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Article

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West African Journal of Monetary and Economic Integration

Provided in Cooperation with:

West African Monetary Institute (WAMI), Accra

Suggested Citation: Diallo, Ibrahima; Konté, Mamadou Abdoulaye (2022) : Estimating monetary conditions index for selected countries in the ECOWAS region, West African Journal of Monetary and Economic Integration, ISSN 0855-594X, West African Monetary Institute (WAMI), Accra, Vol. 22, Iss. 1, pp. 1-30

This Version is available at:

<https://hdl.handle.net/10419/310954>

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ESTIMATING MONETARY CONDITIONS INDEX FOR SELECTED COUNTRIES IN THE ECOWAS REGION

By: Ibrahima Diallo¹ and Mamadou Abdoulaye Konté²

Abstract:

Monetary conditions index (MCI) has become an important indicator of monetary policy performance since its introduction by Bank of Canada in the 1990s. This is so, as the index allows central banks to gauge monetary policy stance and effectiveness. This paper builds an MCI for the seven (7) central banks in ECOWAS region, namely The Gambia, Ghana, Guinea, Liberia, Nigeria, Sierra Leone, and the UEMOA zone. The paper estimated a Dynamic Factor Model (DFM), complemented by Principal Component Analysis (PCA) to derive the weights of the variables in the MCI basket. Vector Autoregression (VAR) techniques are used for robustness analysis to assess the effectiveness of the computed MCIs as an indicator of monetary policy stance. In constructing the index, we consider three operating targets, namely interest rate, exchange rate, and reserve money, currently in use by central banks in the region. Key findings are that MCI can be effective to gauge monetary policy stance in West Africa, and thus presents the possibility of an alternative argument in the policy rule of central banks in the region.

Keywords: Monetary Policy, Monetary Conditions Index; Dynamic Factor Model; ECOWAS.

JEL Classification : E52, E58, C32

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1.0 Introduction

Since its introduction by the Bank of Canada in the 1990s, Monetary Conditions Index (MCI) has been widely used by central banks to gauge monetary policy stance and its effectiveness. More specifically, to account for the existence of different monetary policy transmission channels, the Bank of Canada came up with a composite index comprising interest rate and exchange rate in the 1990s. This was, thus, to allow the Bank to account for the role of the exchange rate in the design and implementation of its monetary policy. Most central banks developed an MCI for the same purpose. This was important for monetary institutions given that most central banks, particularly in emerging economies and developing countries use, in practice, different instruments and operational target (interest rate, exchange rate, monetary aggregate, asset prices, etc.), rather than a single one, to achieve their objectives (Montiel, 2013). While price stability remains the primary objective of most central banks, it turns out that most banks are assigned other objectives such as economic growth, financial stability, and external stability. As explained by the Tinbergen rule, this situation makes it difficult for a central bank to achieve these multiple objectives using a single instrument of monetary policy, in the context of, like many emerging economies, weak fiscal, financial, and monetary institutions that make these countries very vulnerable to high inflation and currency crises (Mishkin, 2004). The use of a single instrument such as interest rate in a monetary policy rule such as the Taylor rule requires that a country has adopted a full floating exchange rate regime and reached a certain level of financial depth and fiscal discipline (International Monetary Fund (IMF), 2015). However, this is not the case in most developing countries such as the ECOWAS region, as the Banking system largely constitutes the dominant formal financial market in the context of an absence of well-functioning securities, equities, and real estate markets (Mishra and Montiel, 2012). Thus, central banks in these countries combine many monetary and financial indicators, including interest rate in the money market, exchange rate through interventions in the foreign exchange market as well as monetary aggregates for liquidity management purposes (Bank for International Settlement (BIS), 1998).

Generally, despite the obvious success of policy rule essentially based on the Taylor rule with interest rate being the operational target in most central banks, empirical evidence has shown the need to consider the role of exchange rate and other monetary and financial variables in the transmission of monetary policy through the construction of MCIs. Consequently, many other monetary institutions, and other private and public economic and financial institutions (IMF, OECD, Deutsche Bank, Goldman Sachs, JP Morgan, etc.) have developed an MCI to equally assess the impact of domestic and foreign policies on general monetary conditions (Ericsson et al., 1999).

The index has been expanded to a broad index with the inclusion of more monetary and financial indicators such as credit to the private sector, monetary aggregates, etc. Since the global financial crisis (GFC) in 2007, which showed evidence of the existence of a more globalized and interconnected financial system, empirical research has been focused in further monitoring the interlinkages between the financial and real economy, using composite indicators such as financial conditions index (FCI) among the most popular in the literature.

Empirical evidence has shown that MCI produce important outcome as a measure of monetary policy stance and operational target of monetary policy (Gerlach and Smets, 2000).

Our paper contributes to existing literature in several ways. First, to our knowledge, there has not been a paper on MCIs covering the entire central banks in the Economic Community of West Africa (ECOWAS) region. Second, the existing few papers published in the region (Tule et al., 2014; Yaaba, 2013; Dembo Toe, 2012) did not use similar methodology (Dynamic Factor Model), thus, this paper can be seen as complementary to the existing ones. Third, our paper comes in the context of new reforms that central banks in the region are to implement, following the decision of Head of States of ECOWAS countries in June 2019 to adopt inflation targeting (IT) as the monetary policy regime for the future West African Central Bank. In addition, in view of the multiple objectives assigned to central banks in the ECOWAS region, including price stability, economic growth, and financial stability, this paper seeks to develop a monetary conditions index as an alternative policy rule for the apex monetary institutions in the region. The combination of some weighted instruments such as MCI could address more than one objective of central banks.

While FCIs have practically replaced MCIs in most recent empirical analysis to capture monetary and financial sentiments (with FCI being MCI plus financial indicators), we limit our study in this paper to MCIs, given the absence of well-developed financial markets such as stock and real estate markets in most ECOWAS countries, as required by FCI.

Following the introduction, Sections 2 reviews relevant literature while Section 3 presents the estimation technique and sources of data. Sections 4 and 5 provide the finding and the robustness analysis, and Section 6 concludes the paper and provides policy recommendations.

2.0 Literature review

2.1 Theoretical literature

The theoretical literature on monetary policy transmission is based on the existence of several transmission channels of monetary policy to the real economy. These are the interest rate channel, the asset price channel, the credit channel, the exchange rate channel, etc. (Mishkin 1996; Bernanke and Gertler, 1995; Berg et al., 2013). The interest rate channel constitutes the most traditional and conventional channel of monetary policy and is based on the IS-LM Keynesian model. In effect, central bank policy decisions are expected to affect commercial bank liquidity, which determines the money market rates as well as long term interest rates through arbitrage and rational expectations that, in turn, influence demand for goods. The asset price channel, on the other hand, is based on arbitrage by households and consumers between bonds and equities/assets that affect the stock market values and real estate prices. The exchange rate channel explains the trade-off between assets denominated in foreign and domestic currencies, which has an impact on consumption and investment between domestic and foreign goods. Finally, the credit channel captures the mechanism through which central bank measures affect banking system reserves that in turn impact both access to loan by customers (bank lending channel) and external finance premium (balance sheet channel). Thus, Central banks seek to influence aggregate demand by targeting a monetary/financial variable that is expected to be linked to aggregate demand.

Gerlach and Smets (2000) set the MCI functions as an operational target of the central bank in the reaction function, such that the Bank reacts to any excess demand by restrictive monetary policy targeted at raising the MCI. The choice of the weight depends on the monetary indicator elasticity of aggregate demand. Thus, the larger the size of the traded goods sector in the economy, the higher the weight attributed to the exchange rate. Similarly, the bigger the interest rate elasticity of aggregate demand, the lower the weight. Gerlach and Smets (2000) notes that the choice by Bank of Canada of these two indicators (short term interest rate and exchange rate) to compose the MCI was motivated by the evidence of their importance in the monetary policy transmission in Canada. This, however, might not be a general case in other central banks, given that other monetary variables such as real long term interest rate, monetary aggregates as well as asset prices could also play an important role in the monetary policy transmission in some countries. These indicators could also be included in building an MCI (Ericsson et al., 1996; Smets, 1997).

2.2 Empirical literature

Most recent literature in MCIs² focus on FCIs (financial conditions index), as the latter is an extension of the MCI. In effect, as financial depth becomes more important in many emerging economies, monetary policy transmission has been extended to other channels in a broad perspective such as stock prices (Kazdal et al., 2022). Consequently, recent research investigations essentially construct broad MCI by considering both the traditional channels (interest rate and exchange rate) as well as other channels (private sector credit channel, monetary aggregates) and financial variables (bond, equity, etc.). The Bank of Canada was the first to construct an MCI in the early 1990s, and many central banks followed in building their MCI using it for different purposes such as a tool of monitoring monetary policy stance, as an operating target, or even as an indicator of economic activity.

In Europe, Nucu and Anton (2018) built an MCI for Central and Eastern European (CEE) countries for the period 2005 – 2015 using Vector Error Correction (VEC) model. Their findings indicate that MCI has the ability to capture monetary policy developments and that monetary policy decisions in Eurozone have significant impact on monetary conditions in the CEE countries during the period 2005 - 2015. The authors conclude that MCI could capture the monetary policy of the countries studied. In Croatia, (Benazic, 2012) constructed an MCI using cointegration method for the period 1998-2007. The author concludes that the computed MCI was useful for assessing monetary policy stance. Kodra (2011) equally computed an MCI for Albania using OLS for the period 1998 – 2008. The author concludes that the MCI represents an operational tool in the conduct of monetary policy and could be used to evaluate the impact of monetary policy on business cycle in the country. Goux (2003) constructed an MCI for Eurozone using a VAR model and confirmed that real activity in the euro area was significantly impacted by monetary conditions. In Portugal, on the other hand, Costa (2000) discusses the interpretations of MCI, its advantages as well as its limitations while Esteves (2003), using model multipliers simulations, calculated static and dynamic MCI for the country. The author concludes that the computed MCI has the significant characteristics of

² The traditional MCI using only interest rate and exchange rate is called narrow monetary conditions index (NMCI) while the extended one is called broad monetary conditions index (BMCI).

allowing for the estimation of the short-run effects of monetary conditions on both GDP growth and inflation in Portugal. Nicholetta and Turnbull (2000) constructed an MCI for UK and conclude that it can serve as an adequate gauge of monetary policy of the monetary authority, but the author was not in favour of using it as an operating target of monetary policy due to its inability to identify shocks. Frochen (1996) built MCIs for five Western European countries namely France, Germany, United Kingdom (UK), Italy, and Spain for the period 1987 - 1995. The author used a modelling approach developed by the National Institute for Economic and Social Research (NIESR). They found that the MCIs were related to both real output and inflation, and thus could be used for monitoring economic activity.

In Asia, most central banks and other academic institutions had computed one or several MCIs since 2000s. Poon (2010) computed broad MCI for ASEAN 5 (i.e., Indonesia, Malaysia, Philippines, Singapore, and Thailand) from 1980 to 2004 using an ARDL modelling approach. He found that the computed MCI could explain key transmission mechanism of monetary policy in those countries. Many other MCI were published across the individual countries of ASEAN including Pei-Tha & Kian-Teng (2008) for Malaysia; Chow (2012) for Singapore; Hataiseree (1998) for Thailand; etc. These studies concluded that the MCI could serve either as an indicator of monetary policy stance or an operating target complementing other monetary policy tools. In India, Kannan et al., (2006) built a broad MCI for the central bank covering the period 1996 - 2007 using a quarterly aggregate demand equation. The authors showed that the index was effective for assessing the stance of the monetary policy and could also be considered as a leading indicator of economic activity and inflation. In Turkey, several MCIs have been published including those by Vuslat (2004) and Kesriyeli and Kocaker (1999). They showed that the indices explain monetary policy stance in Taylor rule in Turkey. Also, several MCIs have been computed for Pakistan such as Abdul (2002) and Hyder and Khan (2007) with mixed findings. While Abdul (2002) showed that the MCI was useful for understanding monetary policy stance in Pakistan, Zulfiqar & Khan (2007) cautioned against the use of MCI as a significant monetary policy instrument for the country.

In Latin America, Cespedes et al., (2015) developed a conditional MCI for Brazil from 2000 – 2005, using VARs and Bayesian approach. The findings suggest that the computed MCI showed a better measure of monetary policy stance in Brazil, as compared to the ones computed by Batini and Turnbull (2002). Lattie (1999) built an MCI for Jamaica from 1991 – 1998. Findings indicate that MCI could be an important complementary tool to serve as operating target of monetary policy in the country.

In Africa, most central banks have developed MCI for monetary policy purpose. In Tunisia, Ali and Moheddine (2018) developed an MCI using VAR model from 1965 – 2015. The authors concluded that computed MCI has significant effects on real activity and inflation in Tunisia with exchange rate playing a major role in the monetary policy transmission. Gichuki & Moyi (2013) computed a broad MCI for Kenya using cointegration method and data spanning from 2000 to 2011. The authors concluded that the computed MCI could be used as an indicator of monetary policy stance in Kenya. In Uganda, Okello and Opolot (2010) constructed an MCI using a VAR model during 1999 – 2010 and showed that the index could effectively be used to complement monetary aggregates as an operating target of monetary

policy. In South Africa, Knedlik (2005) developed an MCI for the period 1994 – 2003 and suggested that the computed index was useful for the conduct of monetary policy in South Africa.

In West Africa, Tule et al., (2014) and Yaaba (2013) developed MCIs for the Central Bank of Nigeria. They concluded that the computed MCIs were useful input to the central bank's monetary policy, either as an indicator of monetary policy stance or an operational target. In the same vein, Dembo Toe (2012) and Diarisso and Samba (1999) developed some MCI for monetary policy and found that MCI could describe monetary policy stance in WAEMU zone.

Thus, central banks across the world have developed MCIs and most of them affirmed the importance of the index in the successful conduct of monetary policy. However, in recent years, MCIs have been extended to FCIs by considering the importance of financial development in both advanced and emerging countries. In effect, empirical evidence has shown that other markets (stock market, real estate, etc.) also play an important role in monetary policy transmission channel, like the banking system. Consequently, other channels such as bonds, and equity prices are integrated in developing monetary policy stance and operational target index. Thus, empirical works on FCIs abound with most papers adopting either the PCA or DFM.

In the US, Hatzius et al., (2010), and Guichard and Turner (2008) constructed an FCI using VAR and PCA methods to assess monetary policy stance. Equally, Montagnoli and Napolitano (2005) using Kalman filter also developed an FCI for the US and the Euro zone while Angelopoulou et al., (2014) and Mayes and Viren (2001) built an FCI for the Euro area. In Asia, several FCIs have been developed in Turkey, including Kazdal et al., (2022), Chadwick and Ozturk (2019) and Kara et al., (2015) while (Hua et al., (2015) and Guihuan and Yub (2014) constructed an FCI for China. In the same vein, Osorio et al., (2011) developed an FCI for 13 Asian economies using VAR and Dynamic Factor Model (DFM). In Latin America, Cottani et al., (2012) developed an FCI for some Latin America countries while Gomez et al. (2011) constructed an FCI for Columbia. Finally, in Africa, Kabundi and Mbelu (2021) and Gumata et al., (2012) computed an FCI for South Africa while Yaaba (2018) constructed an FCI for Nigeria and Ghana. As compared to MCI, most FCIs show improvement regarding the capability of the index to assess monetary policy stance or as operational target for central bank.

It is important to recall that, as stated earlier, the extension of MCI to FCI requires the development of capital markets such as stock market. In the ECOWAS, there exists stock markets only in WAEMU, Nigeria, and Ghana. The rest of the member countries lack these markets and continue to rely on the banking system. Consequently, this paper focused on MCI rather than FCI in order to cover all the seven (7) central banks in ECOWAS.

3.0 Model, Estimation technique and Data

3.1 Theoretical framework

Our theoretical model follows Gerlach and Smets (2000) which includes the MCI as an argument in the central bank reaction function. The model considers a small open economy specialized in the production of a simple good. The model comprises four (4) equations:

$$p_t = E_{t-1}p_t + \gamma(y_t - \varepsilon_t^s) \quad (1)$$

$$y_t = -\alpha r_t - \beta(e_t + p_t - p_t^*) + \varepsilon_t^d \quad (2)$$

$$R_t = R_t^* - E_t p_{t+1} + e_t + \varepsilon_t^x \quad (3)$$

$$r_t = R_t - E_t(p_{t+1} - p_t) \quad (4)$$

where variables with « * » denote foreign variables, namely foreign price (p_t^*) and foreign interest rates (R_t^*). All variables are in logarithms. The first equation represents a simple Phillips curve in which price (p_t) is a function of last period expectations (E_{t-1}) of prices and output gap ($y_t - \varepsilon_t^s$). Gerlach and Smets (2000) stipulates that equation (1) can be derived from an economy where prices are determined as a mark-up over wages while the latter are set one period in advance. The second equation represents aggregate demand which depends on expected real interest rate (r_t) defined by equation (4)) and real exchange rate ($(e_t + p_t - p_t^*) = q_t$). Equation (3) represents the equilibrium condition for international capital markets which assumes that uncovered interest rate parity does not hold, thus there is a time varying risk premium (ε_t^x) while equation (4) is the real interest rate.

The central bank minimizes the following intertemporal loss function (L):

$$E_t \sum_{i=0}^{\infty} \rho^i L_{t+i} \quad (5)$$

where
$$L_{t+i} = \gamma^2(y_t - \varepsilon_t^s)^2 + \chi(\pi_t - \bar{\pi}_t)^2 \quad (6)$$

with
$$\pi_t = p_t - p_{t-1} \quad (7)$$

Equation (6) indicates that the monetary authority reacts to both deviations of output from its potential ($y_t - \varepsilon_t^s$) and deviations of inflation from its target ($\pi_t - \bar{\pi}_t$). In other words, equation (6) is like a Taylor rule in which the central bank minimizes its loss function vis-à-vis its two objectives i.e., output and price stability. This means that the bank has adopted a rule rather than a discretionary monetary policy, and thus there is no inflation bias that the public needs to care about. This assumes that the public knows α , β , and γ as well as the distributions of the disturbances ε_t^s , ε_t^d , and ε_t^x , and that the nominal variables (interest rate and exchange rate) are observed by the public while the output and prices are equally assumed to be observed by both the public and the monetary authority. The model stipulates, in consequence, that there is full information available to the public and the monetary authority, i.e., they can observe endogenous variables and are able to deduce sources of disturbances hitting the economy. Thus, the state-contingent reaction function of the bank is as follow:

$$L_t = (\pi_t - E_{t-1} \pi_t)^2 + \chi(\pi_t - \bar{\pi}_t)^2 \quad (8)$$

The central bank solves the model by choosing the level of inflation that minimizes its loss function. This leads to the following first order condition:

$$\pi_t = (1 - \varphi)E_{t-1}p_t + \varphi\bar{\pi}_t \quad (9)$$

where $\varphi = \chi / (1 + \chi)$ and by imposing rational expectations,

$$E_{t-1}\pi_t = E_{t-1}\bar{\pi}_t \quad (10)$$

The optimal inflation rate can be obtained by substituting equation (10) back into equation (9), which gives the following:

$$\pi_t^{opt} = (1 - \varphi)E_{t-1}\bar{\pi}_t + \varphi\bar{\pi}_t \quad (11)$$

Equation (11) suggests that the Bank chooses a level of inflation equal to a weighted average of the public expectations of the inflation target and the current inflation target. Also, it is important to note that the weight of the actual inflation target depends on the relative importance attached to achieving the inflation target in the Bank's objective function. The inflation forecast error is given by:

$$p_t - E_{t-1}p_t = \varphi(\bar{\pi}_t - E_{t-1}\bar{\pi}_t) \quad (12)$$

Using equations (1), (2) and (12), we obtain the following:

$$(1 - \omega)r_t + \omega q_t = MCI_t^{opt} = \theta(\varepsilon_t^d - \varepsilon_t^s) - \theta\varphi(\bar{\pi}_t - E_{t-1}\bar{\pi}_t)/\gamma \quad (13)$$

where $\omega = \beta/(\alpha + \beta)$ and $\theta = 1/(\alpha + \beta)$.

The real monetary conditions index (MCI) is defined by the left-hand side of equation (13), i.e., $((1 - \omega)r_t + \omega q_t)$, as a weighted average of the real interest rate and real exchange rate. The weight on the exchange rate is assumed to be a function of the elasticity of aggregate demand to the exchange rate and interest rate. Equation (13) represents an optimal reaction function of the central bank in which a tight monetary policy corresponds to a rise in the MCI, and vice versa.

3.2 The Model

The general form of MCIs can be written as follows:

$$MCI_t = \sum_i^n w_i(z_{it} - \bar{z}_i) \quad (14)$$

where z_{it} is the relevant economic indicator i , included in the MCI basket, \bar{z}_i is the long-term trends or equilibrium values of the indicator i at time t , extracted using HP filters; and w_i represents the weight of indicator i .

The main indicators used in developing the MCI are interest rate and exchange rate. However, any relevant monetary or financial variables may be included in computing the MCI given that MCI is, by definition, a combination of monetary policy indicators (Mishra and Montiel, 2012; Frochen, 1996). In addition, financial indicators could be considered given the role of the capital market in monetary policy transmission, helping to generate the FCI. In this paper, in addition to the two traditional indicators (interest rate and exchange rate), we also include monetary aggregate to account for the fact that most central banks in ECOWAS are practicing

monetary targeting as their monetary policy framework. Thus, monetary aggregates play a key role in monetary policy formulation in these countries. To recall, in monetary targeting regime, reserve money is the operational target while broad money is the intermediate target. Given that MCI plays a role as operating target or an indicator of monetary policy stance, any composite index regarding monetary policy framework should consider the current monetary policy framework of the central bank (Guihuan and Yub, 2014; Hua et al., 2015).

Equation (14) could therefore be rewritten as:

$$MCI_t = w_r(r_t - \bar{r}) + w_q(q_t - \bar{q}) - w_m(m_t - \bar{m}) \quad (15)$$

$$\text{With: } w_r + w_q + w_m = 1$$

r, q , and m are the short-term interest rate, exchange rate, and reserve money, respectively.

In relative term, equation (15) becomes:

$$MCI_t = (r_t - \bar{r}) + \frac{w_q}{w_r}(q_t - \bar{q}) - \frac{w_m}{w_r}(m_t - \bar{m}) \quad (16)$$

where w_r, w_q, w_m are weight of interest rate, exchange rate, and base money, respectively.

The relative terms allow to express the estimate coefficients with respect to interest rate, which remains the main monetary policy instrument used by central banks.

One should note that the coefficient for reserve money is negative as a rise in the variable corresponds to a loose monetary policy stance while a rise in the two other variables is equivalent to tight monetary policy stance.

3.3 Estimation technique and sources of data

As shown in the literature, the main estimation techniques in constructing MCIs are aggregate demand model, Vector Autoregression (VAR), Principal Components Analysis (PCA), and Dynamic Factor Model (DFM). The PCA is widely used given its simplicity, but its main drawback is that it is static, unlike DFM and VAR methods, which are dynamic. In this paper, we apply DFM, complemented by PCA in developing the MCI. In the robustness analysis, we utilize VAR and compute IRFs to assess the effectiveness of MCI in the transmission of monetary policy.

Under a DFM, a latent factor is estimated using Kalman filter through state-space representation. Other differences between PCA and DFM are the fact that PCA assumes a common variance of the model while DFM considers differences in the variance of the estimates. In addition, DFM assumes that residuals have a normal distribution while PCA does not impose this restriction (Kazdal et al., 2022). Basically, DFM may be written as a system of three (3) equations, as follow:

$$y_t = Pf_t + Qx_t + u_t \quad (17)$$

$$f_t = Rf_t + A_1f_{t-1} + A_2f_{t-2} + \dots + A_{t-p}f_{t-p} + v_t \quad (18)$$

$$u_t = C_1u_{t-1} + C_2u_{t-2} + \dots + C_{t-q}u_{t-q} + \varepsilon_t \quad (19)$$

where y_t and f_t represent a vector of dependent variables and a vector of unobservable factors, respectively. P , Q , R , A_i , and C_i are matrices of parameters while x_t and w_t represent matrices of exogenous variables. Finally, u_t , v_t , and ε_t are vectors of disturbances and are orthogonal to each other. Equations (17), (18), and (19) represent a state-space model that can be estimated using Kalman filter technique.

We estimate an MCI for each of the seven selected countries in ECOWAS³ including the BCEAO⁴ for UEMOA zone and the central banks of the six (6) member countries on the West African Monetary Zone. The variables used in the estimation are policy rate, exchange rate, and reserve money. The policy rate is taken in real terms and was deflated using the inflation rate. For Liberia, we use lending rate rather than MPR since the country started using the MPR in 2019 while the short-term interest rate was used for UEMOA. Similarly, exchange rate is also used in real terms. Given the lack of long series of real effective exchange rate (REER) in high frequency, we computed bilateral real exchange rate against the USD, using the standard formulas, as follows:

$$Q_t = S_t * P_t / P_t^* \quad (20)$$

where Q_t and S_t represent real exchange rate and nominal exchange rate, respectively. P_t and P_t^* stand for domestic and foreign prices, proxied by domestic CPI and US CPI (for WAMZ) and Euro CPI (for BCEAO), respectively. Given that the CFA is pegged to the Euro while the USD is the most used currency in the WAMZ countries for external transactions, the two indices are representative of the foreign prices for the two zones. Equation (20) stipulates that a rise in Q_t corresponds to an appreciation of the real exchange rate. The variables are taken in growth rates (except interest rate) and normalized to minimize the influence of the data size difference.

In order to check for robustness and the effectiveness of monetary policy using the constructed MCI, we estimated a simple VAR and obtained impulse response functions (IRFs). More specifically, using Cholesky ordering, we consider an exogenous innovation of monetary policy with the MCI as the operating target (shocked variables) and examine how inflation rate reacts to the disturbance. We do not consider output reaction given the fact that, first, price stability remains the primary objective of all central banks in the region, and second, there was no long series of GDP in high frequency for most countries in ECOWAS (only Ghana and Nigeria publish quarterly GDP).

MCIs are computed using monthly data covering the period 2005 – 2021, except for Sierra Leone and Liberia, which span from the period 2008-2021 and 2011-2021, respectively, due to data constraints. All data were collected from the databases of the respective central banks for the countries studied, except the US CPI and Euro CPI that were obtained from the OECD Stat.

4.0 Estimation results

³ This paper could not include Cape Verde, due to data constraint.

⁴ Banque Centrale de l'Afrique de l'Ouest, i.e., Central Bank of West Africa.

This section presents the descriptive statistics and correlation matrix. It is followed by the analysis of the estimation results of the MCI using both DFM and PCA approaches to the derivation of the MCI weights.

4.1 Summary Statistics

Table 1 presents the summary statistics for the variables used in the study, namely, inflation rate, policy rate, monetary aggregates, and exchange rate.

Table 1: Selected monetary policy variables from 2006 - 2021.

	<i>Mean</i>	<i>STD</i>	<i>Min</i>	<i>Max</i>
<i>The Gambia</i>				
<i>Inflation</i>	5.8	1.9	0.4	7.9
<i>Policy rate</i>	15.6	4.2	10.0	23.0
<i>Exchange rate variation</i>	4.8	10.2	-19.6	19.4
<i>Broad money growth</i>	16.8	10.4	-0.9	44.8
<i>Reserve money growth</i>	16.7	12.4	-4.3	44.6
<i>Ghana</i>				
<i>Inflation</i>	12.2	3.5	7.9	18.1
<i>Policy rate</i>	17.0	4.0	12.5	26.0
<i>Exchange rate variation</i>	11.5	11.5	0.9	45.5
<i>Broad money growth</i>	26.3	10.1	11.9	44.8
<i>Reserve money growth</i>	25.5	10.3	4.6	45.0
<i>Guinea</i>				
<i>Inflation</i>	11.6	4.0	7.3	20.8
<i>Policy rate</i>	15.1	4.0	11.0	22.0
<i>Exchange rate variation</i>	4.0	12.9	-26.0	23.5
<i>Broad money growth</i>	19.4	18.0	1.1	74.4
<i>Reserve money growth</i>	18.6	24.9	-5.1	81.5
<i>Liberia</i>				
<i>Inflation</i>	11.5	5.9	5.5	28.5
<i>Policy rate</i>	13.4	0.7	12.4	14.3
<i>Exchange rate variation</i>	6.5	11.3	-12.6	25.6
<i>Broad money growth</i>	22.1	17.6	-1.5	50.1
<i>Reserve money growth</i>	16.3	16.3	-6.6	59.9
<i>Nigeria</i>				
<i>Inflation</i>	12.3	3.4	6.6	18.6
<i>Policy rate</i>	11.3	2.6	6.0	14.0
<i>Exchange rate variation</i>	9.3	15.1	-8.0	54.8
<i>Broad money growth</i>	17.9	14.8	-2.3	85.1
<i>Reserve money growth</i>	22.5	23.0	-19.9	108.2
<i>Sierra Leone</i>				
<i>Inflation</i>	13.2	3.4	7.9	17.9
<i>Policy rate</i>	14.2	3.8	9.5	20.0

<i>Exchange rate variation</i>	10.4	9.4	-1.0	29.1
<i>Broad money growth</i>	20.7	9.0	7.0	38.2
<i>Reserve money growth</i>	19.5	13.4	6.5	54.8
<i>UEMOA</i>				
<i>Inflation</i>	2.0	2.3	-1.0	7.5
<i>Short term rate</i>	3.4	0.9	2.0	5.0
<i>Exchange rate variation</i>	0.6	8.4	-10.9	13.4
<i>Broad money growth</i>	13.4	3.3	8.5	18.8
<i>Reserve money growth</i>	11.3	7.1	-2.5	20.4

Sources: Countries' Central Banks

- In **The Gambia**, inflation rate averaged 5.8 percent and has remained in single digits throughout the period under review, with a maximum of 7.9 percent reached in 2016. This is an indication of a relative stability in the domestic economy of The Gambia, as it remained below the ECOWAS convergence criteria of a maximum of 10.0 percent. Despite this, the bank's key rate was relatively high averaging 15.6 percent remaining at a level greater than or equal to 10.0 percent, thus reflecting a positive but high real interest rate during the period. Similarly, the exchange rate variation was less than 4.8 percent, on average, among the lowest in the region. The Gambian dalasi, however, witnessed large fluctuations during the period around the band of ± 20.0 percent. As for the monetary aggregates, broad and reserve money increased by an average of about 17.0 percent per annum during the period. It should be noted that the country witnessed strong growth in monetary aggregates amounting to 33.9 percent and 45.6 percent in 2020 and 2021, respectively while the average was around 13.0 percent growth in previous years. This was partly explained by the expansionary monetary policy measures taken by the Central Bank of The Gambia resulting in a reduction in the policy rate by 2.5 percentage points to mitigate the effects of COVID-19 on real activity.
- In **Ghana**, inflation rate averaged 12.2 percent, more than four percentage points above the inflation target of 8.0 percent. The inflation rate exceeded the target for most of the period under review but remained within the target in recent years. Bank of Ghana's policy rate remained relatively high with an average of 17.0 percent and a minimum of 12.5 percent during the period under review. This indicates that the bank has maintained a positive real interest rate while the lending rate has always exceeded 20.0 percent. A possible explanation for the rise in inflation could be linked to the strong variation in the exchange rate (11.5 percent on average) with a maximum of 45.5 percent, and monetary aggregates which exceeded 25.0 percent, on average, during the period.
- In **Guinea**, the inflation rate was 11.6 percent on average between 2006-2020. Inflationary pressures remained relatively high between 2010-2013 at double digits before starting a steady decline to single digits between 2014-2019. With regard to interest rates, the policy rate recorded 15.1 percent, on average, while the borrowing rate remained at 25.0 percent on average, during the review period, approaching 30.0 percent in certain periods. Real interest rates remained positive during the period. Exchange rate variation stood at 4.0, on

average, among the lowest in the region. The *franc guineen* (GNF), however, recorded large volatility during the review period around ± 25.0 percent. In addition, the growth of monetary aggregates was nearly 20.0 percent on average between 2006-2020, but with very significant fluctuations as shown by the standard deviation of the same order as the average as well as the maximum reaching more than 70.0 percent.

- In **Liberia**, inflation rate averaged 11.5 percent, with the rate remaining generally low until 2016 when the country witnessed high inflationary pressures between 2016-2019, following the global shock in commodity prices and Ebola virus disease that affected the country. Lending rate from the banking system was 13.5 percent on average, i.e., an average real interest rate of less than 2.0 percent, which is relatively low compared to the sub-regional average. The variation in the exchange rate, meanwhile, was 6.5 percent on average, but with high volatility, particularly during commodity prices shocks and Ebola disease, which partly explains the rise in inflation that followed. Monetary aggregates also experienced strong growth with broad money growth reaching 20.0 percent, on average, during the review period.
- In **Nigeria**, the average inflation rate for the period under review was 12.3 percent while the policy rate averaged 11.3 percent during the period. This indicates that the real interest rate remained negative on average in Nigeria between 2007-2021. However, this was not the case at the level of the financial system, in particular the banking sector, since the lending rate remained relatively high in recent years. The exchange rate depreciated by an annual average of 9.3 percent with, however, significant fluctuations during the period under review, reaching a peak depreciation of more than 50.0 percent in 2016, during the commodity crisis. As regard to monetary aggregates, both reserve money and money supply fluctuated recorded important fluctuations, averaging to 22.5 percent and 17.0 percent, respectively. The two variables spanned from negative to positive territory during the period under-reviewed.
- In **Sierra Leone**, the average inflation rate for the period under review was 13.2 percent while the policy rate averaged 14.2 percent during the review period. This indicates that the real interest rate remained positive, on average, in Sierra Leone during 2007-2021. The lending rate was relatively high in Sierra Leone, reaching a maximum of 25.0 percent. The exchange rate depreciated by an average of 10.4 percent per annum with, however, significant fluctuations during the period under review, reaching a high depreciation of 29.1 percent during the period. As for the monetary aggregates, the money supply as well as the monetary base grew by around 20.0 percent during the period, with strong variations going from a minimum of 7.0 percent to a maximum of 54.8 percent and a maximum of 38.2 percent, respectively.
- The **UEMOA Zone** witnessed strong internal stability reflected in very low inflation rate around its objective of 2.0 percent, on average, and a maximum of 7.5 percent between 2005-2021. Thus, the inflation rate for the region has never exceeded single digit in the past 15 years. Some member countries have even recorded negative inflation rates in recent years. In fact, UEMOA (WAEMU) has been one of the most economically stable areas in

the world over the past decades, with a significantly low inflation rate compared to most other regions of the world. This is largely explained by the fixed peg arrangement of the CFA with the euro, whose price stability remains a reference at the global level. This is, thus, confirmed by the very small variation (depreciation) of the nominal exchange rate against the US dollar (0.6 percent on average).

This internal and external stability of the Zone enabled member countries to record low interest rates, unlike most developing countries which witnessed double digit interest rates, on average, or even greater than 20.0 percent. Similarly, monetary aggregates represented by the money supply and the reserve monetary grew, respectively, by 13.4 percent and 11.3 percent, on average, during the review period.

4.2 Weight estimates

The analyses above show that only the UEMOA zone and The Gambia have generally recorded low and stable inflation over the recent years, as the rest of the group have witnessed, on average, double digit inflation rate. This suggests that monetary policy effectiveness remains an important challenge for central banks vis-à-vis compliance with the ECOWAS convergence criteria of a maximum of 5.0 percent inflation rate. As Banks use different monetary policy instruments, it may be useful to explore the possibility of developing the MCI that combines instruments use by central banks in the region.

Table 2 presents the estimated weights of the three (3) indicators used to compute the MCI from both DFM and PCA techniques. Results from DFM show that reserve money has the bigger weight for all the countries, except in Liberia and the UEMOA zone where the exchange rate has the highest weight. This means that the adoption of monetary targeting could explain the relative importance of monetary aggregates in these central banks while the other instruments are used as complements.

Table 2: Estimated weights of MCI

<i>Countries/Zone</i>	<i>Methods</i>	<i>Interest rate</i>	<i>Exchange rate</i>	<i>Reserve money</i>
<i>The Gambia</i>	DFM	0.32	0.27	0.45
	PCA	0.37	0.29	0.34
<i>Ghana</i>	DFM	0.31	0.24	0.49
	PCA	0.36	0.32	0.32
<i>Guinea</i>	DFM	0.10	0.51	0.39
	PCA	0.26	0.37	0.37
<i>Liberia</i>	DFM	0.10	0.65	0.26
	PCA	0.32	0.38	0.30
<i>Nigeria</i>	DFM	0.26	0.22	0.52
	PCA	0.28	0.35	0.36
<i>Sierra Leone</i>	DFM	0.34	0.20	0.46
	PCA	0.34	0.33	0.33
	DFM	0.41	0.46	0.13

<i>UEMOA</i>	PCA	0.33	0.34	0.32
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Source: Authors' computations

Note: DFM stands for Dynamic Factor Model and PCA stands for Principal Components Analysis

In Ghana, even though the country has adopted inflation targeting regime with interest rate as the main operating target, the findings suggest that monetary aggregates remain important for the Bank of Ghana. Thus, the use of MCI could be relevant for the Bank, to complement the forward-looking interest rate. This is, however, different from Yaaba (2018) who found that the exchange rate has the higher weight than interest rate. In Liberia, the country migrated to monetary targeting from exchange rate targeting in 2019. However, given that the country still uses dual currency with the USD being the main currency and Liberian dollar used as the residual currency, the findings suggest that the exchange rate remains the most important instrument, weighing two-third of the MCI. In UEMOA zone, the results indicate that exchange rate remains the main variable in the MCI in line with the monetary regime of exchange rate targeting by BCEAO. Dembo Toe (2012) found that interest rate was slightly higher than exchange rate for UEMOA with an MCI ratio of 1.1:1. Findings from PCA, on the other hand, show that, except for Guinea, the three indicators have weights close to 0.30 or more, indicating that they are all important determinant of MCI. Interest rate has the highest weight in The Gambia, Ghana, and Sierra Leone while it was lowest in Guinea and Nigeria. Not surprisingly, exchange rate records the highest weight in Liberia and UEMOA Zone.

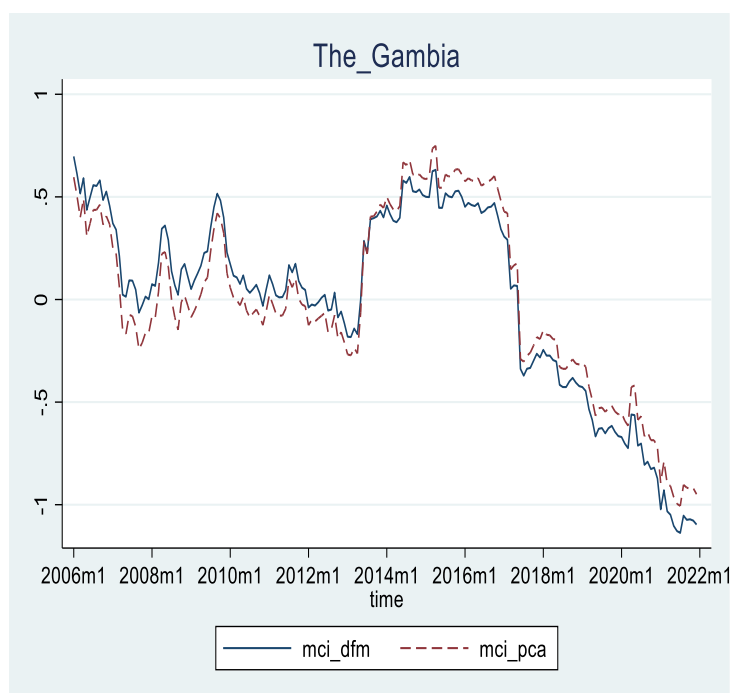
4.3 The computed MCIs

The following section presents the results of the computed MCI from both DFM and PCA for each of the seven Central Banks in the ECOWAS region. As stated earlier, interest rate, real exchange rate variation, and growth of reserve money constitute the indicators used for the computation of the index. This means that, as shown by equations 13, 14, and 18, a tight (ease) monetary policy stance corresponds to a rise (fall) in interest rate, a rise/appreciation (fall/depreciation) in real exchange rate, and a fall (rise) in the growth of reserve money.

The Gambia

Chart 1 presents the computed MCI for The Gambia. The chart indicates a downward trend in the MCI between 2006-2008 corresponding to loosening monetary policy. During that period, real interest rate dropped to 9.0 percent at end-2007, from 12.0 at the beginning of the year. Similarly, the Central Bank of The Gambia (CBG) left both real and nominal exchange rates depreciating to double digits, on average. The expansionary monetary policy in 2007 was a response to the challenges the country faced in the previous year, particularly in the agricultural sector that led the country into an economic recession

Chart 1: MCI for The Gambia

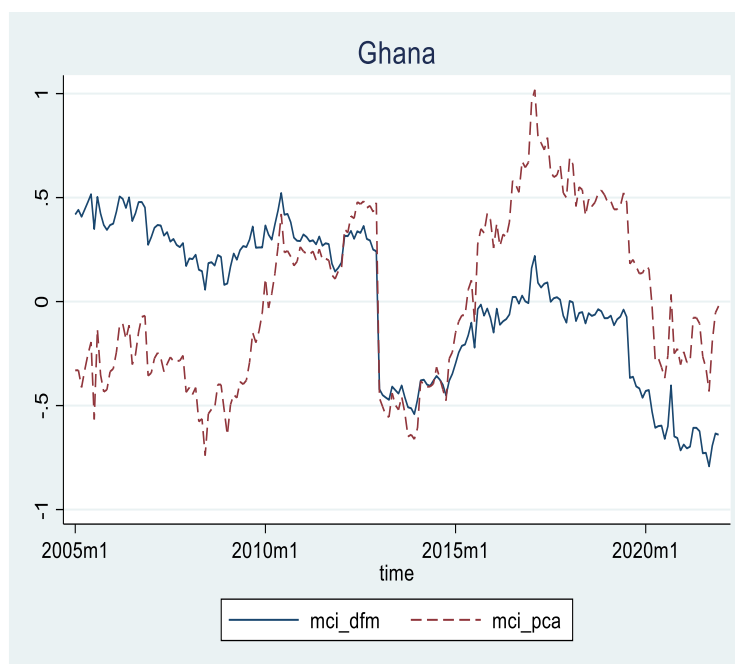


in 2005 (-2.5 percent) and 2006 (-0.7 percent) while experiencing low inflation rate (0.4 percent in 2006). Between 2008 and 2010, the monetary policy stance had been tightened globally as real activity rebounded to around 6.0 percent while inflation rate remained in single digit during the period. However, as inflation rate remained relatively low, the CBG continued to support economic activity, following the new recession recorded in 2011 (-8.5 percent), caused by the contraction in the agricultural sector (by 27.7 percent), which is the main driver of The Gambian economy, due to drought witnessed in the country. Thus, the CBG generally adopted an expansionary monetary policy between 2010 and 2014, as it dropped the policy rate by 2.3 percentage points to 12.5 percent in 2012 while the nominal exchange rate depreciated by 10.7 percent the same year. The Bank also increased liquidity support to the economy as broad money supply rose by 12.0 percent, on average, during the period. In response to the inflationary pressures afterwards (inflation rate reached 6.9 percent in 2014, the highest rate since 2004), the CBG tightened its monetary policy from 2014-2016, by raising its main instruments (the policy rate rose above 20.0 percent during the period, the nominal exchange rate appreciated by 12.2 percent in 2015 while broad money supply fell, by -0.9 percent the same year) aimed at stabilising inflationary pressures in the country. Finally, from 2017 through 2021, the MCI has been on the downward trend suggesting that the CBG has embarked on a loosening monetary policy stance. In effect, the Bank dropped its policy rate to 12.0, on average between 2017-2021, from 23.0 percent in 2016. Similarly, the Bank increased liquidity supply, particularly since the start of the COVID-19 pandemic, as the broad money supply grew by 24.5 percent, on average, during 2020-2021.

Ghana

Chart 2: MCI for Ghana

Chart 2 presents the computed MCI for Ghana. Despite the existence of an important gap between the two (2) indices, they show similar trend during the entire period. More specifically, the computed MCI globally indicate five (5) periods of distinct loosening and tightening of monetary conditions in Ghana. The first period (2005-2007) shows loosening monetary conditions, which correspond to the pre-adoption of inflation targeting regime in Ghana. During that period, the Bank increased

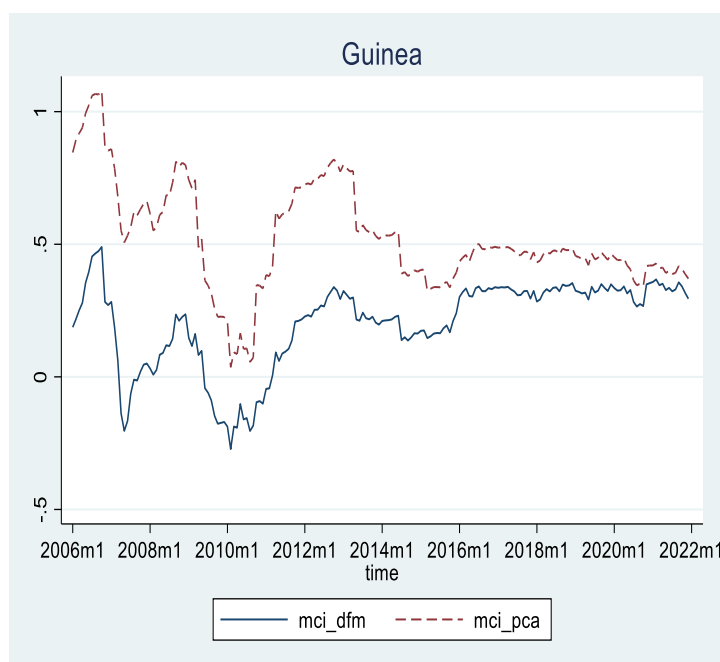


liquidity supply, as broad money grew by more than 30.0 percent, on average, while the policy rate declined by 2.0 percentage points to 13.5 percent in 2007, from 15.5 percent two years earlier. However, as inflation rate rose to 18.1 percent in 2008, compared to a target of 8.0 (± 2) percent, The Bank of Ghana (BoG) tightened monetary policy by increasing the policy rate to 17.0 percent and 18.0 percent in 2008 and 2009, respectively, while limiting the depreciation of the Ghanaian Cedi to less than 5.0 percent in 2010, from 20.1 percent two years prior. As inflation rate attained the target in 2010, despite the challenges following the global financial crises in 2008-2009, the Bank generally left the monetary conditions stable until 2013. After a sharp decline in the MCI in 2013, as inflation rate was above the target, monetary conditions were tightened as the Bank increased the policy rate and reduced liquidity availability in the money market until 2016. As the business cycle was severely hit by the commodity price shocks in 2014-2016 (real GDP growth dropped to 3.4 percent in 2016, from double digit growth, on average, between 2011-2013), the BoG decided to ease monetary policy conditions since 2017 by lowering its policy rate, allowing more depreciation of the Ghanaian Cedi, and supplying more liquidity to the real economy. The expansionary monetary conditions became favourable, as the BoG succeeded in maintaining the inflation rate within the target from 2018 through 2021, despite the challenges caused by the impact of the COVID-19 and policy measures adopted by the government in response of the pandemic.

Guinea

Chart 3: MCI for Guinea

The MCI for Guinea are presented in Chart 3. The indices show that monetary conditions trended downwards during 2006-2010, which was characterized by severe political and social crises in Guinea. As inflation dropped to 12.9 percent in 2007 from nearly 40.0 percent in the previous year, the monetary authority embarked on an expansionary monetary policy to satisfy high social pressures in 2007. Thus, broad money supply (M2) rose by 40.1 percent, on average, between 2006 and 2010 while exchange rate depreciation remained in double digit, on average, during the same



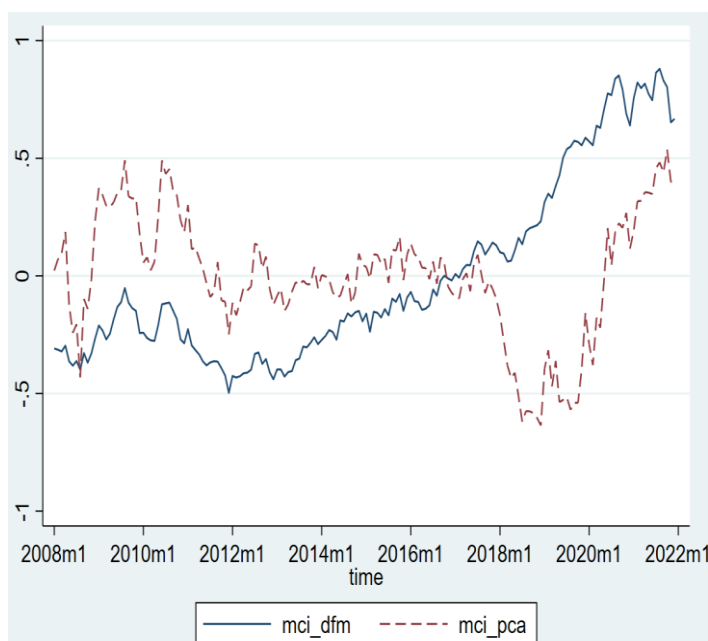
period. The policy rate, in the same vein, was reduced to 9.0 percent in 2010, compared to 20.3 percent in 2006. Consequently, monetary conditions were accommodative during 2006-2010, except for 2007, corresponding to the implementation of a new government policy saddled with reforming the economic imbalances that led to deep social and political crises in early 2007. The next period (2011 – 2013), corresponding to the period, the monetary authority tightened monetary policy in response to inflation, which stood at 20.8 percent at end-2010. Thus, monetary policy conditions reversed to upward trend with the MPR rising by 7.8 percentage points to 16.8 percent from 9.0 percent the previous year while the nominal exchange rate appreciated by 1.0 percent in 2011-2012. Similarly, the Central Bank of Guinea (BCRG) embarked on liquidity sterilisation aimed at reducing the huge quantity of money in circulation, which led the M2 growth to decline to single digit, from 45.0 percent, on average, between 2008 – 2010. During the next period, 2013 – 2015, as inflation rate reached the implicit target (single digit), coupled with the Ebola disease outbreak as well as global commodity price shocks, the monetary policy stance was accommodative, as shown by the decrease in the MCI. More specifically, the BCRG significantly dropped its policy rate by 6.0 percentage points to 16.0 percent in 2013 while broad money supply rose by 15.6 percent, on average, between 2013-2015, from 1.1 percent in 2012. The nominal exchange rate also depreciated by around 10.0 percent during the period, from an appreciation of 1.7 percent in 2012. After the shocks, inflation rate was maintained at the implicit target of single digit, and the BCRG generally maintained its monetary policy unchanged with the policy rate at 12.5 percent, the real interest rate positive, and nominal exchange rate posted a lower variation (less than 1.0 percent). Similarly, broad money supply growth stood at less than 15.0 percent, on average, except in 2020, following the COVID-19 outbreak that led the BCRG to adopt some accommodative policy measures by reducing the policy rate by 1.0 percentage point to 11.5 percent, increasing liquidity support to the banking system, causing the nominal exchange rate to depreciate by 6.0

percent during the pandemic. However, the monetary authority soon reverted to a tight monetary policy stance in 2021, as the inflation rate reached double digits by introducing some sterilizing measures to reduce the volume of liquidity leading to nominal exchange rate appreciation while the policy rate was kept unchanged during the year.

Liberia

Liberia operates a dual currency regime with both the Liberian dollar and the US dollar allowed to circulate concurrently in the country. The country operated an exchange rate targeting regime until 2019 when it shifted to a monetary targeting framework and introduced the policy rate. Chart 4 indicates that monetary conditions witnessed an upward trend between 2009 and 2011, though it significantly dropped early 2010. During this period, the Bank adopted a tight monetary policy stance as the exchange rate depreciated by less than 1.0 percent in 2010 and 2011 in the context of a low inflation rate (single digit). This restrictive monetary policy through the main monetary policy instrument

Chart 4: MCI for Liberia

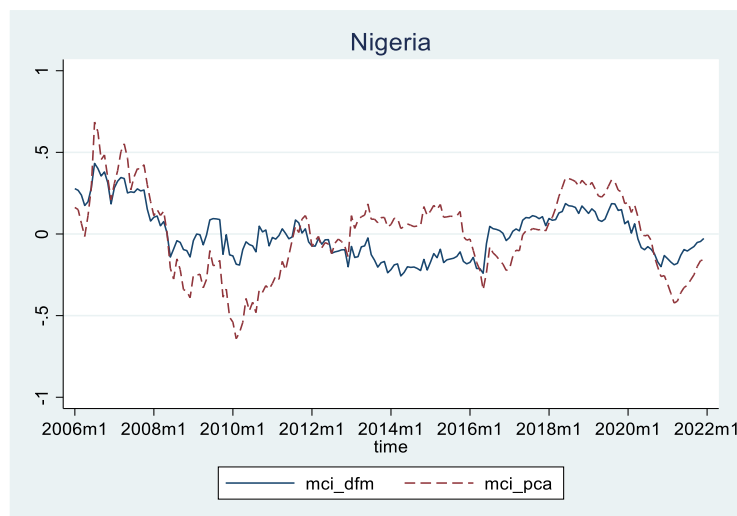


(exchange rate) was, nevertheless, contained by the increase in money supply in the economy. Then, between 2011 and 2017, the Bank reverted to accommodative monetary conditions. This was in response to the outbreak of the Ebola virus disease in 2013 and the commodity prices shocks that severely hit the country (real GDP recorded 0.0 percent and -1.6 percent growth in 2015 and 2016, respectively), as Liberia highly depends on commodity exports. Thus, the exchange rate depreciated by 15.0 percent, on average, in 2015-2016 while inflation also rose to double digits during the period. Even though the monetary authority adopted a new monetary regime, which is monetary targeting, in 2019 the Bank generally continued to implement accommodative monetary conditions after the COVID-19 outbreak in 2020.

Nigeria

Chart 5 presents the computed MCI for Nigeria during the period under review. It shows that monetary conditions were generally loosening during 2007-2008, 2012-2015 and in 2020 while monetary conditions were tight in 2009 and between 2015 - 2020. These results were compared with those published in previous works such as Yaaba, 2012. During the global financial crisis (GFC), and in the face of low and stable inflation (5.4 percent, on average, in 2007), the

Chart 5: MCI for Nigeria



Central Bank of Nigeria (CBN) adopted loose monetary stance by gradually reducing the policy rate, and significantly injecting liquidity into the financial system with broad money supply increasing by about 50.0 percent, on average, between 2007-2008. This was among the responses of CBN to the GFC, as many other central banks did during the period. In the same vein, the Naira depreciated during that period. However, these policy measures significantly impacted the domestic stability of the country, as inflation rate reached 15.1 percent at end-2008, compared to 8.5 percent end-2006. Consequently, the CBN tightened its monetary policy stance from 2009-2011, as it increased the policy rate toward the end of 2010 while liquidity supply was drastically reduced with broad money supply rising by an average of 15.3 percent during the period, as against about 60.0 percent at end-2008.

However, the nominal exchange rate continued to depreciate during the period. Between 2012 and 2015, monetary conditions remained generally eased, as the Bank significantly increased its operational target (reserve money) by 31.5 percent, on average, during the period, while the policy rate subsequently declined to 11.0 percent, from 13.0 percent in the previous year. This was a response by the CBN to the global commodity price shocks aimed at supporting the economy through increased liquidity supply into the financial system, as inflation rate reached the implicit target (single digit). During the period, CBN directly intervened to support the economy through different schemes such as the Agricultural Credit Guarantee Scheme (ACGS) and the Commercial Agriculture Credit Scheme (CACS), aimed at reducing the country's dependence on oil, which like most commodities, recorded shocks during 2014-2016 (oil prices declined to US\$52.7 per barrel in 2015 and further down to US\$33.4 per barrel in 2016, from US\$113.0 per barrel in 2013). This culminated in a moderation in economic growth in 2015 (2.8 percent) and the country slipped into recession in 2016 (-1.5 percent), from more than 5.0 percent growth prior to the shocks.

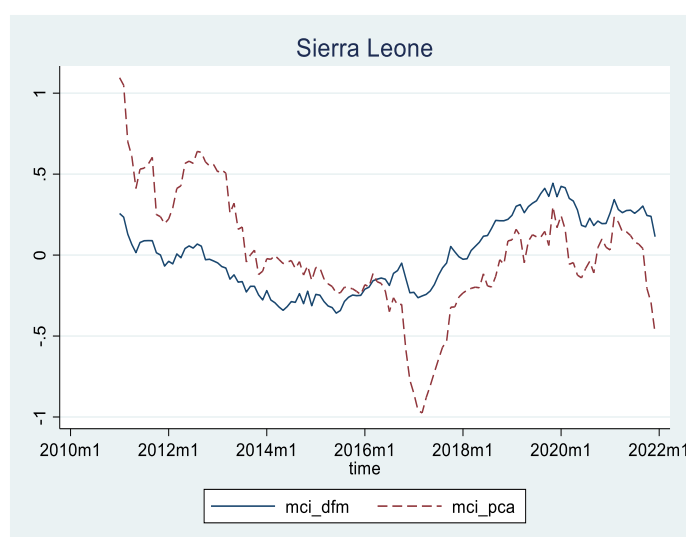
Similarly, inflation reached 16.4 percent in 2016, as against single digit in the three previous years (2013-2015). As domestic price stability remained the core mandate of the Bank, the CBN adopted a restrictive monetary policy stance from 2016-2019, as it gradually increased

the policy rate twice the same year in 2016 while reserve money grew by less than 10.0 percent, on average, from 2016 – 2019. Finally, following the COVID-19 outbreak in 2020, the bank reverted to a loose monetary policy stance from mid-2020 by decreasing successively the policy rate to 12.5 percent (in May 2020) and 11.5 percent (in September 2020) while reserve money grew by 65.9 percent the same year due to liquidity support to the economy, as part of measures taken by the Bank to counter the macroeconomic effects of the Pandemic. The nominal exchange rate also depreciated, by 17.8 percent the same year. Finally, in 2021, the CBN reverted to a tight monetary stance as the COVID-19 measures significantly impacted domestic price stability with inflation rate rising to 15.8 percent. While the Bank kept the policy rate unchanged at 11.5 percent, growth in money supply moderated to an average of 7.3 percent in 2021, and depreciation in the exchange rate also moderated by about 10.0 percentage points to 14.2 percent at end-2021, from 24.1 percent at end-2020.

Sierra Leone

The MCI for Sierra Leone, spanning from 2011 through 2021, is presented in Chart 6. The country introduced the monetary policy rate (MPR) in 2011, as part of the monetary policy instruments of the Bank of Sierra Leone. The Chart shows that monetary conditions eased between 2011 and 2016, except in 2012, in line with the Bank's monetary policy stance. In effect, the Bank fixed the first MPR at 26.0 percent in 2011 to reverse the rising inflationary pressure in the country. As inflation rate started declining by end-2011, the Bank

Chart 6: MCI for Sierra Leone



gradually decreased the policy rate by 6.0 percentage points to 20.0 percent in 2012, followed by another 10.0 percentage points to 10.0 percent from end-2013 to the first quarter of 2015 and another cut by 0.5 percentage point to 9.5 percent in the third quarter of 2015. Similarly, the Bank's operating target, reserve money, rose, on average, to above 20.0 percent during 2011-2015, as the bank largely injected liquidity into the economy. The accommodative monetary policy was explained by the responses of the Bank to the different shocks that severely affected the country during the period. More specifically, Sierra Leone, like Guinea and Liberia, were significantly affected by the outbreak of the Ebola virus disease, coupled with the global commodity price shocks, as the country highly depends on commodity exports. The Bank, however, adopted a tight monetary stance from 2017 through 2020, as exchange rate depreciation peaked at 30.0 percent at end-2016 contributing to high inflationary pressures, with inflation rate reaching about 20.0 percent early-2017. Consequently, the Bank increased the policy rate to 14.5 percent in 2017 and further to 16.5 percent between 2018 and early-2020. Following the COVID-19 outbreak, the monetary conditions went downward, as monetary policy stance was eased by the Bank, which decreased the MPR from 16.5 percent early-2020 to 15.0 percent in 2020 and 14.0 percent in 2021. Similarly, the Bank injected liquidity into the

system to support the economy with reserve money growing by 76.8 percent at end-2020. While these measures coupled with the easing fiscal policy had positive effects on the real economy, with output growth rebounding to 3.2 percent in 2021, from -2.2 percent in 2020, this was done at the expense of the domestic stability, as inflation rate rose to 17.0 percent at end-2021, from 13.6 percent in early-2020.

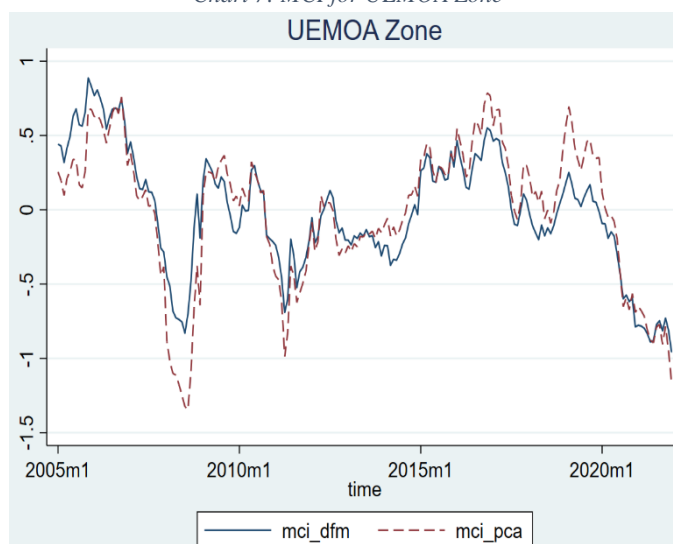
UEMOA zone

UEMOA is known for its good track record regarding domestic price stability, as inflation rate has remained in single digit for the last two decades. This was so, due mainly to the exchange rate targeting regime adopted by the BCEAO, pegging the CFA to the Euro since 1960s. Consequently, as inflation rate was relatively low (below 5.0 percent, on average), monetary conditions were loose between 2006 and 2011, except in 2009 when inflation rose to 7.0 percent, on average. During that period, the CFA

depreciated against the USD while interest rate trended downwards. The tight monetary policy stance that led to a rise in the MCI in 2008 was related to the response of the BCEAO to the global financial crises, as inflation rate reached a peak of 7.4 percent in 2008, as against 2.4 percent in the previous year. All member countries witnessed unprecedented inflationary pressures, as some countries (Niger and Burkina Faso) reached double digit inflation rates while others were close to 10.0 percent (Mali and Togo) in 2008. Consequently, the BCEAO reverted to a restrictive monetary stance to reduce the pressures and bring inflation rate down to the zonal objective of 2.0 percent. As inflation significantly declined at end-2009 to negative territory in all member countries, except in Mali and Togo (where inflation was positive but equally below the objective of 2.0 percent), the Bank switched to a loose monetary policy stance in 2010 through 2012, aiming to reverse the negative trend of inflation in the zone. Meanwhile, the exchange rate depreciated, on average, between 2010 and 2012, while reserve money grew by 19.0 percent in 2010 and 12.5 percent the following year. However, interest rate was kept around 3.0 percent by the Bank during that period.

From 2013 through 2020, despite a low and stable inflation rate around the objective, the BCEAO reversed to a tight monetary policy stance, by leaving its main operational target, the exchange rate, appreciating significantly in 2013 and 2016, and reducing liquidity support to the market. This led to a moderation in the inflation rate, which turned negative during the last quarter of 2016. In response, the BCEAO reversed again its monetary stance by adopting a loose monetary policy stance starting from 2017 to sustain the relatively high growth recorded in 2012 (6.9 percent), from the low of growth of the previous year (0.8 percent). Consequently, the loosening monetary conditions led to a lower appreciation or even depreciation (except in

Chart 7: MCI for UEMOA Zone



2019) and coupled with a gradual decline in the interest rate allowed the zone to maintain a growth of 6.3 percent, on average, during the period (although it witnessed 1.8 percent growth in 2020 due to the COVID-19 outbreak) in the context of a low and stable inflation rate, which stood at 1.1 percent, on average. In 2021, the zone maintained a loose monetary stance aimed at supporting the real economy following the COVID-19 pandemic, even though inflationary pressures emerged beginning from the second quarter of the year.

4.4 Robustness analysis

The robustness of the MCI depends on the extent to which the index is correlated with real indicators such as output and prices. In addition to the significance of the association, the sign also matters, as the MCI and the two macroeconomic variables are expected to be negatively correlated. More specifically, a rise in the index (tight monetary conditions) is expected to lead a decline in output and in inflation, and vice versa. Consequently, the first step consists of computing the correlation coefficients between the MCI and inflation⁵. In the second step, we use VAR analysis and compute the impulse response function (IRF) of inflation responses to MCI shocks.

V-1. Correlation analysis

Table 3 presents the correlation between inflation rate and the two computed MCIs (DFM and PCA).

Table 3: Correlations between inflation rate and MCI

	<i>MCI_DFM</i>	<i>MCI_PCA</i>
<i>The Gambia</i>	-.39**	-.26**
<i>Ghana</i>	.14*	-.30**
<i>Guinea</i>	-.06	.61***
<i>Liberia</i>	.40**	-.82***
<i>Nigeria</i>	-.28**	-.70***
<i>Sierra Leone</i>	.43**	-.16*
<i>UEMOA</i>	-.33**	-.67***

Note: *** denotes significance at 1.0 percent; ** denotes significance at 5.0 percent; * denotes significance at 10.0 percent.

As explained earlier, satisfactory results should indicate a negative correlation between inflation and the two indices. Table 1 shows a negative and significant association between inflation and at least one of the two indices, except for Guinea. More specifically, in The Gambia, Nigeria, and the UEMOA Zone, the two indices are negatively and significantly correlated with inflation. In Ghana, Liberia, and Sierra Leone, inflation was found to be negatively and significantly associated with one of the MCIs. Finally, in Guinea, one MCI is negatively but insignificantly correlated with inflation while the second is positively and

⁵ We did not include output growth as the data are monthly in this paper, and most of the countries do not have real GDP in high frequencies.

significantly associated with inflation. This could be indicative of the price “puzzle”. The correlation analysis indicates that the MCI could describe the stance of monetary policy in most ECOWAS countries, meaning that MCI could serve as an alternative policy rule in the region, particularly for the next ECOWAS Central Bank. Given that correlation analysis is static and might not consider dynamic relationship between the MCIs and the selected macroeconomic variables, we subject the MCI to further robustness check by estimating a VAR model.

V-2. VAR analysis

The correlation analysis might not be sufficient to describe the relationship among macroeconomic variables. More specifically, the correlation analysis describes contemporaneous linkage among variables and, thus, has important drawback, as it ignores the dynamic relationship and lag effects among the variables. These two shortcomings should be avoided when conducting monetary policy analysis, given the reality of monetary policy transmission lag. In consequence, we compute IRFs from a simple VAR model comprising two endogenous variables, namely the MCI and inflation to assess the effect of a shock to MCI on inflation.

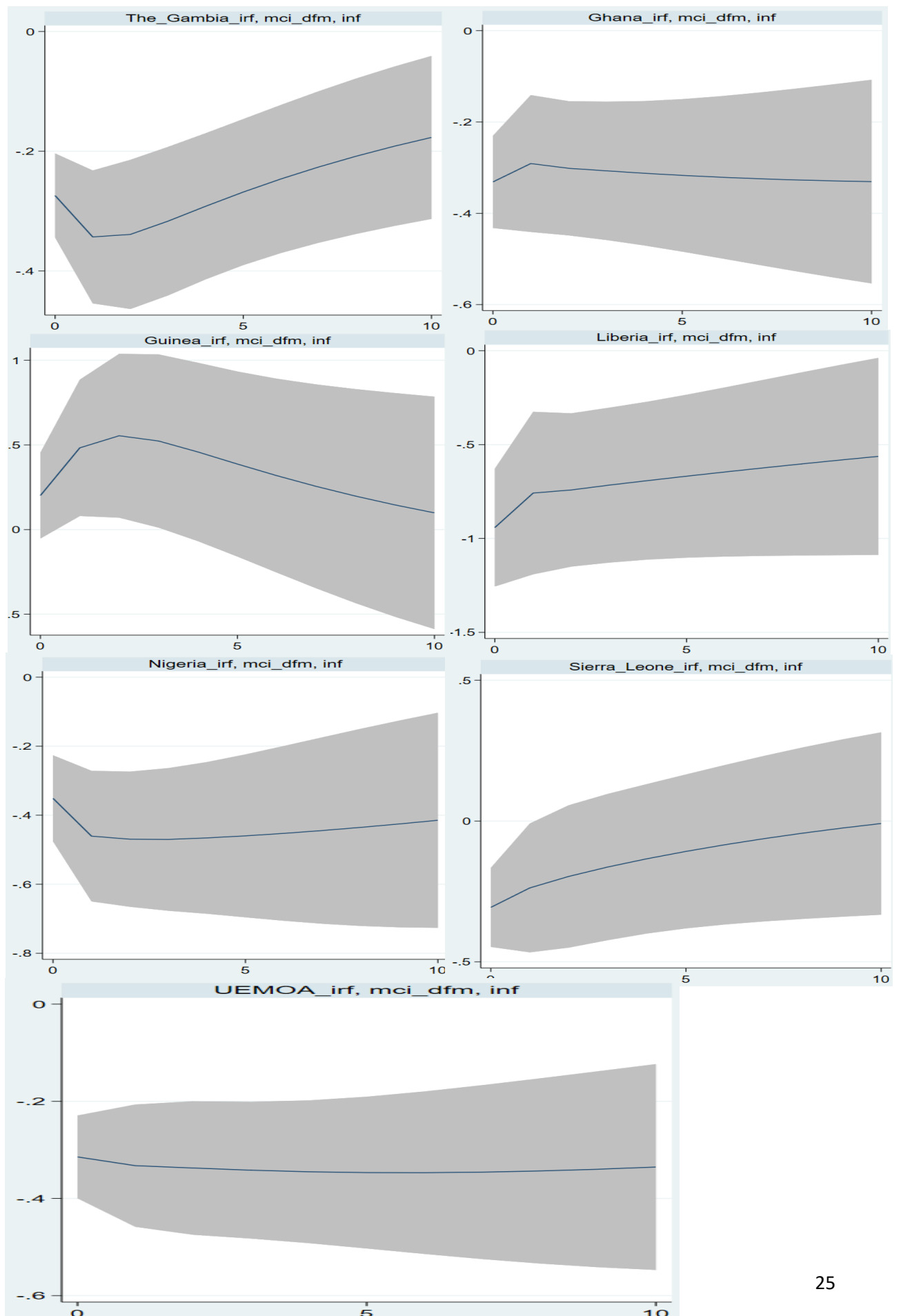
We use the Cholesky decomposition to order the MCI first and inflation rate second (mci, inflation). This means that we consider the exogenous innovations in the MCI by the monetary authority, through which the identifying assumptions are made, that monetary policy does not react contemporaneously to innovations in the price level (Mishra and Montiel, 2012).

Chart 8 presents the findings from the IRF for the seven Central banks in ECOWAS⁶. The results are more or less identical to the findings from the correlation analysis. More specifically, the results are consistent and significant for all the countries/zone, except Guinea. Thus, an unanticipated innovation by the central bank through a rise in the MCI (tight monetary policy) is associated with a decline in inflation rate, as expected. More specifically, a positive innovation corresponding to one percent standard deviation shock to MCI would lead to an instantaneous fall in inflation rate by 0.27 percent in The Gambia; 0.35 percent in Ghana; 0.9 percent in Liberia; 0.37 percent in Nigeria; 0.35 percent in Sierra Leone, and 0.30 percent in the UEMOA zone. The impact of the shocks is permanent in most countries, except in The Gambia and Sierra Leone.

Overall, the constructed MCIs for the seven Central banks depict movement of monetary policy variables in response to inflationary pressures. The reactions of the respective central banks using a combination of different instruments reflect alternative policy rules employed by the monetary authorities to achieve their mandates.

⁶ As explained earlier, we consider the six central banks of WAMZ and BCEAO. Due to inadequacy of data, we do not cover Cape Verde, which constitutes the 8 and last Central Bank in the ECOWAS region.

Chart 8: Responses of Inflation to MCI shocks



5.0 Conclusion and Policy implications

The Heads of State of ECOWAS member countries have directed the regional monetary institutions (West African Monetary Agency and West African Monetary Institute) and Central Banks to fast-track reforms towards the actualisation of the monetary union and the creation of the West African Central Bank. The Authority further, at its 55th Summit in Abuja (Nigeria) in June 2019, endorsed the inflation targeting (IT) regime as the explicit monetary policy framework for the WAMZ member states under the ECOWAS single currency program, with forward-looking interest rate as the operational target (WAMI, 2020). As at end-2022, only Ghana has adopted IT regime while all the other countries of the WAMZ operates a monetary targeting framework, and the UEMOA zone operates an exchange rate targeting regime. While the chosen monetary policy framework was expected, given that it has become a dominant monetary policy regime across the world, the effectiveness of monetary policy transmission remains an important challenge in the region. That is why forward-looking interest rate might not be sufficient, as most ECOWAS countries still have managed floating exchange rate regime, rather than full-fledged floating regime, as in many advanced IT countries. In the same vein, most countries rely on monetary aggregates for liquidity management. In this regard, central banks in the ECOWAS region might need complementary monetary policy instruments, such combinations of instruments to strengthen monetary policy transmission, at least in the short- to medium-term.

This paper aimed at constructing an MCI for the ECOWAS countries using their monetary policy instruments/operating targets in anticipation of the adoption of an inflation targeting regime for the future ECOWAS Central Bank. The paper used three indicators⁷ (interest rate, exchange rate, and reserve money) that currently constitute the operating targets of the seven central banks in the ECOWAS region. Key findings are that the MCI can be effective to gauge monetary policy stance in West Africa, and thus presents the possibility of an alternative argument in the policy rule of central banks in the region.

The robustness analysis through correlation analysis between the constructed MCI and inflation rate, and the IRFs of inflation to exogenous innovations from MCI show an effective monetary policy transmission for most central banks. The policy implication is that the MCI constitutes an effective means of monetary policy transmission in the ECOWAS countries. This is so due to the fact that most of the central banks combine, *de facto*, these monetary indicators (interest rate, exchange rate, and monetary aggregates) in their monetary policy framework, even if, officially, each of them uses a single one, i.e., interest rate (IT regime in Ghana), exchange rate (exchange rate targeting regime in the BCEAO), and monetary aggregates (monetary targeting regime in The Gambia, Guinea, Liberia, Nigeria, and Sierra Leone).

The key policy recommendation is that monetary authorities can use the MCI as an alternative or at least a complementary monetary policy instrument during the short- to medium-term in their preparedness to adopt IT framework, as decided by the Heads of State of ECOWAS. In addition, the use of forward-looking interest rate alone as a monetary policy instrument can be

⁷ As explained earlier, the paper could have developed a Financial Conditions Index (FCI)

considered in the long run, when the financial markets have deepened and the exchange rate regime is market determined, as in most advanced and emerging economies.

Finally, we acknowledge some drawbacks of MCIs, as they seem to be very sensitive to changes in weights, variables, and assumptions (Ericsson et al., 1999).

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