Monetary-Fiscal Policy Interactions and Tests for Monetary Dominance in the West African Monetary Zone

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Abstract

In 2000, the West African Monetary Zone was formally established. The monetary zone has six members: The Gambia, Ghana, Guinea, Liberia, Nigeria and Sierra Leone. The objective of the WAMZ was to establish a monetary union characterised by a common central bank and a single currency (the *eco)*, which was to replace the existing national currencies of members. The proposed monetary union failed to commence after some few attempts, the last of which was in 2015. The initial plan was that the WAMZ (of the Anglophone West African countries and Guinea) will merge will merge with the existing West African CFA zone franc shared by members of the West African Economic and Monetary Union (WAEMU) to form a formidable monetary union across the whole of West Africa in the future as part of the African Economic Community's six-stage process of achieving a monetary union and a single currency for Africa by 2028. The failed January 2015 take off of the WAMZ caused the Heads of States and Governments of the Economic Community of West African States (ECOWAS) to change focus and strategy by relinquishing the initial plan of the WAMZ-WAEMU merger and replacing this with rescheduling the creation of a single currency for the 15-member ECOWAS countries by 2020. Since WAEMU is already a monetary union with established single currency, common central bank and integrated monetary-fiscal policy interactions, the assessment of WAMZ (as the other integral part of West African sub-region) in these respects is necessary. Consequently, the focus of this paper is the evaluation the monetary-fiscal policies interactions in the WAMZ as well as establish the extent of monetary dominance as against fiscal dominance in the monetary zone. The modelling of monetary policy follows the standard Taylor rule which makes the nominal interest rate to depend on inflation and output gap. In monetary reaction function, Taylor (1993) proposed short term interest rate as monetary policy instrument in which the conjecture was that there would be increase in the Federal Fund rate if there is increase in inflation above its target or if there is increase in output gap above the value of its trend. On the fiscal side, this study applied the fiscal rule suggested by Davig and Leeper (2005, 2013) in which government revenue/GDP ratio reacts to government expenditure ratio, public debt ratio and output gap in modelling fiscal policy in the WAMZ. This study applied monthly data of monetary and fiscal policy rules. The applied monthly monetary and fiscal data for the WAMZ countries span from 2001M1 to 2015M12. The econometric estimation method employed is the regime switching regressions of Markov regime switching models of the Taylor monetary rule (augmented by interest rate smoothing) and of the fiscal rule suggested by Davig and Leeper (2005) augmented with lagged values of government revenue scaled by output. Estimation results are varied across the six WAMZ countries. Evidence gathered from the interactions of monetary and fiscal policies across the WAMZ are strong enough to suggest that The Gambia and Ghana have strong monetary dominance (the Ricardian equivalence) in the two estimated regimes. Nigeria, the lead economy only exhibit monetary dominance in Regime 1. All the WAMZ countries display monetary dominance in Regime 2 apart from Nigeria which manifests the 'indeterminacy' status in Regime 2. None of the WAMZ countries have the explosive and the 'Non-Ricardian' postures. Given the high probability of staying in either of the regime, for the six WAMZ countries, these results are good enough for the membership of the proposed monetary integration of West Africa.

1.1 Introduction

The Economic Community of West African (ECOWAS) has a long term objective of establishing an economic and monetary union between all member countries.When ECOWAS revised its Treaty in 1993, the crucial aim was to accelerate the economic integration process and strengthen political cooperation. The revised objectives heralded the formation of a second monetary zone, the West African Monetary Zone (WAMZ) which formally came into existence on 15 December, 2000 when five prospective member countries (The Gambia, Ghana, Guinea, Nigeria and Sierra Leone) signed the Articles of Agreement of the zone. This Accra Declaration established the WAMZ. At ECOWAS, the thinking was that the successful launch of the WAMZ would aid the merger with the CFA zone and that this would usher-in the ECOWAS single currency, the *eco*. The establishment of a monetary union characterised by a common central bank and a single currency (*the eco*) which is to replace the existing five national currencies is the main objective of the WAMZ which was initially scheduled to take-off in January 2003. Liberia later joined the WAMZ.

A mid-term convergence assessment in 2002 revealed that despite some achievements by WAMZ member countries, these were not adequate enough support the take-off of the monetary union in January 2003. A major problem was the inadequate commitment of member countries of WAMZ to support their commitment expressed with actions. This consequently led to the extension of the WAMZ programme to 30 June, 2005 so that the common central bank and the common currency would take off on 1 July 2005. Another deadline of 31 December, 2009 was set so that the single currency and the common central bank would be effective from 1 January 2010. Due to same reasons this could not be met. The official reason for this action was stated as "the global economic and financial crisis which has put constraints on member state's ability to meet the convergence criteria individually and collectively". The last agreed take off date of 1 January 2015 actually became unrealistic and failed. This caused the Heads of States and Governments of the Economic Community of West African States (ECOWAS) to change focus and strategy by relinquishing the initial plan of the WAMZ-WAEMU merger and replacing this with rescheduling the creation of a single currency for the 15-member ECOWAS countries by 2020.

The making of monetary policy and fiscal policy are two distinct functions of government. While monetary policy action relates to how a central bank controls nominal interest rates and money supply to impact economic conditions, fiscal policy is about the decision of government to raise revenue (tax) and about how proceeds from revenues are to be spent. The contention here is in the conflicts of the objectives and targets of these policies and their instruments as well as the coordination of the two policies. Two major factors highlighted as the causes of the non-alignments in the two policies are: (1) policy's institutional structure; and (2) the credibility of the principal actors. These (and other factors) make the interactions of the two policies of government to be cloudy and complete and more complex in the cases of monetary unions. As already indicated, the loss of monetary independence is a cost of joining a monetary union. If a monetary union is to be successful, price stability of member state should be made paramount; and with the loss of monetary powers at national levels, fiscal policy remains the only instrument available at national levels to maintain price stability. The loss of monetary sovereignty thus increases the potential role of fiscal policy as instrument of economic output stabilisation. The effectiveness of fiscal policy (in counteracting asymmetric and real economic shocks) is a strong determinant of the success of a monetary union.

In a monetary union, respective objectives and functions of common monetary policy and several national fiscal policies are clearly specified. Usually, the primary objective of a monetary union's monetary policy is the maintenance of price stability within the area covered by such monetary integration. On fiscal policy side, individual national authority is responsible for the commitment towards ensuring sound public finance, even if there are formal laid-down framework for fiscal coordination and other fiscal policy requirements across the monetary union. Towards the achievement of the overall goals of a monetary union, it is necessary for monetary and fiscal policies to interact well. One of the instance of monetary policy interactions with the fiscal policy is when a well formulated monetary policy (with its focus on price stability) promotes the stability of inflation expectations and ensures the achievement of low inflation risks premia. These together assist in reducing the level of long term interest rates and its volatility which in turn, benefits government's debt servicing costs. On the other hand, there are effects of fiscal policy on monetary policy when the supply side of the economy is shaped by tax regime adopted or when long term interest rate is influenced

through public debt, making the demand side effect of fiscal policy to directly be on inflation outlook. Nevertheless, there are complications and complexities arising out of these owing to the feature of monetary unions in which there is a single monetary policy for many fiscal policies.

The formation of a monetary union (or the plan to form a monetary union) would raise some question about the combination of (and co-ordination of) monetary policy and fiscal policy as well as the determination of the optimal mix of the two economic policies. Member countries of such monetary union (or prospective monetary union), each with its own fiscal spending and revenue policy, are (will be) joined together by a single monetary policy in countries with varied population of private economic agents. Crucial questions that come to mind are: (a) if such common monetary policy has (or will have) same impact in each of the member countries; (b) if the effects on these countries would be according to their degree of public debts and sizes of these countries; and (c) how the separate fiscal policies affect (or will affect) the ability of the common central bank to control inflation and achieve its inflation targeting objective. These questions and concerns necessitate the investigation of policy mix in a monetary union member countries (or proposed member countries) in order to reveal in the economic regime is monetary dominant or fiscal dominant.

In spite of all these, a major issue of concern is that in a monetary union, national governments face a budget constraints and their decision-making is based on national variables while the supra monetary institution focuses on union-wide average variables. This makes the reaction of national governments to monetary policy and supply shocks not univocal.

Since WAEMU is already a monetary union with established single currency, common central bank and monetary-fiscal policy interactions, the assessment of WAMZ (as the other integral part of West African sub-region) in these respects is necessary. Consequently, the main objective of this paper is the investigation of the forms of the mix of monetary and fiscal policy that has sharpened the past across the WAMZ, through the assessments of monetary-fiscal policies interactions in the monetary zone as well as establish the extent of both monetary dominance as against fiscal dominance in the monetary zone.

2.1 Theory and Model

Leeper (1991) classified the behaviours of fiscal and monetary authorities as portrayed by the theories are classified into two forms by Leeper (1999) as: (i) 'passive' and (ii) 'active'. In general terms, Leeper (2016) connotes 'active' as a situation where the policy authority has the freedom to pursue its objective while 'passive' means the policy authority generates constraints through the active authority's behaviour and the price sector. These are from his FTPL's points of view. Since the two fundamental basic tasks of macroeconomic policies are: (a) to determine inflation; and (ii) to ensure debt stability. Leeper (2016) highlights the two different mixes of the interplay of monetary and fiscal behaviours that can guarantee the delivery of these two fundamental tasks: (a) active monetary policy with passive fiscal policy; and (b) active fiscal policy with passive monetary policy. Under aggressive inflation targeting regime (like in monetary unions), the policy combination of active monetary policy and passive fiscal policy (depicting monetary dominance) is appropriately necessary because under such policies combination, fiscal policy shocks would not be able to affect the price level. Simply put, under such regime, central bank raises nominal interest rate sharply whenever inflation rises (determination of inflation/price level) and then inform fiscal authority to ensure that whenever government debt rises, it should raise budget surpluses in future in order to finance that debt (debt stabilisation). When active fiscal policy is combined with passive monetary policy, policy makers set surplus largely independent of the levels of government debt and inflation condition. The fiscal behaviour eventually determines the price level. Debt would then be stabilised when the monetary authority allows the surprise changes in inflation and prices of bonds to adjust the value of government debt (revaluation of government debt). This results into government debt's market value being equal to the present value of future surplus. Here, the monetary authority does not attempt at fighting inflation.

Monetary Regime (or M-Regime) and Fiscal Regime (or Fiscal Regime) are the two regimes borne out of the summary of Leeper's propositions of the mix of the policies, described as 'consistent with a determinant equilibrium'. The equilibrium in the M-Regime relates to the conventional assignment of the two tasks of monetary control of inflation (for monetary policy) and fiscal assurance of government solvency (for fiscal policy). This is believed to be a common model of central bank. The assignment of the

two tasks is flipped in the F-Regime in which monetary policy is tasked with debt stabilisation and the price level determination is left with fiscal policy, thus altering the roles of the two policies. Table 1 below summarises the policies mix of price level determination and debt stabilisation.

Table 1: The Regimes of Two-Policy Mix of Price Determination and Debt Stabilisation

	The Nature of M-Regime	***The Nature of F-Regime***
Monetary Policy Actions	In targeting inflation, nominal interest rate is raised more than one-for-one with inflation.	In response to inflation, nominal interest rate is weakly adjusted in order to ensure that debt is not destabilised by interest payments on government debts.
Fiscal Policy Actions	Revenues (taxes) are raised when there is enough increase in real government debt to cover real debt services and eventually retire the increase in the principal value of debt.	Revenues (taxes) are made irresponsive to the state of government indebtedness and price level.
Label	Active monetary policy and passive fiscal policy. Monetary Dominance	Active fiscal policy and passive monetary policy. Fiscal Dominance

Source: Leeper, (2016)

The central point being stressed by Leeper's the active/passive framework is that there are different ways of determining the price levels, given the parameters of monetary and fiscal policy. In the M-Regime of active monetary policy and passive fiscal policy, the determination of the price level is governed by the quantity theory of money or the New Keynesian view of monetary policy, while in the F-Regime of active fiscal policy and passive monetary policy, the FTPL governs the determination of the price level. A very crucial and important state that in both regimes, stability emanates from a passive policy that is able to accommodate the policy actions taken by the active authority. It is therefore necessary for an inflation targeting central bank to be confident that the behaviour of fiscal policy would be 'passive'. Nevertheless, a vital point to note (particularly, in cases of monetary unions) is that the control of inflation by monetary policy requires the appropriate support/backing of fiscal policy, hence the need for the policies to interact well in order to achieve the two macroeconomic goals and avert economic crisis.

Leeper's model sees monetary policy goal as 'guiding inflation towards its target'. Therefore, a monetary policy is active when it is tight, contractionary and if the policy decisions guide inflation to its target. Monetary policy is passive when there is divergence from inflation target. On fiscal side, fiscal policy is active when it is loose, expansionary and allows budget deficit higher than the sustainable budget deficit; but passive when the policy is tight, contractionary and ensures long term equilibrium. What is drawn from these is the distinction in the domination of the economy, between monetary domination and fiscal domination. Table 2 below reveals the clear distinction between a monetary dominance and fiscal dominance regimes.

Table 2: Distinction between Monetary Dominance and Fiscal Dominance

Monetary Dominance (M-Regime): **Fiscal policy exhibits 'Ricardian equivalence';* **Monetary policy follows its inflation target path.*	*Active Monetary Policy*	Monetary authority pursues its inflation target independent of fiscal policies. Tight, contractionary monetary policy
	Passive Fiscal Policy	Fiscal authority determines tax and spending levels, independent of GIBC consideration. Loose and expansionary fiscal policy
Fiscal Dominance (F-Regime): **Fiscal policy exhibits 'non-Ricardian equivalence;* **Fiscal policy significantly affects inflation and price stability;* **Monetary policy ensures public debt stability;* *FTPL holds.*	*Active Fiscal Policy*	Fiscal authority effects tax and expenditure changes in order to balance the budget intertemporaly. Fiscal policy allows long run unsustainable and excessively budget deficit higher than the sustainable budget deficit. Loose and expansionary fiscal policy.
	Passive Monetary Policy	Monetary authority sets interest rates to accommodate fiscal policy. Loose, expansionary monetary policy

Source: Leeper, (2016)

In an F-regime of fiscal dominance, whenever there is a rise in price level due to expansionary fiscal shock, monetary growth would passively increase equally because the monetary authority is compelled to accommodate the fiscal shock. If the long term government budget balance is to be maintained under this regime in which fiscal policy allows long run unsustainable and excessively high budget deficits, the proposition of Leeper's model is that inflation target of central bank would be abandoned, and the central bank gives room for the emergence of higher inflation (that is, expansionary monetary policy). This consequently causes the monetary authority to either inflate the

public debt or work towards generating seigniorage revenue that could be transferred to the fiscal side (budget). This thus reflect FD as a phenomenon of government's long term sustainability (when primary balance is not kept at equilibrium) and higher inflation is generated (than warranted) and original target of monetary policy is abandoned when loose (passive) monetary policy is adopted. It should be noted that it is an underlying assumption of the FTPL that government's actions are not constrained by budgetary issues; and according to FTPL (which holds in a FD regime), fiscal policy determines prices when there are no budgetary adjustments in response to fiscal shocks affecting the government intertemporal budget constraints (GIBC) thus reflecting the 'non-Ricardian' behaviour in which price is made to adjust to balance the budget constraints. Hence, fiscal policy plays a more important role than monetary policy in ensuring price stability and in determining inflation in a FD regime. Therefore, under such regime, fiscal policy changes must impact the price level regardless of the degree of monetary authority's commitment to price stability. In this 'non-Ricardian' fiscal policy situation, there could be high inflation and price instability. This appears not to be the best option for monetary unions. In an M-regime of monetary dominance, the central bank focuses on its inflation targeting goal while a passive and expansionary fiscal policy is in place to avoid the disruption to fiscal policy long term sustainability. In targeting inflation, if a monetary policy specifies the form and direction of interest rate movement in response to specific inflation and growth deviations, there could be stable/low inflation if fiscal policy is not considered when such fiscal policy displays 'Ricardian' behaviour. This is an instance of the implication of the FTPL. Leeper (1999) considers this policy mix as 'default' and as one that can guarantee stable policy combination. This is deemed more appropriate for monetary unions. However, when both policies are active, such expansionary fiscal shocks are addressed by monetary policy to some extent.

In the event of monetary integration when the monetary policy formulation will be transferred to a supra-national level and the formulation of fiscal policies (of members states) remains at national levels, the competing views or rather, the interactions of monetary and fiscal policies and how they affect inflation under two conflicting fiscal dominance and monetary dominance regimes are very crucial and relevant for policy makers at both national and supra-national levels within such monetary integrated bloc.

Specifically, FTPL could be of interest to monetary unions (and the WAMZ) because it will contribute in revealing and explaining the pattern of price level evolution across such monetary unions, particularly in member states. There are fiscal limitations imposed on existing and proposed members of existing and proposed monetary unions so as to ensure that the 'Ricardian regime' and 'monetary dominance' are institutionalised.

In this assessment, the modelling of monetary policy follows the standard Taylor rule which makes the nominal interest rate to depend on inflation and output gap. In the monetary reaction function, Taylor (1993) proposed short term interest rate as monetary policy instrument in which the conjecture was that there would be increase in the Federal Fund rate if there is increase in inflation above its target or if there is increase in output gap above the value of its trend. The Taylor's modelling of the nominal interest rate rule is simply given as:

$$i = f(\pi + yg) \qquad 1$$

where i is nominal interest rate, π is inflation and is yg output gap. Nevertheless, it is worthy of note to state that Taylor (1993) did not perform econometric estimation of the reaction function but only attach equal of value of 0.5 coefficients to inflation and output gap. Although, results generated in the estimation of the central bank reaction function by Taylor (1993) generated varied results, however, the common interpretation of Taylor rule is that inflation gap's weigh should be greater than unity (1) in order to show that real interest rate is raised by monetary authority in responding to higher inflation and the below-normal level of output requires lower interest rates. Monetary behaviour and the correlation between expected inflation, nominal interest rate and real interest rate (as established by 'Fisher Equation') could both be captured by this empirical relationship linking nominal interest rate with inflation and output.

On the fiscal side, this study applied the fiscal rule suggested by Davig and Leeper (2005, 2013) in which government revenue/GDP ratio reacts to government expenditure ratio, public debt ratio and output gap in the modelling of fiscal policy. This is depicted as:

$$r = f(lb + yg + g) \qquad 2$$

Where r is government revenue/GDP ratio, is lb one-period lagged public debt/GDP ratio, is yg output gap and is g government expenditure/GDP ratio. Making fiscal revenue to be function of lagged debt could say something about how revenue (taxes) are raised by fiscal authority to respond to public debt increases and as well establish the positive correlation created by GIBC between public debt and future primary surpluses.

3.1 Data and Methods

This study applied monthly data of monetary and fiscal policy rules. These data for the WAMZ countries which span from 2001M1 to 2015M12 were obtained from the databases of IMF World Bank and the Economic Intelligence Unit (EIU). Inflation rate, defined as log difference in GDP deflator was lagged over the past twelve months while public debt GDP was lagged in same manner. The nominal interest rate was taken to be the money market rates for these countries. Output gap was estimated as log deviation of real output from the potential as derived through the application of Hodrick-Prescott (H-P) filtering method with lambda (λ) = 14,400, which is appropriate for monthly data. Fiscal variables used are government revenue, public debt and government expenditure (all, as share of GDP). All data employed sourced as annual data were converted to monthly values using Eviews' 'linear-match' specification. For the monetary policy regime estimations, lagged values of dependent variable (nominal interest rate) was included on the right hand side of the estimated model in order to account for interest rate smoothing. Equally for fiscal regimes, as regressor, lagged value of the dependent variable (revenue/GDP ratio) was included so as to remove possible residual autocorrelation. In these tests of monetary dominance and assessment of the nature of monetary-fiscal policy interactions and to account for possible change in monetary and fiscal regimes in the WAMZ, the econometric estimation method employed is the Markov regime switching regression models of the Taylor monetary rule (augmented by interest rate for smoothing) and of the fiscal rule suggested by Davig and Leeper (2006) augmented with lagged values of government revenue scaled by output. Empirical characterisation of policy behaviour (according to these rules) were established while allowing for regime changes. Monetary and fiscal policy were allowed to switch independent of each other. With the view that there is always discrete shift in policy behaviour, we can differentiate between policy behaviour that is time variant and other

equilibrium conditions that do not display time, but which coincides with policy shifts. The regime switching regression of monetary policy (Taylor rule) estimated for these WAMZ countries is specified as:

$$i_t = \alpha_0(S_t^M) + \alpha_\pi(S_t^M)\pi_t + \alpha_{yg}(S_t^M)yg_t + \alpha_{i_t}(S_t^M)i_{t-1} + \sigma_m(S_t^M)\varepsilon_t^m \qquad 3$$

Where i_t is nominal interest rate, π_t is inflation, yg_t is output gap, as the lagged value of interest rate (i_{t-1}) is for interest rate smoothing meant to address interest rate inertia, S_t^M represents the monetary policy regime which follows a two state Markov chain with its transition matrix P^M, while ε_t^m is the disturbance with normal distribution and zero mean. Independent of the coefficients in the monetary rule, the variance of the error switches between two different values. The assumption here is that parameters α_0, α_π, and α_{yg} are time varying. The variance of the shock is not constant but has Markov-switching property. From the estimation of the above monetary rule, the situation of 'active' monetary policy is established when the coefficient estimates of inflation is greater than one ($\pi_t \geq 1$). Conversely, the monetary rule is 'passive' if this coefficient is less than unity ($\pi_t \leq 1$). Monetary policy stance changes over time. This prompts the question on how the behaviour of fiscal policy would be in the same period. Answer to this question would reveal if these policies are 'accommodative' or 'counteractive' to each other. Therefore, for clear understanding of the policy mix in the six WAMZ countries, it is relevant to equally account for possible changes in fiscal regimes in these countries.

There are two broadly used strands of fiscal policy rules: (i) the fiscal rule in which the value of the primary budget deficit allows public debt ratio stabilisation (Bohn, 1998) ; and (ii) the fiscal rule in which government revenue/GDP ratio reacts to government expenditure ratio, public debt ratio and output gap (Davig and Leeper (2005, 2013). This research applied the second strand. The fiscal counterpart of Equation 3 above would reflect the regime switching fiscal policy rule expressed as:

$$r_t = \gamma_0(S_t^F) + \gamma_b(S_t^F)b_{t-1} + \gamma_y(S_t^F)y_t + \gamma_g(S_t^F)g_t + \sigma_r(S_t^F)\varepsilon_t^r \qquad 4$$

where r_t is the government revenue/output ratio, b_{t-1} is one-period lagged public debt/output ratio, γ_g is the government expenditure, γ_y is the output gap, ε_t^r is the disturbance term with normal distribution and zero mean while S_t^F is the fiscal regime

that follows a Markov chain with transition matrix P^F. The fiscal rule modeling allows the variance of the errors to switch between two values. The assumption here is that parameters $\gamma_0, \gamma_b, \gamma_y$ and γ_g are time varying and that the variance of the shock is not constant but has Markov-switching property. The Leeper's (1991) FTPL specifies that a fiscal regime is 'passive' when the estimated coefficient of debt/output ratio is positive and statistically significant ($\gamma_b \geq 1$), implying that increase in the stock of outstanding public debt would cause significant reduction in government deficits. On the other hand, an active fiscal policy regime is established if ($\gamma_b \leq 1$); and this is when the fiscal authority is not constrained by the level of public debt. At this point, this study follows the method of joint matrix estimation proposed by Davig and Leeper (2009) in which the joint transition probability matrix governing the monetary-fiscal regime in the WAMZ was estimated as:

$$P^{MF} = P^M \otimes P^F \qquad 5$$

where P^{MF} is the joint transition matrix which indicates the mix of monetary policy and fiscal policy, reflecting the interactions between the two macroeconomic policies within the WAMZ, P^M and P^F respectively, are the transition matrix for monetary policy and fiscal policy. From the estimated joint transition matrix, the monetary-fiscal policy interaction could be interpreted as reflected in Table 3 below.

Table 3: Monetary-Fiscal Policy Mix Implications

	Active Monetary Policy	***Passive Monetary Policy***
Active Fiscal Policy	Explosive	Non-Ricardian (FTPL)
Passive Fiscal Policy	Ricardian	Indeterminacy

Source: Leeper (2007)

The explosive policy mix is unsustainable as both monetary and fiscal policies are 'active'. The indeterminacy mix is when both policies are 'passive'. For monetary unions (in which monetary policy and fiscal policies are at the supra-national and national levels respectively), the 'Ricardian' mix of the interactions between the two macroeconomic policies is deemed to be the best.

4.1 Results and Findings

The results of the Markov regime switching regressions for both monetary and fiscal policy regimes in the WAMZ are exhibited in Table 4 below.

Table 4: Results of Markov Switching Regressions of Monetary and Fiscal Policies Regimes in the WAMZ Countries

Monetary Rule Regimes Switching						
Variables	***Gambia***	***Ghana***	***Guinea***	***Liberia***	***Nigeria***	***S/Leone***
Constant:						
State 1:	6.3176*	-0.0366	19.7330*	0.09397*	1.2505*	-0.5700
State 2:	5.3892*	7.9482*	0.6409	0.4074*	6.9404*	9.2570*
Inflation:						
State1	619.9587*	518.8409*	-72.541**	-7.3280	71.9769*	-85.8522*
State 2	358.0398*	436.6295*	171.3730*	48.8968*	-35.7580	728.5705*
Output Gap:						
State1:	-11.6994*	45.3135***	650.8563*	5.1947*	116.4321*	-1780.55*
State 2:	2.8125	-51.4353	98.3488*	-3.8306	228.1941***	142.600**
Interest Rate Smoothing:						
State1:	0.4941*	0.4081*	-0.080***	0.7808*	0.6706*	0.6550*
State 2:	0.4519*	0.4191*	0.6409*	0.5985*	0.6370*	0.0950
Transition Probability:						
P11:	0.95	0.96	0.98	0.97	0.99	0.97
P22:	0.98	0.96	0.97	0.96	0.96	0.96
Expected Duration:						
State 1:	19.78	25.72	60.30	38.56	68.90	29.23
State 2:	44.23	30.67	48.53	26.90	29.85	26.64
Standard Deviation (Sigma):	0.10*	0.47*	0.17*	-1.46*	0.28*	0.82*
AIC:	3.35	4.14	3.45	0.22	3.66	4.86
HQIC:	3.44	4.22	3.53	0.31	3.74	4.95
SBIC:	3.56	4.35	3.66	0.43	3.86	5.07
Log Likelihood:	-270.66	-337.16	-279.03	-8.26	-296.18	-397.54
Fiscal Rule Regimes Switching						
Variables	***Gambia***	***Ghana***	***Guinea***	***Liberia***	***Nigeria***	***S/Leone***
Constant:						
State 1:	4.0109*	0.7454*	11.4237*	19.6979*	4.3896*	4.8721*
State 2:	1.2346**	26.9125*	13.0254*	-6.3574*	0.4661*	4.7851*
Public Debt/GDP:						
State1	-0.004	0.0410*	-0.0010	-0.0090*	-0.0285*	-0.0137*
State 2	0.0169*	-0.1168*	-0.0013*	0.0072	0.0172*	0.0147*
Govt. Expenditure/GDP:						
State1:	0.4894*	0.2129*	0.4771*	0.1843*	0.6292*	0.5313*
State 2:	0.5591*	0.2450*	0.6097*	0.1893*	0.7474*	0.5666*
Output Gap:						
State1:	-30.9041*	82.3639*	271.6433*	25.8408*	-10.9854**	-115.523*
State 2:	-66.8563*	122.8293*	40.1287*	3.0609**	93.8618*	-59.907*
Lagged Govt. Revenue/GDP:						
State1:	0.2409*	0.5986*	-0.6623	0.1430	-0.2579*	0.0163
State 2	0.2043*	-0.5109	-0.2850*	1.0290*	-0.0949**	-0.0465
Transition Probability:						
P11:	0.97	0.98	0.96	0.97	0.98	0.94
P22:	0.97	0.97	0.98	0.97	0.99	0.96
Expected Duration:						
State 1:	37.25	55.01	25.99	30.51	62.10	17.40
State 2:	48.54	35.38	61.60	29.82	125.16	27.55
Standard Deviation (Sigma):	-0.47*	-1.71*	-4.10	-0.52*	-4.82*	-1.18
AIC:	2.23	-0.25	2.30	2.15	0.08	0.87
HQIC:	2.33	-0.16	2.39	2.25	0.18	0.87
SBIC:	2.47	-0.01	2.54	2.39	0.33	1.12
Log Likelihood:	-174.33	34.36	-179.93	-167.44	5.87	-60.64

Source: Author's Estimation and Eviews 9.5 Output

As reflected in the results of the maximum likelihood estimations of Markov switching monetary and fiscal regimes, active and passive regimes across the WAMZ can be determined. State of variance (as measured by standard deviation for the policies parameters) are not uniform but all positive and significant at 1% level under monetary policy regime and all negative and significant at 1% except in the cases of Guinea and Sierra Leone.

In monetary policy Regime 1, monetary policy is active only in The Gambia, Ghana and Nigeria and active in all the WAMZ countries except Nigeria in State 2 as highlighted in the reaction of nominal interest rate to inflation. These results are statistically significant at 1% and 10% levels of significance apart from Liberia in State 1 and Nigeria in State 2. The estimation results show high transition probabilities (of between 0.95 and 0.98) of staying in Regime 1 and Regime 2. Nigeria, the lead economy in the monetary zone exhibits the highest duration of 68.90 months of staying in State 1, while The Gambia came up with the highest duration is State 2. Interest rate smoothing is positive (except in Guinea) and statistically significant across the WAMZ. The log likelihood values are between -8.26 and -397.54. From the results of the maximum likelihood estimations of fiscal policy Markov regime switching, fiscal policy is passive in Regime 1 and Regime 2 in all the WAMZ countries, though not statistically significant in the cases of The Gambia and Guinea (in State 1) and Liberia (in State 2) as reflected in the response of government revenue to public debt. In fiscal regime switching estimation across the WAMZ, the probability of staying in both regimes are very high between 0.94 and 0.99, just aa obtained in the monetary rule estimations. As evident in the monetary regime, Nigeria (the lead economy) also demonstrated the longest expected duration of staying in both fiscal policy regimes with log likelihood values of 5.87. However, it is shown that Guinea, Ghana and Liberia recorded high and statistically significant attention of fiscal authorities to output stabilisation in State 1 while such attention were given by Ghana, Nigeria and Guinea in State 2. This shows that Guinea has the possibility of consistence in fiscal attention to output stabilisation. The likelihood values are within the space of 5.87 and -179.93 in the fiscal regime estimations.

The summary the outcome the Markov regime switching regression of the WAMZ countries in the two regimes are displayed in Table 5 below.

Table 5: Monetary-Fiscal Policy Mix Implications for the WAMZ Countries

Regime 1			
Country	***Monetary Regime***	***Fiscal Regime***	***Implications***
The Gambia	Active	Passive	*Monetary Dominance (Ricardian)*
Ghana	Active	Passive	*Monetary Dominance (Ricardian)*
Guinea	Passive	Passive	*Indeterminacy*
Liberia	Passive	Passive	*Indeterminacy*
Nigeria	Active	Passive	*Monetary Dominance (Ricardian)*
S/Leone	Passive	Passive	*Indeterminacy*
Regime 2			
Country	***Monetary Regime***	***Fiscal Regime***	***Implication***
The Gambia	Active	Passive	*Monetary Dominance (Ricardian)*
Ghana	Active	Passive	*Monetary Dominance (Ricardian)*
Guinea	Active	Passive	*Monetary Dominance (Ricardian)*
Liberia	Active	Passive	*Monetary Dominance (Ricardian)*
Nigeria	Passive	Passive	*Indeterminacy*
S/Leone	Active	Passive	*Monetary Dominance (Ricardian)*

Source: Author's Interpretations

The summary of reveals that in both regimes only The Gambia and Ghana exhibit monetary dominance (the Ricardian Equivalence) with is the strongest for membership of a monetary union. Although, the monetary zone's lead economy, Nigeria displays monetary dominance in Regime 1, the country shows an indeterminacy status in Regime 2. All the WAMZ countries (except Nigeria) exhibit monetary dominance in Regime 2. None of the WAMZ countries simultaneously demonstrates the 'indeterminacy' or the 'explosive' status in both regimes. Given the implications of the monetary-fiscal policy interactions in the mix in both regime, one point to highlight regarding the switching is that the probability of switching from one regime to the other is very low across the WAMZ, while by implications, the probability of remaining in any of the two regimes is very high between 0.94 and 0.99.

Table 6: Monetary and Fiscal Policies Regimes Transition Probability Matrices of the WAMZ Countries

Country	*Regimes Transition Matrices*
Gambia	$P^M = \begin{bmatrix} 0.9494 & 0.0506 \\ 0.0226 & 0.9774 \end{bmatrix}$ $P^F = \begin{bmatrix} 0.9732 & 0.0268 \\ 0.0206 & 0.9794 \end{bmatrix}$ $P^{MF} = P^M \otimes P^F = \begin{bmatrix} 0.9239 & 0.0254 & 0.0492 & 0.0013 \\ 0.0196 & 0.9298 & 0.0010 & 0.0495 \\ 0.0220 & 0.0006 & 0.9521 & 0.0262 \\ 0.0005 & 0.0221 & 0.0201 & 0.9573 \end{bmatrix}$
Ghana	$P^M = \begin{bmatrix} 0.9411 & 0.0389 \\ 0.0326 & 0.9674 \end{bmatrix}$ $P^F = \begin{bmatrix} 0.9818 & 0.0182 \\ 0.0283 & 0.9717 \end{bmatrix}$ $P^{MF} = P^M \otimes P^F = \begin{bmatrix} 0.9436 & 0.0175 & 0.0382 & 0.0007 \\ 0.0272 & 0.9339 & 0.0011 & 0.0378 \\ 0.0320 & 0.0005 & 0.9498 & 0.0176 \\ 0.0009 & 0.0317 & 0.0274 & 0.9400 \end{bmatrix}$
Guinea	$P^M = \begin{bmatrix} 0.9834 & 0.0166 \\ 0.0206 & 0.9794 \end{bmatrix}$ $P^F = \begin{bmatrix} 0.9615 & 0.0385 \\ 0.0162 & 0.9838 \end{bmatrix}$ $P^{MF} = P^M \otimes P^F = \begin{bmatrix} 0.9455 & 0.0006 & 0.0160 & 0.0006 \\ 0.0159 & 0.9674 & 0.0003 & 0.0163 \\ 0.0198 & 0.0007 & 0.9417 & 0.0377 \\ 0.0003 & 0.0203 & 0.0159 & 0.9635 \end{bmatrix}$
Liberia	$P^M = \begin{bmatrix} 0.9741 & 0.0259 \\ 0.0372 & 0.9628 \end{bmatrix}$ $P^F = \begin{bmatrix} 0.9672 & 0.0328 \\ 0.0335 & 0.9665 \end{bmatrix}$ $P^{MF} = P^M \otimes P^F = \begin{bmatrix} 0.9421 & 0.0319 & 0.0251 & 0.0008 \\ 0.0326 & 0.9415 & 0.0009 & 0.0250 \\ 0.0358 & 0.0012 & 0.9312 & 0.0316 \\ 0.0012 & 0.0360 & 0.0322 & 0.9305 \end{bmatrix}$
Nigeria	$P^M = \begin{bmatrix} 0.9855 & 0.0145 \\ 0.0335 & 0.9665 \end{bmatrix}$ $P^F = \begin{bmatrix} 0.9839 & 0.0161 \\ 0.0080 & 0.9920 \end{bmatrix}$ $P^{MF} = P^M \otimes P^F = \begin{bmatrix} 0.9696 & 0.0159 & 0.0143 & 0.0002 \\ 0.0079 & 0.9776 & 0.0001 & 0.0144 \\ 0.0330 & 0.0005 & 0.9509 & 0.0156 \\ 0.0003 & 0.0332 & 0.0077 & 0.9588 \end{bmatrix}$
S/Leone	$P^M = \begin{bmatrix} 0.9658 & 0.0342 \\ 0.0375 & 0.9625 \end{bmatrix}$ $P^F = \begin{bmatrix} 0.9425 & 0.0575 \\ 0.0363 & 0.9637 \end{bmatrix}$ $P^{MF} = P^M \otimes P^F = \begin{bmatrix} 0.9103 & 0.0555 & 0.0322 & 0.0020 \\ 0.0351 & 0.9307 & 0.0012 & 0.0330 \\ 0.0353 & 0.0022 & 0.9071 & 0.0553 \\ 0.0014 & 0.0361 & 0.0349 & 0.9276 \end{bmatrix}$

Source: Author's Estimation and Eviews 9.5 Output

The transition probability matrices of the two regimes of monetary policy and fiscal policy across the WAMZ over the estimation period is displayed in Table 6 above which also reflects the joint transition probability matrices estimation of Equation 5 for the six countries over the period covered by the study. The joint regime transition probability matrices in Table 6 above still reflect very high probabilities of remaining in both regimes. These probabilities are in 90% percentages as shown in the estimations. The Markov switching smoothed regime probability patterns for the six WAMZ countries are reflected in Figures 1 to Figure 12 in Appendix 1 and Appendix 2.

1.6 Conclusions

This paper tests for monetary dominance and evaluates the monetary-fiscal policies interactions in the WAMZ. The modelling of monetary policy follows the standard Taylor rule which makes the nominal interest rate to depend on inflation and output gap. The modelling of the fiscal policy followed the fiscal rule suggested by Davig and Leeper (2006, 2013) in which government revenue/GDP ratio reacts to government expenditure ratio, public debt ratio and output gap. Appropriate relevant monthly data of monetary and fiscal policy rules were employed in the econometric estimation of Markov regime switching regression of the models of the monetary rule (augmented by interest rate smoothing) and of the fiscal rule augmented with lagged values of government revenue scaled by output towards and determining the monetary-fiscal policy interactions in the WAMZ as well as testing monetary dominance which is the ultimate for countries seeking to come together in a monetary integration. Evidence gathered from the interactions of monetary and fiscal policies across the WAMZ are strong enough to suggest that The Gambia and Ghana have strong monetary dominance (the Ricardian equivalence) in the two estimated regimes. Nigeria, the lead economy only exhibit monetary dominance in regime 1. All the WAMZ countries display monetary dominance in Regime 2 apart from Nigeria which manifests the 'indeterminacy' status in Regime 2. None of the WAMZ countries have the explosive and the 'Non-Ricardian' postures. Given the high probability of staying in either of the regime, for the six WAMZ countries, these results are good enough for the membership of the proposed monetary integration of West Africa.

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Appendix 1

Figure 1: Markov Switching Smoothed Regime Probability for Monetary Regime of The Gambia

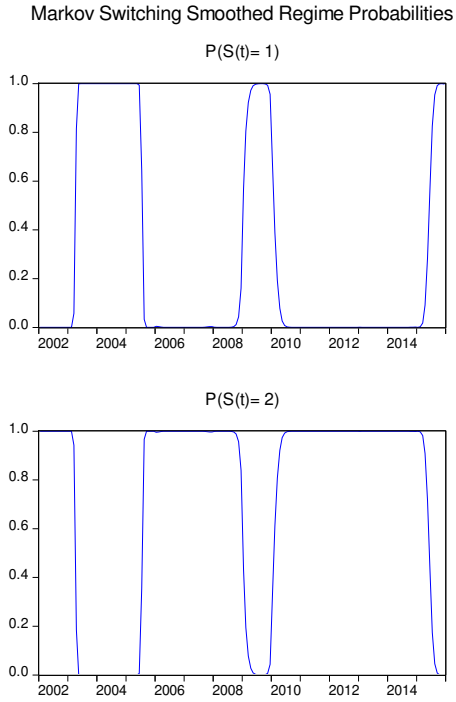


Figure 2: Markov Switching Smoothed Regime Probability for Monetary Regime of Ghana

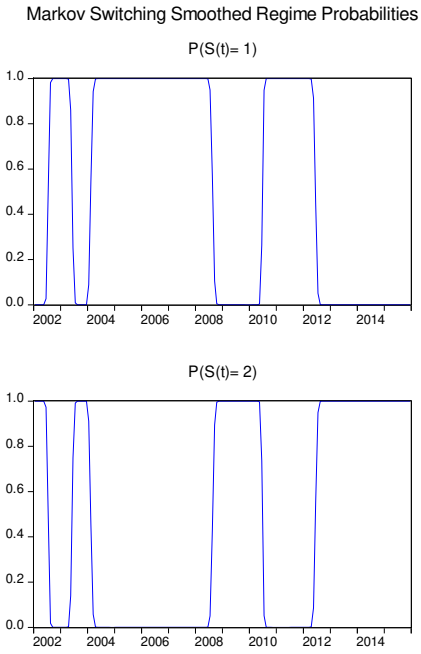


Figure 3: Markov Switching Smoothed Regime Probability for Monetary Regime of Guinea

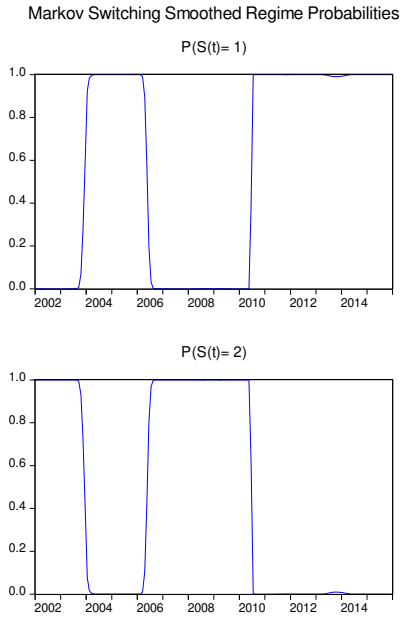


Figure 4: Markov Switching Smoothed Regime Probability for Monetary Regime of Liberia

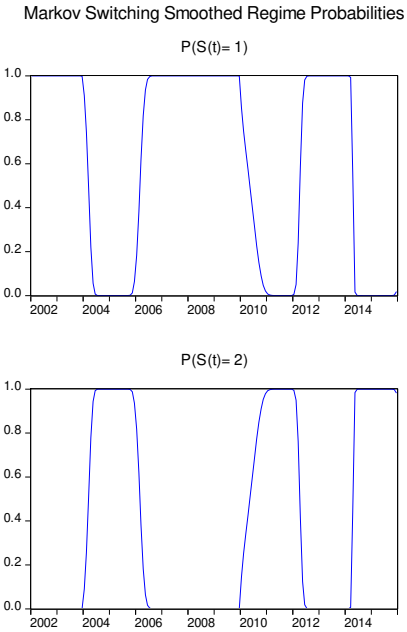


Figure 5: Markov Switching Smoothed Regime Probability for Monetary Regime of Nigeria

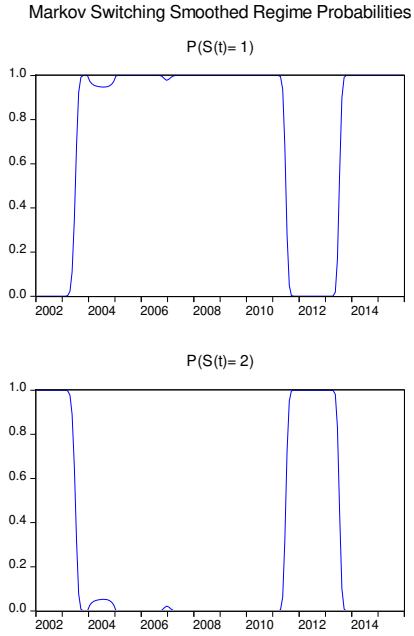
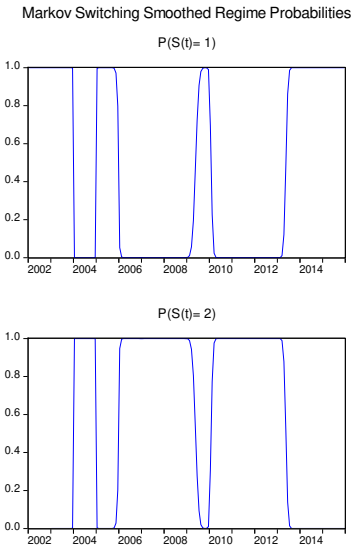


Figure 6: Markov Switching Smoothed Regime Probability for Monetary Regime of Sierra Leone



Appendix 2

Figure 7: Markov Switching Smoothed Regime Probability for Fiscal Regime of The Gambia

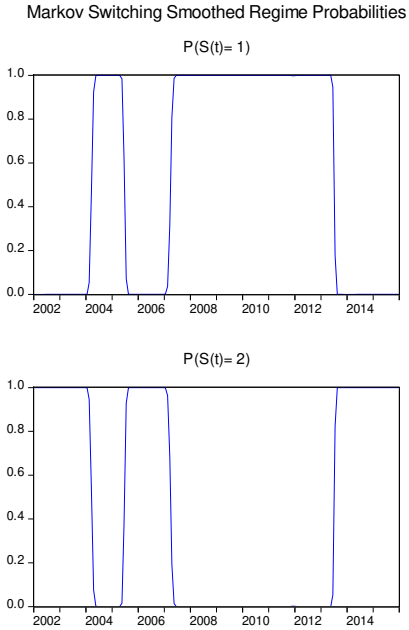


Figure 8: Markov Switching Smoothed Regime Probability for Fiscal Regime of Ghana

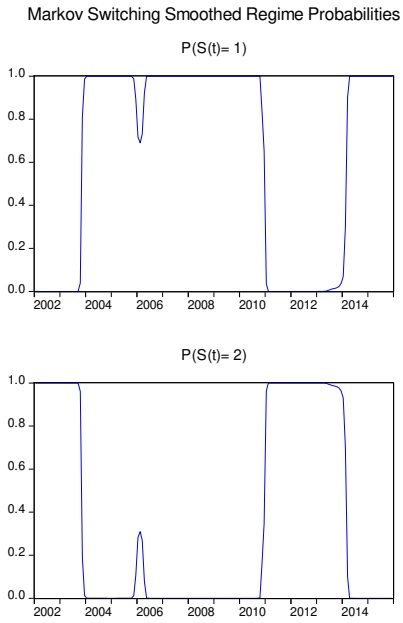


Figure 9: Markov Switching Smoothed Regime Probability for Fiscal Regime of Guinea

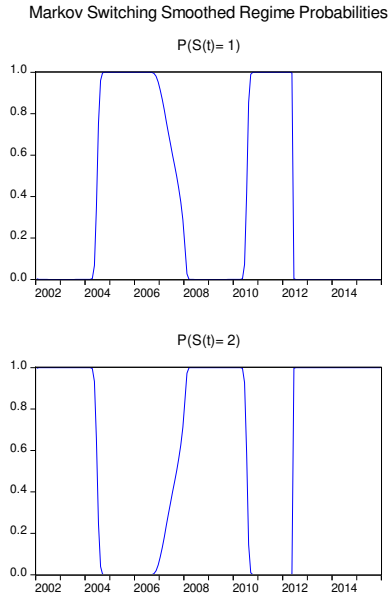


Figure 10: Markov Switching Smoothed Regime Probability for Fiscal Regime of Liberia

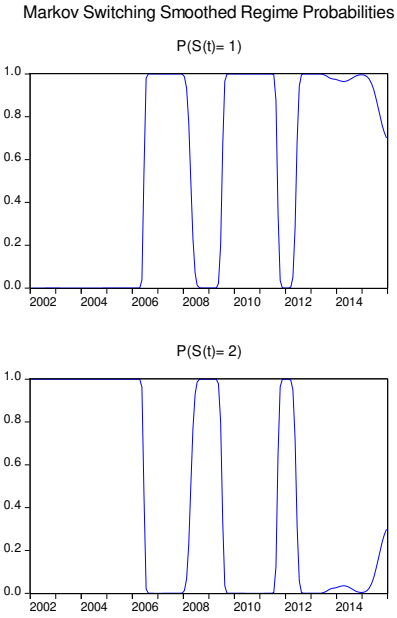


Figure11: Markov Switching Smoothed Regime Probability for Fiscal Regime of Nigeria

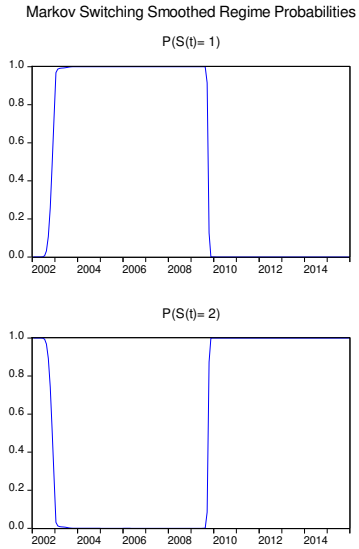


Figure 12: Markov Switching Smoothed Regime Probability for Fiscal Regime of Sierra Leone