Fiscal Cyclicality in the Anglophone West Africa and Guinea: Panel Data Assessments of Contemporaneous and Lagged Fiscal Rules

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by

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Abstracts
This study assessed the nature of fiscal cyclicality within the Anglophone West African countries as well as Guinea (all known as the West African Monetary Zone (WAMZ) countries). This study was conducted within the context of the achievement of fiscal cyclicality objectives over the period covered by the study, as a pointer to the future due to the proposed monetary integration of the West African sub region. The cyclical conduct of fiscal policy by member countries of a monetary union is a crucial determinant of the coherence of the monetary union and hence, the significance of understanding the cyclical behaviour of fiscal policy within these West African countries. In this study, the models of fiscal policy cyclical behaviour of these WAMZ countries were specified at the level and backward-looking in line with the contemporaneous fiscal rule model and lagged fiscal rule model; and were estimated using annual panel data of the relative fiscal and output variables of the WAMZ countries spanning generally over the 15-year period between 2000 and 2014. The countries under assessment are commodity exporting countries and the commodity windfalls uniformly influence government expenditure patterns in these countries. This makes the panel data regression estimations employed in this study to be appropriate. Panel data random effects generalised least square (RE-GLS) regressions, random effects maximum likelihood estimation (RE-MLE) regressions, generalised estimating equation (GEE) population-averaged regressions and fixed effects regressions were performed to generate results. The statistically significant results of the estimations of the contemporaneous fiscal rule estimations suggested counter-cyclicality across the four methods of regression. However, the lagged fiscal rule regression estimates generated statistically insignificant information about co-movements of fiscal policy and real output cycle variables, although counter-cyclicality was equally established. The indication of this is that fiscal policies move against business cycles in the Anglophone countries and Guinea, implying that in 'bust' or financial and economic crisis, fiscal authorities in these countries are likely to opt for expansionary fiscal policies (lowering revenue/taxes and raising expenditures) while they are likely to contract fiscal policy during 'boom'. If on the take-off of monetary integration in West Africa, fiscal policy matters are eventually relinquished to national authorities, these would have implications for fiscal policy/monetary policy interactions within the proposed West African monetary union, when monetary policy would be in the hand of a supranational regional monetary authority while the fiscal policies would be in the hands of fifteen national authorities.

1. Introduction

Fiscal cyclicality study deals with the movements of fiscal variables alongside output cycle; and the direction towards which revenues and expenditures move with output cycle. As a pointer to the future and within the context of the achievement of fiscal cyclicality objectives, this research study aimed at revealing the nature of fiscal cyclicality within the Anglophone West African countries as well as Guinea (all known as the West African Monetary Zone (WAMZ) countries) over the period covered by the study. The cyclical conduct of fiscal policy by member countries of a monetary union is a crucial determinant of the coherence of the monetary union. Fiscal policy could be counter-cyclical or pro-cyclical. Counter-cyclical fiscal policy enhances macroeconomic stability while pro-cyclicality causes further cross-country macroeconomic differences. These underpin the significance of the understanding the cyclical behaviour of fiscal policy within and in the context of the West African countries being examined, given the proposed monetary integration of the West African sub region.

2. Theory and Concept of Fiscal Policy Cyclicality

The investigations of consistency of the actual behaviour of fiscal authorities with the cyclical stabilisation of fiscal policy objectives have, in the last few decades, come to the fore. For existing and proposed monetary unions, this is an area of research interest since fiscal policy will always serve as a tool of macroeconomic stabilisation when dealing with the country specific shocks emanating from the union's member state. When countries join a monetary union, it is automatic they will lose monetary policy tools that were hitherto available for fighting against shocks. If the countries within such monetary union are displaying some structural dissimilarities, this could make the loss of monetary policy instruments to be much more significant as these countries would be susceptible to asymmetric shocks. Therefore, national fiscal policy should be able to cushion the idiosyncratic shocks that might result due to the loss of national monetary policy.

Within the perspective of economic crisis and in the context of the Eurozone and the financial crisis (which serves as lesson for proposed currency unions like the WAMZ), Benetrix and Lane (2012) identify three reasons on the importance of clear understanding of the cyclical behaviour of fiscal policy: (i)in consideration of the divergent macroeconomic outcomes in the Eurozone, which is an important factor in the

Eurozone crisis, there is need to understand the role of national fiscal policies; (ii) it is possible for the capacity of Eurozone countries to have been limited or constrained by insufficient fiscal counter cyclicality in the pre-crisis period; (iii) to have an understanding of fiscal performance during the pre-crisis period, it is essential to have a broader look into fiscal cyclicality as fiscal volatility could be caused by financial cycles even with small output gaps.

Fiscal cyclicality study centres on how fiscal variables move with output cycle. Simply defined, fiscal cyclicality is the direction towards which the fiscal variables (revenues and expenditures) move with output cycle. Kaminsky, Reinhart, and Vegh (2004) are the early advocate of the approach through which the cyclicality of fiscal policy could be determined by investigating the direction of co-movements between the instruments of fiscal policy and economic output cycles. In their study, they proposed three forms of fiscal cyclicality a government could undertake: (i)*pro-cyclicality* – which is when the fiscal policy instruments move with the business cycle as government would reduce (raise) revenues and increase (lower) expenditures in good (bad) times;[1]*counter-cyclicality* – which when the fiscal policy instruments move against the business cycle as government raises (lowers) revenue/tax rate and lowers (raises) expenditure in good (bad) times: *acyclicality* – which is when government revenues and expenditures are constant over the economic cycles and this will neither reinforce nor stabilise the business cycle (Mpatswe, Tapsoba and York, 2011). Furthermore, Benetrix and Lane (2012) pointed out that "a constant government budget balance/GDP ratio over the cycle may be regarded as acyclical in a descriptive sense, but it is pro-cyclical in terms of the underlying dynamics with revenue gains upswing used to finance spending increases or tax cuts and revenue declines downturn inducing spending cuts or tax hike".

Fiscal policy would be effective if it is able to smooth the volatility of output during business cycles. During the booms, fiscal policy should contract while it should expand during recessions, thus portraying its counter-cyclicality. In the theoretical sense, three economic schools of thought (Neo-classical, the Keynesian and the New Growth theorists) are proponents of counter-cyclical fiscal policy. However, empirical studies reveal that many countries run pro-cyclical fiscal policy. The consensus point to the resolution that

[1]Simply put, there would be expansionary fiscal policy during economic booms and contractionary policy during recession.

the pro-cyclicality of fiscal policy should only be required when market needs to be stabilised and the sustainability of fiscal policy is necessary.

Borrowing largely from Hathroubi and Rezgui (2011), we can express some of the theoretical underpinnings of the cyclical nature of fiscal policy which are in line with the analytical frameworks of Neo-classical and Keynesian economists. Evaluating the government's fiscal response during the bad times (or sharp cycle contractions), the position of the Keynesian economists is that this stems from an expansionary budget deficit either through a tax cut that increases the current revenue or increase in public expenditure that stimulates demand. It could be deduced here that the fiscal policy's counter-cyclicality orientation is optimal. On the other hand, neo-classical economists' position is that debt is counter-cyclical to revenue, and that the optimal fiscal policy involves 'tax rate smoothing' so as to reduce 'tax excess burden' or the 'well-being cost of tax',[2] allow the generation of necessary financial resources to cover government's spending needs and also avoid the conflict between government (that raises taxes revenue to finance its expenditure) and consumers (that pay taxes). Consequently, if the level of activity/revenue (without government discretionary intervention through tax rate) is the only determinant of tax revenues, the budget deficits and public debt should therefore widen during the bad times and shrink during the good times, thus causing the level of government expenditure to affect the level of debt.[3] Another view point of the neoclassical economists is that fiscal policy cyclicality could also be determined by 'the degree of substitution between public consumption and private demand for consumption and investment'.[4] From these explanations, fiscal policy cyclicality cannot be interpreted in isolation of the expansionary or contractionary effect of the fiscal policy. Consequently, the optimality of counter-cyclicality of fiscal policy also implies the optimality of budgetary stimulus that stabilises the economy. Within the perspective of the Keynesian and neo-classical economics, public expenditure increase would stimulate economy during recession while it would be dangerous to allow fiscal cyclicality during recession

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[2]Tax smoothing is optimal since it satisfies the government interpemporal budget contraints.
[3]Hathroubi and Rezgui (2011) citing Barro (1974, 1979).
[4]Hathroubi and Rezgui (2011) citing Aschauer, 1989)

since a reduction in public expenditure will result into an amplified negative consequence on the economic output.[5]

Studies reveal that in many developing countries, particularly in African countries, fiscal policies have been pro-cyclical, contracting during bad times and expanding during good times (Thornton (2008); Lledo, Yackvoc and Gadene (2011)). Dessus, Sanchez and Varoundakus (2013) who got evidence of fiscal policy pro-cyclicality in WAEMU cite Aizenman et al (2000) and Gavin and Perotti (1977) as concluding that often, fiscal policy pro-cyclicality is explained by the loss of access to international capital market during recession (bad times) and which in the absence of fiscal space through accumulated savings make expansionary policies to be expensive (if not impossible) during bad times. It could be established by literature that the pro-cyclicality of fiscal policies are more pronounced in African countries than in more advanced countries due to: (a) lack of adequate automatic stabilisers; (b) difficulty in knowing the stage of the cycle, lags in fiscal policies; (c) little access to financing (domestic and external) during recessions; (iv) the tendency to increase government spending during expansion, thus leading to unsatisfied social demands. These are the reasons why pro-cyclicality is prevalent in the developing African context. Investigating if fiscal policy in Africa is able to contribute towards stabilising output growth volatility in Africa, Carmignani(2010) got evidence to established that though fiscal policy in Africa has prevalently Keynesian effect at both normal and abnormal times and that African countries tend to adopt pro-cyclical or acyclical fiscal policy stance as against the economic growth stabilising countercyclical fiscal policy.[6]

While stressing the significance of the cyclicality of fiscal policy, Strawczynski and Zeira (2007) posit that the importance of fiscal policy cyclicality stems from the view that it brings to the fore and to a large extent, the constraints faced by the government in forming its policies; and in support of the view in extant literature, they highlight that country with pro-cyclical fiscal policy are usually run by governments that face severe credit constraints.

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[5]In support of this position, Ilzetski and Vegh (2008) are able to establish the conditions for the optimality of fiscal policy counter-cyclicality.
[6]The approach employed by Carmignani (2010) builds on the simple theoretical view that 'if fiscal policy has Keynesian effect, then it must be run counter-cyclically to establish output growth'

3. Models of Fiscal Cyclicality

In a fiscal behaviour literature review by Golinelli and Momigliano (2007)[7] there are three basic specifications of fiscal behaviour in past studies. These are models in which:(i)changes in cyclically adjusted fiscal balance is explained by cyclically adjusted initial primary balance, debt and output gap; (ii) policymakers react to lag of primary balance (rather than cyclically adjusted initial primary balance);(iii)changes in primary balance is explained by lagged values of primary balance, debt and output gap. They however added that none of the three specifications could do justice to the richness of the studies reviewed. Following Ilzetzki and Vegh (2008) in line with some core fiscal rules, seven models of fiscal cyclicality that guide the empirical estimation of fiscal policy cyclical behaviour are specified below:

Model 1: Contemporaneous Fiscal Rule: This is a model of the contemporaneous fiscal rule exhibiting the models of reverse causality as:

$$g_t = \alpha + \tau y_t + \varepsilon_t \tag{1}$$

$$y_t = \alpha + \delta g_t + \mu_t \tag{2}$$

Where: g_t is the cyclical component of government expenditure at time t; y_t is the cyclical component of output at time t; α is the constant; ε_t is the residual representing an independently and identically distributed shock (fiscal shock) with mean 0 and variance σ_ε^2, μ_t is the residual representing an independently and identically distributed shock (supply shock) with mean 0 and variance σ_μ^2.

It is important not to neglect the possibility of endogeneity problem which reveal highly misleading result. Therefore, solving for the reduced form of equation (1) and equation (2) we have:

$$y_t = \delta\varepsilon_t + \mu_t/1 - \delta\tau \tag{3}$$

$$g_t = \tau\mu_t + \varepsilon_t/1 - \delta\tau \tag{4}$$

[7] http://ssrn.com/abstract=2004288 or http://dx.doi.org/10.2139/ssrn.2004288

Thus revealing the covariance between y_t and g_t as:

$$COV(y_t, g_t) = 1/(1 - \delta\tau)^2 \cdot (\delta \sigma_\varepsilon^2 + \tau\sigma_\mu^2) \qquad (5)$$

On the assumption of the absence of output shock, ($\sigma_\mu^2 = 0$), we generate:

$$COV(y_t, g_t)| \sigma_\mu^2 = 0 \; \delta\sigma_\varepsilon^2/(1 - \delta\tau)^2 > 0 \qquad (6)$$

Because the covariance between y_t and g_t is not zero, it would be inappropriate to estimate equation (1) by OLS. The way out is to estimate equation (1) by introduction instrumental variables in a Two-Stage Least Square (2SLS) estimation method. Lagged GDP growth would be applied as instrumental variable.

Model 2: Lagged Fiscal Rule: With this model, attempts are being made to test how statistically significant is the fiscal cyclical reactions to output and to further reveal if government expenditures has expansionary effect on output in these countries. If we assume that government expenditure does not respond to contemporaneous output, but lagged output; and that government expenditure and lagged output determines output, we have:

$$g_t = \alpha + \psi y_{t-1} + \varepsilon_t \qquad (7)$$

$$y_t = \alpha + \xi y_{t-1} + \lambda g_t + \mu_t \qquad (8)$$

Where: g_t is the cyclical component of government expenditure at time t; y_{t-1} is one period lagged the cyclical component of output at time t; α is the constant; ψ is parameter of estimated cyclicality coefficient; and ε_t is the residual representing an independently and identically distributed shock (fiscal shock) with mean 0 and variance σ_ε^2, μ_t is the residual representing an independently and identically distributed shock (supply shock) with mean 0 and variance σ_μ^2. If we substitute equation (7) into equation (8), we derive:

$$y_t = \alpha + (\xi + \psi\lambda) \, y_{t-1} + \theta_t \qquad (9)$$

Where: $\theta_t = \sigma_{\varepsilon t} + \sigma_{\mu t}$

Assuming that $(\xi + \psi\lambda) < 1$, equation 9 can be expressed as:

$$y_t = \sum(\xi + \psi\lambda)^j \, \theta_{t-j} \qquad (10)$$

Consequently:

$$E(y_t) = 0$$

$$Var(y_t) = \sigma_\theta^2 / 1 - (\xi + \psi\lambda)^2$$

With the assumption that the objective of the policymaker is to minimize output variability for given values of ξ and λ, then, by implications, $1-(\xi + \psi\lambda)^2$ is maximized, hence the solution:

$$\psi^{opt} = -(\xi/\lambda)$$

The output variance is reduced to if this optimum is implemented, thus rendering an acyclical and procyclical policy to be apparently suboptimal. However, a countercyclical fiscal policy would cause an increase in government expenditure (g) to partly offset the decline in output (y). We can therefore estimate equation (7) and equation (8) by OLS because:

$$E(\varepsilon_t y_{t-1}) = 0$$

$$E(\mu_t y_{t-1}) = 0$$

$$E(\mu_t g_t) = 0$$

Model 3 and Model 4 – Time trend and non-cyclically adjusted fiscal variables: This is about the introduction into the fiscal behaviour model, time trend and lagged dependent variable of first difference of log of government expenditure (not cyclically adjusted).

$$\Delta lng_t = \alpha + \beta_1 \Delta lny_t + \zeta_1 lng_{t-1} + \gamma_1 T_t + \varepsilon_t \tag{11}$$

$$\Delta lng_t = \alpha + \beta_2 \Delta lny_t + \zeta_2 lng_{t-1} + \tau lny_{t-1} + \gamma_2 T_t + \varepsilon_t \tag{12}$$

Where: Δlng_t is the first difference log of government expenditure at time t; Δlny_t is the first difference log of real GDP at time t; T_t is time trend; β_1, β_2 are parameters of estimated cyclicality coefficient; and ε_t is error terms (representing fiscal shocks).

Model 5: Rule allowing automatic stabiliser to function fully: This model is in initial public finances explain the discretionary fiscal policy action. The model is consistent with a fiscal rule in which automatic stabiliser is expected to operate fully and effectively, Golinelli and Momigliano (2009):

$$\Delta lnpb^*_t = \alpha + \beta_3 lnpb^*_{t-1} + \zeta_3 gp_{t-1} + \gamma_3 D_{t \text{ or } t-1} + \varepsilon_t \qquad (13)$$

Where: $\Delta lnpb^*$ is the first difference of cyclically adjusted primary balance; $lnpb$ is primary balance; gp is output gap;[8] D_t is public debt; β_3 is parameters of estimated cyclicality coefficient; and ε_t is error terms (representing fiscal shocks).

Model 6: Discretionary fiscal action and the initial public finance: Because policymakers are more interested in headline figure, some researchers consider this model to be more realistic. This reason is in addition to the lack of cyclically adjusted fiscal data three or four decades ago when cyclical adjustments of fiscal variables were not common.[9]

$$\Delta pb^*_t = \alpha + \beta_4 pb_{t-1} + \zeta_4 gp_{t-1} + \gamma_4 D_{t \text{ or } t-1} + \varepsilon_t \qquad (14)$$

Where: Δpb^* is the first difference of cyclically adjusted primary balance; pb is primary balance; gp is output gap (either at the year in which budgetary action; D_t is public debt; $\beta_4, \zeta_4, \gamma_4$ are parameters of estimated cyclicality coefficient; and ε_t is error terms (representing fiscal shocks).

Model 7: Fiscal policy decision incorporating discretionary actions and automatic stabiliser: This model is expressed as:

$$\Delta pb_t = \alpha + \beta_5 pb_{t-1} + \zeta_5 gp_{t-1} + \gamma_5 D_{t \text{ or } t-1} + \varepsilon_t \qquad (15)$$

Where: Δpb is the first difference primary balance; pb is primary balance; gp is output gap; D_t is public debt; β_5 is parameters of estimated cyclicality coefficient; ε_t is error term (representing fiscal shocks).

4. Data and Methods

In this study, the models of fiscal policy cyclical behaviour of the Anglophone West African countries and Guinea were specified at the level and backward-looking in line with the contemporaneous fiscal rule model and lagged fiscal rule model expressed above. These equations were estimated using annual data of the relative fiscal variables of the WAMZ countries spanning generally over the 15-year period between 2000 and

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[8] For output gap, many past studies opt for time (*t)* output gap (indicating the year in which budgetary actions are effective while many apply time (*t-1*) which is the year when budgetary decision was taken.
[9] Golinelli and Momigliano (2009).

2014. There have been arguments that the estimation of the response of government expenditure (as fiscal instrument) to output is better to be annual rather than quarterly. This was a strong reason for the use of annual fiscal data and the real GDP data serving as proxy for output, coupled with the non-availability of quarterly fiscal data for these West African countries. The six WAMZ countries under assessment here are commodity exporting countries and the commodity windfalls uniformly influence government expenditure patterns in these countries. This makes the panel data regression estimations employed in this study to be appropriate.

The model of contemporaneous fiscal rule implies the instant reaction of the cyclical component of government spending to the cyclical component of real output (real GDP).[10] Therefore, Equation (1) estimates the response of government expenditure to contemporaneous output, thereby capturing a fiscal reaction function in which the coefficient τ represents fiscal policy cyclical stance. Therefore, fiscal policy in a WAMZ country would be countercyclical if *τ < 0*, procyclical if *τ >0*, and acyclical if *τ =0.* On the other hand, the model of lagged fiscal rule, while attempting to test how statistically significant is the fiscal cyclical reactions to output in the West African countries under study, further reveals if government expenditures has expansionary effect on output in these countries from a backward looking perspective, with the assumption that government expenditure does not respond to contemporaneous output. For the assessment of fiscal cyclicality in the Anglophone West Africa and Guinea, the panel data estimation were performed with the application of Equation (1) and Equation (7) for the contemporaneous and lagged fiscal rules respectively. Panel data random effects generalised least square (RE-GLS) regression, random effects maximum likelihood estimation (RE-MLE) regression, generalised estimating equation (GEE) population-averaged regression and fixed effects regressions were performed to generate results.

To gather further evidence of fiscal cyclicality in the WAMZ countries, further steps are taken to incorporate some explanatory control variables (like first difference log of output and time trend) into the fiscal cyclicality analysis. The dependent variable (government expenditure) is also in first difference.

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[10] Mpatswe et al (2011) point out that this is the Taylor-type reaction function without inflation terms.

5. Findings and Results

The unbalanced panel data estimation results of the random effects GLS, random effects MLE, population-averaged and fixed effects regressions are exhibited in Table 1 below in which all coefficients of real output are statistically significant at the 5% for the contemporaneous fiscal rule estimations, suggesting counter-cyclicality across the four methods of regression.

Table 1
Results of Unbalanced Panel Data Estimations of Fiscal Cyclicality

Models of Contemporaneous and Lagged Fiscal Rules		
Estimation Method	*Contemporaneous Coefficient*	*Lagged Coefficient*
Random Effects GLS Regression	-0.7206* (0.1821) *Wald Stat:15.65* *Prob: (0.00)*	-0.1892 (0.1689) *Wald Stat:1.25* *Prob: (0.26*)
Random Effects MLE Regression	-0.6092* (0.1256) *LR Stat:21.79* *Prob: (0.00)*	-0.1838 (0.1343) *Wald Stat:1.86* *Prob: (0.17)*
Fixed Effect Regression	-0.6049* (0.1260) *F Stat:23.06* *Prob: (0.00)*	-0.1834 (0.1348) *F Stat:1.85* *Prob: (0.18)*
GEE Population Averaged Regression	-0.6194* (0.1508) *LR Stat:16.86* *Prob: (0.00)*	-0.1849 (0.1655) *LR Stat:1.26* *Prob: (0.26)*

Source: Author's Estimation and Stata 14 Output.
Note: Standard error coefficients are in parenthesis.
* represents 5% levels of significance.

There are joint significance as evident by the Wald-statistics, F-statistics and LR-statistics. The lagged fiscal rule regression estimates exhibits statistically insignificant of the coefficients of interest as well as the statistical joint insignificance of panel regression methods as revealed by the Wald-statistics, F-statistics and LR-statistics indicating that there are no statistical significant information about co-movements of fiscal policy and real output cycle variables in the WAMZ. It should be noted that the backward looking perspective evaluation is with the assumption that government expenditure does not respond to contemporaneous output.

6. Conclusions

Within the context of the achievement of fiscal cyclicality objectives, this research study assessed the nature of fiscal cyclicality within the Anglophone West African countries as well as Guinea (all known as the West African Monetary Zone (WAMZ) countries) over the 15-year period covered by the study, as a pointer to the future. Panel data random effects generalised least square (RE-GLS) regression, random effects maximum likelihood estimation (RE-MLE) regression, generalised estimating equation (GEE) population-averaged regression and fixed effects regressions were performed to generate results which prompted the suggestion of significant counter-cyclicality across the Anglophone West African countries and Guinea (the WAMZ). The statistically significant results of the estimations of the contemporaneous fiscal rule estimations suggested counter-cyclicality across the four methods of regression. The panel data estimations produced evidence to suggest that government expenditure responds to contemporaneous output, but not lagged output in these WAMZ in which counter-cyclicality was equally established. What these denote for the future West African monetary union is that fiscal policies moves against business cycles in the Anglophone countries and Guinea evaluated in this study. In 'bust' or financial and economic crisis, fiscal authorities in these countries are likely to opt for expansionary fiscal policies (lowering revenue/taxes and raising expenditures) while they are likely to contract fiscal policy during 'boom'. These would have effects on the monetary integration of the West Africa, if on the take-off of the West African monetary union, fiscal policy matters are eventually relinquished to national authorities, with implications for fiscal policy/monetary policy interactions as reflected in fiscal policy and/or monetary policy regimes dominance stances across countries within the proposed West African monetary union when monetary policy would be in the hand of a supranational regional monetary authority while the fiscal policies would be in the hands of up to fifteen national authorities.

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