Is the Monetary Policy of the WAEMU Credible? An Empirical Analysis Based on the Rule Forward Looking

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Abstract
This study aims at making available to the Central Bank of West African States (BCEAO) authorities an additional decision tool that would enhance their transparency and credibility. Therefore the Taylor rule, which connects the level of short term interest rates in output gap and the gap between the rate of inflation and the inflation target the mass money was introduced, net foreign assets and a dummy variable to capture the effects of the 1994 devaluation of the generalized method of moments (GMM) particularly suitable in the context of "Forward looking rules" is used here. The results obtained from annual data (1985-2014) shows that the estimated rule does not pretty much describe the behavior of money market rates over the period. Moreover, it seems that Central Bank of West African States (BCEAO) gives more and more weight to support the activity and the stabilization of prices, anything that weakens its effectiveness and credibility. Our results confirm the need for the central bank to return to its policy primarily based on inflation targeting sit for the credibility of its monetary policy.

Keywords: Credibility of monetary policy; Price stability; Taylor rule; WAEMU; GMM

Introduction
Since the early 90s, several solutions have been developed to demonstrate the effectiveness and credibility of monetary policies. These policies include the adoption of rules in the conduct of monetary policy. However, there are two types of policy rules. There is a passive side rules which are rules granted to the Central Bank so that it cannot take more inconsistent decisions from those it has pledged to take the start of the period [1,2]. But, on the other, given that the global environment is constantly changing, there are rules of monetary authorities, which have been defined by the rule [3] subsequently developed by several authors [4].

Activists rules provide that the trend of monetary policy may be changed based on risky events that affect the economy. Active rules or contingent rules are rules that will ensure credibility both in the long term and the short term. Furthermore, several studies have shown the superiority of the rules of policies, which themselves have evolved from the targeting of monetary aggregates to varying targeting policies reflecting the goal of monetary policy [5]. Indeed, several theories emphasize the link between an active monetary policy rule and efficacy/credibility of monetary authorities. The idea is that the longer the central bank is committed to follow a precise and predetermined monetary policy rule, the more transparent and credible the policy is. But this type of solution allows maintaining credibility, there are two necessary conditions. In order that the rule announced by the authorities necessarily be credible in the long term. Otherwise, it must ensure the stability of the price over the long term. They also equally require a total transparency both in terms of the rule announced as well as that the information it contains. In other words, it must be public. An example of active rule is the Taylor rule. It specifies changes in interest rates of the Central Bank in accordance with the evolution of two variables: the real output and inflation.

For other authors, a monetary policy is all the "more good" it allows to mediate effectively between the stabilization of the product (short term objective) and the maintenance of the prices stability (medium objective and long term), which are desirable objectives from the perspective of social welfare [6]. The formulation of the monetary policy of BCEAO is at least goes the implicit way in the same logic, that of supporting the economic activity understood as an opportunity for the stabilization. In these conditions, of the current economic situation how to define in the case of Central Bank of West African States (BCEAO), a monetary policy rule that allows at best to base establishes its credibility? What are the implicit weights of inflation and production in the decisions of Central Bank of West African States (BCEAO)?

As for the Taylor rule, several adaptations were made to it by central banks through around the world. This is the case of the works of [7], on the experience of the European Central Bank (ECB). In the case of Germany, [8] evaluated the behavior of the BUNDES BANK during the period from 1985 to 2004, holding the keeping hypothesis of interest rates smoothing. Basing themselves on the same hypothesis [9] derived a "rule" of Taylor type a European fictitious Central Bank (ECB) have followed since the creation EMS (1979-2003). In general, studies on the eurozone conclude that the monetary policy is well represented by simple Taylor rules [7,9]. In the Canadian case, [10] finds that the Central Bank of Canada (BCC) act having a behavior of smoothing interest rates. Among the authors who studied the case of African economies let 'we name [11-13]. In the case of Tunisia, basing oneself on the trimestral data from 1997 to 2011 [12] finds that the Taylor rule can be adapted to the Tunisian Central Bank.

In the case of UEMOA countries, several studies have been conducted. The first study is from [11], that is an acceptable approximation of BCEAO behavior. Using trimestral data from 1991 to 1999 this estimate, which provides fixation of Central Bank of West African States (BCEAO) interest rates takes into account reflects the economic fundamentals, such as the output gap (an indicator of the market of goods), the money market rate differential, the passed value in the interest rate, a constant that is proportional to the sum of the target inflation rate and the real interest rate balance. The results obtained as much on annual data on trimestral data show as the estimated rule describes reasonably well the behavior of money market

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rates. The second was [13] which consisted to analyse the adequacy of the simple Taylor rule with the monetary policy of Central Bank of West African States (BCEAO). From annual data, it leads to the result that the Taylor rule, in its initial version, is not consistent with the monetary policy of Central Bank of West African States (BCEAO).

Various empirical analyses that were the subject of this literature review have the same limits. Indeed, the studies mentioned above do not focus on steadiness of the variables stationary, anything that can lead to erroneous results. In addition, the estimates of the rule interest rate using single equation methods of the Taylor rule have been criticized by [14] based on the fact that the structural parameters related to the preferences of monetary authority and structure of the economy, cannot be recovered.

In sum, it appears that the strict adaptation of the Taylor rule in the other countries remains less relevant and this can lead to wrong decisions makings by the monetary authorities. The objective of this work is both descriptive and normative. This is i) first, to verify whether the reaction function of Central Bank of West African States (BCEAO) can be rewritten in terms of a simple rule of active monetary policy combining an inflation and production target and other fundamental variables ii) secondly, to make available to the monetary authorities an additional decision tool that would reinforce their transparency and credibility. To achieve these goals, we organize in which follows: Section 2 presents the monetary environment at Central Bank of West African States (BCEAO) and the way monetary policy is conducted. Section 3 presents a simple model to formulate a Central Bank of West African States (BCEAO) reaction function. Section 4 is to put in a prominent position the methodology. Section 5 analyses the results of the estimates of the “Forward-looking rules” by the generalized moment method (GMM). Section 6 will deal with the conclusion.

The context of monetary policy at Central Bank of West African States (BCEAO)

The institutional frame of monetary policy in the WAMU is regulated by a number of key texts including the Treaty of WAMU of 14th November 1973, the agreement between France and the member countries of the WAMU December 4th 1973, the Treaty of the Economic and Monetary Union of West Africa (UEMOA) on 10th January 1994 and the status of Central Bank of West African States (BCEAO). The management of the central bank is entrusted to a board of director’s orientation while the monetary policy and the definition of instruments are the responsibility of a Monetary Policy Committee (MPC) led by the Governor. Each state member has within it an agency depicted of the central bank in which a National Credit Council seat (MPC) led by the Governor. Each state member has within it an agency depicted of the central bank in which a National Credit Council seat that represents the country at the Central Bank of West African States (BCEAO) reaction function. Section 4 is to put in a prominent position the methodology. Since liberalization, the importance of the money market has increased in the management of the monetary policy of Central Bank of West African States (BCEAO). The boost given to the key rates should therefore be transmitted to the money market by modulating the system of interest rates in the direction desired by the central bank. The output gap is supposed to translate inflationary or deflationary future prospects. While production tends to exceed its potential level, the economy falls into a boom-bust cycle, investment and consumption to bolt resulting ceteris paribus an upward trend in prices; the opposite effect is observed when the output deviates negatively and significantly from its potential level. However, the studies of the decisions of the central bank in recent years foreshadows that the rate setting takes into account the economic conditions including inflationary pressures, resulting both from the abundant liquidity and the expansion of the production (Figure 2).

Figure 1: Evolution of money supply and inflation.

Source: The author based on data from the BCEAO.
Taylor rule. This is clear from the integration of additional arguments as explanatory variables, which may have an impact on the decisions of the monetary authorities in setting policy rates. Thus, the equation of the rule in the forward-looking version takes the following form:

\[ i_t = (1-\theta)\hat{z}_t + \beta_n E(\hat{z}_{t+1} | \Psi_t) + \beta_y E(y_t | \Psi_t) + \theta_i E(i_{t-1} | \Psi_t) + \theta_i + \epsilon_t \quad (5) \]

With \( X \), a vector of extra explanatory variables, \( \hat{x} \) their desired level and \( \theta \), a vector, containing the weight accorded by the authorities to these variables in decision making.

To consider the empirical frame, it is necessary to correctly specify the reaction function in the context of BCEAO and present the difficulties linked its estimate.

\[ i_t = \mu_i + \epsilon_t \]

The equation can be written as:

\[ i_t = \mu_i + \epsilon_t \]

To give the model a valuable form, one method is to replace the anticipated unobservable variables by the observed values. The model then becomes:

\[ i_t = \mu + \epsilon_t \]

Methodological Approach

To investigate the adequacy of the Taylor rule to economies, several authors have proposed various theoretical and empirical models that rival relevance [11,13]. But they are not performed with the necessary statistics care. Some variables used in some countries (ECCI of the Côte d’Ivoire and the three of Mali) do not seem to be stationary. This can lead to the production of fallacious. Our study wears away these shortcomings by the initial test of stationary series which is a starting condition for the application of the GMM. These tests determine the degree of integration of the panels. We can quote: tests of [17,18] (IPS).

But long before, the homogeneity test is important when working on panel data.

For the implementation of our approach, we literally follow the method of [8]. In such an investigation, we use the repo rate on loans of one day. The annual inflation measured by \( \pi_t = \frac{100 \times (P_{t-1} - P_t)}{P_{t-1}} \) where \( \pi \) denotes the logarithm of the price index harmonized and real GDP to measure the output. To determine the output gap, we use the methodology based on the filter of [19], a linear trend and a quadratic trend. The output gap is constructed as the difference between the potential and current production \( y_t = \frac{100 \times (PIB_t - PIB^*_{t-1})}{PIB^*_{t-1}} \)

The estimate of equation (5) by the generalized method of moments, thanks to its robustness, does not require that the residuals are normally distributed, but just to specify the set \( \Psi \) of the variables that can influence the decision-making of the monetary authorities’ money in time \( t \), forming the set of instrumental variables in the estimation.

\[ a_1 = \theta_n \frac{\beta_n}{1 - \beta_n} - \theta_i \frac{\beta_i}{1 - \beta_i} + \theta_i \frac{\beta_i}{1 - \beta_i} + \theta_i \frac{\beta_i}{1 - \beta_i} \]

The relationship between the parameters and starting coefficients satisfy the following formula:

\[ \alpha = \theta_n \frac{\beta_n}{1 - \beta_n} - \theta_i \frac{\beta_i}{1 - \beta_i} + \theta_i \frac{\beta_i}{1 - \beta_i} + \theta_i \frac{\beta_i}{1 - \beta_i} \]
Nevertheless, we may be faced with the problem that some instrumental variables are not needed and skew the results of our estimates. To test this, we carry out a standard test, the J-test for the validity of the over-identifying restrictions.

Data

This study uses annual data from 1985 to 2014. Two main data sources are used: the "World Development Indicator" of the World Bank and BCEAO. Table 1 in the appendix shows the model variables.

By the analysis of Table 2, statistics show that the data are characterized by very large differences in the values of certain variables. Statistics of gap types indicate standard deviations 997.84 for the money supply (M2) and 397.71 for net foreign assets (aen). These differences are probably related to differences in development among the member countries of the WAEMU. To correct this situation, we have chosen to use in this analysis a log transformation. The results, using Stata 12 are given in the table below.

Econometric Results

Several tests are needed before the model estimation. The aim is to verify the assumptions under which the model estimation can be efficient. The tests we present are the homogeneity test and the unit root test.

Homogeneity test

The worthless hypothesis of this test is that there is only a common hunt, no individual effect. The result is an F statistic with (N-1, NT-N-K-1) degree of freedom. If we reject the worthless hypothesis, then it must include the individual effects in the model. With a p-value (0.0000), we reject the worthless hypothesis of the presence of a common intercept (Table 3).

Unit root test

Tests recently developed are this of test [17] and testing [18]. We use in this study the last two tests. The results of the unit root tests in panel are consistent and show that all variables are integrated of order one except the variables lipc, yt, and dln_m2 which are stationary at first level.

Result of the estimate by MMG

In this section, we proceed to the estimate a reaction function of Taylor forward-looking type for the frame of BCEAO using GMM that proves to be the most suitable in terms of economic theory (Table 5). The test of Hansen (p=1.00) and the second order autocorrelation test of [20] (p=0.871) did not reject the hypothesis of the validity of variables in delayed level and difference as instruments and the autocorrelation of second order hypothesis.

From the results of the estimate, the partial adjustment coefficient of the interest rate is negative and significant (-0.25), which tend to show a tendency to fix the interest rate level in terms of its passed value. The sign of this value of the smoothing coefficient of the interest rates is contrary to those of other authors [21]. Furthermore, our results contradict the simple rule [3] makes the implicit assumption that the fixing of short-term interest rate is independent of the passed value of this one.

The coefficient associated inflation is positive and significant (0.02). Although small, it is consistent with the predictions of the economic theory [11]. The lesson we can draw from this result is that the policy of BCEAO is no longer focused only around the objective of fighting against inflation, other determinants involved in the decision making. This result is consistent with Article 8 of the statutes BCEAO, which states that without prejudice to this inflation target, the Central Bank

### Table 1: Description of variables and sources of data.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Description</th>
<th>Data source</th>
</tr>
</thead>
<tbody>
<tr>
<td>l</td>
<td>rate of BCEAO</td>
<td>BCEAO</td>
</tr>
<tr>
<td>m2</td>
<td>money supply M2</td>
<td>BCEAO</td>
</tr>
<tr>
<td>Aen</td>
<td>net foreign assets of the states with the BCEAO</td>
<td>BCEAO</td>
</tr>
<tr>
<td>Yt</td>
<td>goods and services</td>
<td>World Bank (WDI)</td>
</tr>
<tr>
<td>Ipc</td>
<td>inflation target</td>
<td>World Bank (WDI)</td>
</tr>
</tbody>
</table>

### Table 2: Descriptive statistics of the model variables.

| Variables | Coef | Std.err. | T | p>|T| | [95% conf. Interval] |
|-----------|------|----------|---|----|------------------------|
| l | 0.596581 | 0.0118232 | 5.05 | 0.0000 | 0.0363411 to 0.0829751 |
| b89 | -0.178741 | 0.397976 | -0.45 | 0.654 | -0.9636058 to 0.6061238 |
| b9093 | 1.896556 | 0.2415941 | 7.85 | 0.0000 | 1.420098 to 2.373014 |
| ln_m2 | 1.155992 | 0.116925 | -9.88 | 0.0000 | -1.386634 to -0.9253497 |
| aen | -0.00310041 | 0.0002573 | -3.9 | 0.0000 | 0.0015116 to -0.0004966 |
| Yt | -2.105 | 0.57996 | -3.75 | 0.0000 | -2.987964 to -0.81206 |
| J | 0.2951425 | 0.044193 | 6.59 | 0.0000 | 0.2067525 to 0.3835325 |
| const | 1.123257 | 0.886629 | 1.333 | 0.0000 | 10.07351 to 13.57163 |
| sigma_u | 1.013561 | 0.886629 | 1.333 | 0.0000 | 10.07351 to 13.57163 |
| sigma_e | 0.9806172 | 0.044193 | 2.222 | 0.0000 | 0.2067525 to 0.3835325 |
| rho | 0.5165155 | (fraction of variance due u_i) | 0.0000 | Prob>|T| | Pro >0.0000 | F(6, 196)=13.02 |

F test that all u_i=0
contrary to the predictions of economic theory. This is an indication of the central bank having the effect of increasing production. Indeed, according to a study of [22], the forecasting inflation of IPC in the WAEMU is due to 82.6% to its own innovations to 3.8% to those of the nominal effective exchange rate, 8.8% to imported inflation developments and to 4.8% for the change in the money supply.

The coefficient associated with significant net foreign assets (-0.025) confirms the importance of this variable in the policy of the central bank. Indeed, in practice, the net foreign assets are an important variable in the specific case of a monetary zone with a fixed exchange.

The selected binary variable concerns the three years preceding the devaluation (Br9193). It has appeared statistically significant and presents the expected positive sign. The positive sign of Br9093 means that on an average, the monetary authorities have adjusted the rates on the rise, on the account of the devaluation of the FCFA expectations.

From what precedes, it is clear that BCEAO deviates gradually from its main objective that of the inflation target, anything that prejudices its credibility.

Moreover, the following graph showing the graphic representation of simulated rates from this model and the effective rate, confirms it (Figure 3).

**Conclusion**

This work aims at estimating the BCEAO reaction function, in order to give its monetary policy strategy a more credible and effective frame. A Taylor rule type "Forward looking" is estimated using annual data.

The latter takes into account the smoothing of interest rates and we assume that the Central Bank reacts to projected inflation differentials of 6 quarters, and to those of other variables anticipated for the same period. The methodology used for estimating the rule "Forward looking" is the GMM which takes into account the endogenous nature of the regressors and the autocorrelation of errors. In this context, we estimated the Forward model taking into account the inflation gap and the output Gap, the M2 money supply, the net foreign assets and a dummy variable to capture the effects of the 1994 devaluation. The estimated Taylor rule has permitted to remark a more systematic and a dummy variable to capture the effects of the 1994 devaluation. The estimated Taylor rule has permitted to remark a more systematic response of the Central Bank in relation to the output gap, in addition to the importance conferred to foreign assets movements, inflation and the money supply. Generally it is noted in this context, a persistence of interest rate reflecting a trend of the monetary authorities to set the interest rate according to past ones. Furthermore, the weight given to inflation is much lower than that accorded to the economic activity, which is in contradiction with the fact that inflation is the overriding objective of the monetary policy. Besides, our model "Forward looking" does not describe accurately the historical behaviors of BCEAO, and confirms our previous results. This demonstrates that, in fact, the central bank opts increasingly for a disconnection between inflation and money supply.

shall support the economic policy of the Economic and Monetary Union of West Africa (UEMOA), for a sound and sustainable growth.

Regarding the gap of business, with a negative sign (-0.5), it seemed appeared at first sight in contradiction with the theoretical foundations of the model. However, its interpretation leads to an interesting result. Indeed, taken in absolute value, it is higher than the inflation in determining the key rate of the central bank. This result shows that the monetary policy of BCEAO is generally more influenced by the level of production. In other words, the inclusion of output gaps in union eventually bequeaths to the second place the objective of fighting against inflation. Moreover, it contradicts the conclusions of the work of [22] according to which, the weight given to the economic activity is very low compared to that accorded to inflation. Indeed, a key rate cut by the central bank has the effect of increasing production. This was demonstrated by [23].

Regarding the money supply, its weight (0.26) is positive, contrary to the predictions of economic theory. This is an indication that the evolution of the money supply figures prominently in the process of decision making of BCEAO authorities and confirms our previous results. This demonstrates that, in fact, the central bank opts increasingly for a disconnection between inflation and money supply. Indeed, according to a study of [24], the forecasting inflation of IPC in the WAEMU is due to 82.6% to its own innovations to 3.8% to those of the nominal effective exchange rate, 8.8% to imported inflation developments and to 4.8% for the change in the money supply.

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**References**


