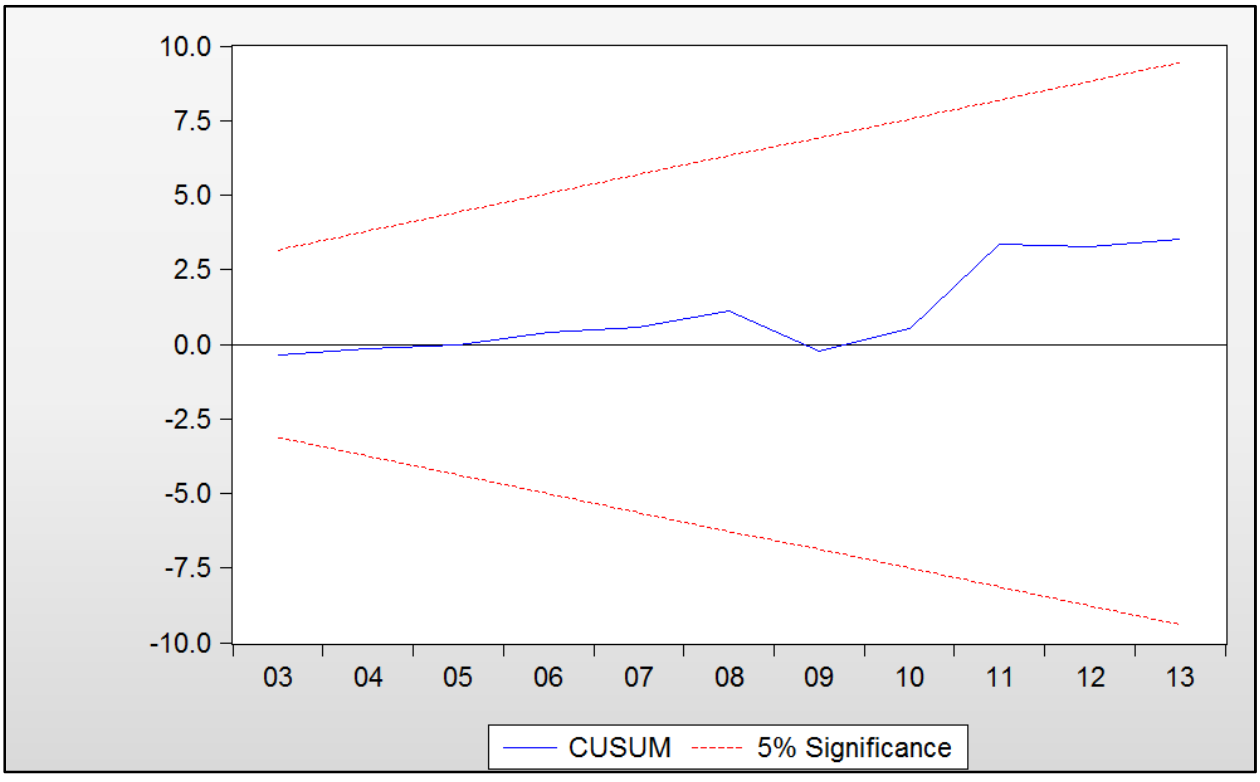

Figure 1 CUSUM test

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