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How to Improve the Effectiveness of Monetary Policy in the West African Economic and Monetary Union

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How to Improve the Effectiveness of Monetary Policy in the West African Economic and Monetary Union[1]

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Abstract

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The West African Economic and Monetary Union (WAEMU) is a currency union with a fixed exchange rate and limited capital mobility and, therefore, an independent monetary policy in the short run. The Central Bank of West African States (BCEAO) is conducting the single monetary policy with the main goal of preserving price stability and supporting economic growth. However, the effectiveness of its monetary policy remains low, with a weak reaction of market interest rates and inflation to BCEAO's policy actions. The paper concludes that, while the institutional setup and the instruments of monetary policy are adequate, the transmission mechanism of monetary policy remains constrained by liquidity management practices, shallow and segmented financial markets, and interest rate rigidities. To improve the effectiveness of monetary policy the BCEAO should be more proactive in determining the stance of fiscal policies, develop financial markets, and liberalize controlled interest rates. The BCEAO is undertaking important reforms in these directions.

Contents

Conclusions

- The BCEAO has the capacity for monetary policy in the short-to-medium term. Limited capital mobility allows conducting an independent monetary policy even with a fixed exchange rate regime (See section II, A for details).
- The institutional characteristics needed for an independent monetary policy under a fixed exchange rate regime are present (II, B and C).
- The BCEAO can control regional interest rates, which diverge substantially from the euro-area rates, as capital mobility is limited (II, D).
- The BCEAO has the needed instruments (interest rates and reserve requirements) for achieving the goals of monetary policy (III, A and C).
- However, BCEAO's ability to conduct active monetary policy remains constrained by the need to inject liquidity to help weaker banks rather than to steer interest rates (III, B). The recent sharp increase of commercial bank refinancing poses macroprudential risks.
- All channels of monetary policy transmission (through the volume of credit, interest rates, asset prices, and expectations), other than the exchange rate channel, could be more active and efficient (See section IV, A for details).
- Shallow financial markets and interest rate rigidities impede the transmission of monetary policy signals (IV, B).
- The link from BCEAO's policy actions to market interest rates and inflation remains extremely weak and can affect both only marginally (IV, C).

Policy recommendations

- Achieve a true structural liquidity deficit by gradually disengaging the BCEAO from the market and adequately calibrating liquidity injections to market conditions based on improved liquidity projections.
- Monitor closely the evolution of the macroprudential risks flowing from the sharp increase of commercial bank refinancing by the BCEAO; tighten liquidity provision to banks with high exposures to BCEAO borrowings and government securities.
- Develop deep and functioning interbank, secondary debt, stock, and other financial markets by introducing the adequate infrastructure and collateral procedures, and instilling mutual confidence in market participants.
- Allow for a gradual emergence of a single interbank reference rate and an interest rate curve by developing an institutional framework and supporting infrastructure, adapting regulations to encourage banks to trade liquidity.
- Improve the transmission of BCEAO policy actions to inflation by reducing price and interest rate rigidities, in particular by introducing more flexibility of deposit rates.
- Identify empirically the monetary component of inflation and set reasonable expectations of a possible impact of BCEAO policy actions on inflation.

I. **INTRODUCTION**

1.   **The West African Economic and Monetary Union (WAEMU) is one of four
currency unions in the world.** The WAEMU consists of eight low-income countries
(LICs)—Benin, Burkina Faso, Côte d'Ivoire, Guinea-Bissau, Mali, Niger, Senegal, Togo—
coordinates their macroeconomic policies, and addresses a number of important common
challenges among member countries. The Central Bank of West African States (BCEAO),[2]
the central bank of the WAEMU, issues the common currency, the CFA Franc, pegged to the
euro; conducts a single regional monetary policy, pools foreign exchange reserves of
members, and supervises the banking system of the WAEMU.

2.   *A prioiri*, **based on theoretical considerations, in a fixed exchange rate
arrangement any central bank should have some scope for an independent monetary
policy, if capital mobility is restricted**. This follows directly from the so called "trilemma"
in international macroeconomics suggesting that countries cannot simultaneously enjoy full
capital mobility, fixed exchange rates, and monetary autonomy (Obstfeld, Shambaugh, and
Taylor, 2005 and 2008; Montiel, 2009). Recently, Klein and Shambaugh (2013) confirmed
that extensive capital controls enable a country to have monetary autonomy, as suggested by
the trilemma. Partial capital controls, however, do not generally enable a country to have
greater monetary control than is the case with open capital accounts unless they are quite
extensive. According to Rey (2013), the global financial cycle has transformed the trilemma
into a dilemma. Now, independent monetary policies are possible if and only if the capital
account is managed directly or indirectly, irrespective of the exchange rate regime. Along the
same lines, Farhi and Werning (2014) found that with fixed exchange rates, capital controls
help regain some monetary autonomy.

3.   **BCEAO's own estimates suggest that the effectiveness of its monetary policy is
low.** An increase of 1 percentage point of the BCEAO's policy rate has no impact on
inflation in the short run but may lead to a reduction in inflation of 0.05 percent after a 14-
month lag. An increase in broad money by 1 percentage point may lead to an increase in
inflation by 0.07–0.12 percent in the short run and by 0.16–0.21 percent in the long run
(2012b). Among the components of money supply, only the credit to the economy has an
impact on inflation, with a lag of 16 to 24 months. The BCEAO estimates that an annual
increase in credit to the economy up to 20 percent has no inflationary impact and translates
mainly into real growth. Any credit increase above this benchmark usually leads to an
increase in the component of inflation linked to the monetary factor.

4.   **The goal of this paper is to explore the impediments to better monetary policy
implementations in the WAEMU and suggest possible actions for improvement.** Is the
problem in the institutional setup, BCEAO's control of regional liquidity, monetary policy
instruments, channels of the transmission mechanism, financial markets, or interest rates and
price rigidities? On theoretical grounds, under the constraints of a fixed exchange rate regime
and capital controls, several preconditions should be met. First, the BCEAO should have an

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[2] Banque Centrale des Etats de l'Afrique de l'Ouest.

adequate monetary policy framework and functioning monetary policy instruments. Second, there should be a clear transmission between these instruments and market interest rates. This precondition requires that the BCEAO should be able to influence regional market rates and that they are not determined by exogenous forces given the peg to the euro. Finally, there should be a clear link between BCEAO policy actions and inflation.

5.   **Accordingly, the paper proceeds by revisiting possible problematic areas where policy action may be needed to improve implementation**. Section II addresses the question of whether the overall setup for monetary policy, the institutional framework, the exchange rate regime, and capital control arrangements are adequate for monetary policy implementation. Section III looks at the question whether the BCEAO has the right monetary policy instruments and can effectively control them. Section IV addresses the questions whether there is a clear transmission mechanism between these instruments and market interest rates, and whether there is a link from BCEAO's policy actions to inflation. Conclusions and policy recommendations are presented in the cover box.

II.   WAEMU's MONETARY AND EXCHANGE RATE POLICY

A.   Monetary Policy Framework

6.   **In 2010, the BCEAO revamped its institutional framework for monetary policy.** The new framework includes changes to the Central Bank of West African States (BCEAO's) decision-making bodies, revisions to the objectives of monetary policy, and a larger set of operational tools. The main decision makers now include the governor, the monetary policy committee (MPC), the board of directors, the audit committee, and the national credit councils with one council in each member state of the West African Economic and Monetary Union (WAEMU). The MPC is responsible for setting monetary policy in the WAEMU. It is headed by the governor and meets four times a year for ordinary sessions. In addition, ad hoc sessions may be called. The MPC is also responsible for defining the instruments used to achieve the policy objectives. The BCEAO regularly publishes Communiqués on the meetings of the MPC and quarterly a detailed report on monetary policy. To strengthen financial supervision, a financial stability committee (FSC), headed by the governor and comprising mainly regulators (banking commission, social security regulator, insurance regulator, the regional council for savings and financial markets) has also been put in place.

7.   **Price stability is the main objective of monetary policy**. Price stability is defined as an annual average inflation rate of 2 percent plus/minus 1 percentage point and set over a 24-month horizon. This rate is set as the operational indicator. A number of secondary objectives of monetary policy are mentioned in the WAEMU documents. The BCEAO Statute (Article 8) also mentions support of sound and sustainable growth as a secondary objective of its monetary policy. Under the WAEMU Treaty (Article 62), monetary policy should also support integration in the economic union, "without prejudice to objectives assigned to it." In addition, the Statute of the BCEAO specifies an intermediate target of monetary policy (Article 76). For three consecutive months, the ratio of the average foreign assets of the

BCEAO to its sight liabilities (banknotes in circulation and deposits of banks, governments, other organizations) should exceed 20 percent. In the opposite case, the MPC must take an appropriate action to restore the ratio.

8.   **The BCEAO prepares an annual macroeconomic framework to inform decisions on monetary policy.** The framework for the upcoming year includes projections for the real, fiscal, monetary, and external sectors. The level of credit to the economy is aligned with the nominal growth and is adjusted by changing the money supply using the assumption on velocity. The macroeconomic framework is used to inform decisions of the MPC and helps identify key challenges that may face the region in the upcoming year, in particular regarding inflation and growth.

9.   **The BCEAO is working on an improved model for inflation forecasting**. The model is intended for forecasting inflation by components, such as underlying inflation (total inflation excluding energy and fresh agricultural products), petroleum products, solid fuels, electricity, and others. The projection horizons are 3, 12, and 24 months, and the projections for the current year are made public on the BCEAO website. One of the purposes of the model is to identify the component of inflation controllable by monetary policy instruments. Preliminary results indicate that inflation in the zone is largely determined by import prices—because a substantial part of the Consumer Price Index (CPI) basket is imported— local supply-side shocks—droughts and conflicts, public expenditure—mainly salary and other current expenditure increases—and to a lesser extent excess money supply.

B. Exchange Rate Regime

10.   **The WAEMU region maintains a fixed exchange rate regime.** The regional currency, the CFA franc, is officially pegged to the euro at a fixed rate of CFAF 655.957 per euro. Exchange rates for other currencies are derived from the rate for the currency concerned vis-à-vis the euro. The monetary cooperation agreement of 1973, signed between the WAEMU member countries and France, is based on three pillars: a common issuing institution, fixed parity with the euro, and an unlimited convertibility guarantee. In exchange for the unlimited convertibility of the CFA franc into euros, the WAEMU member states are required to deposit 50 percent of their reserve holdings into the operations account with the French Treasury.

11.   **The defense of the exchange rate is not currently a binding constraint in the WAEMU region.** The unlimited support and the convertibility guarantees provided to the CFA by the French Treasury reduce the need to build up reserves and therefore allow the BCEAO to change its balance sheet to achieve the goals of economic policy. The operations account with the French Treasury functions as a current account for the zone. All purchases or sales of foreign currencies or euros against CFA francs are settled through a debit or credit to the operations account. The stock of reserves cannot be less than 20 percent of the base money. This should drive corrective measures. In practice, the BCEAO's official reserves have always exceeded this threshold substantially and have been about 100 percent of the base money in recent years. In principle, the operations account can turn negative in the case of balance of payments difficulties, but this has never happened. In this case, the French

Treasury would provide foreign reserve advances to the BCEAO account in its overdraft option.[3]

12. **According to traditional metrics, the BCEAO's official reserves have been adequate for defending the peg.** They amounted to CFAF 6,886 billion (about US$14 billion) at the end of 2013. Reserves coverage remained adequate at 4.7 months of next year's imports, 50 percent of broad money, and about 91 percent of short-term liabilities. An alternative method to assess adequacy takes into account the cost of holding reserves and their benefits in terms of mitigating the impact of macroeconomic volatility. According to this approach, the optimal reserve coverage in the WAEMU varies between 5 and 10 months of imports, depending on the interest rate differential with the rest of the world. This approach, however, does not take into account the access to reserves guaranteed by the French Treasury under the franc zone arrangement.

C. Capital Mobility

13. **The WAEMU region maintains capital controls on most capital transactions with nonresidents.** In all WAEMU countries, the mechanisms of capital controls are comparable and administered jointly by the national ministry of finance and the BCEAO. Although the rules differ slightly from country to country, in general prior approval by the ministry of finance is required for virtually all *outward capital transfers,* except for the amortization of debts and repayment of short-term loans. In particular, the authorization by the ministry of finance is required for the following capital flows from residents to nonresidents: (i) all direct investment abroad by residents, including investment through foreign companies under direct or indirect control of residents; (ii) purchases of foreign securities; (iii) purchases of money market instruments; (iv) granting of guarantees and sureties; (v) financial credits and loans; (vi) reinvestment of liquidation proceeds; and (vii) gifts, endowments, and other transfer of assets (AREAER, 2014). In addition, outward transfers necessary to service credit facilities to nonresidents require an exchange authorization, subject to the approval of the BCEAO.

14. **Although the regulation of *inward capital transfers* is more liberal, and many are subject to declaration just for statistical purposes, substantial restrictions exist**. For example, authorized foreign exchange dealers must surrender to the BCEAO in exchange for CFA all assets denominated in euros and other currencies held in their establishments; securities and mutual funds issued outside the WAEMU by nonresidents may not be listed on a regional securities exchange; prior authorization by the Regional Council on Public Savings and Financial Markets is required for issue by nonresidents of securities, real assets, and money market instruments; sales of corporate securities to nonresidents resulting in foreign control of domestic establishments requires declaration to the national ministry of finance.

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[3] Although convertibility is guaranteed by the French Treasury, it does not mean that this guarantee is without any limits. For instance, large imbalances in the region ultimately led to a devaluation of the CFA franc in 1994.

15.   **The use of the CFA franc outside the WAEMU is not allowed.** The CFA franc
cannot be used as payment for current international transactions or as capital with countries
outside the WAEMU. Swaps of CFA francs for foreign currencies are prohibited. Registered
intermediaries must refrain from carrying out any transaction involving forward selling of
CFA francs in their relations with nonresidents. Travelers can export CFA franc banknotes,
and the BCEAO does not repurchase exported banknotes. In addition, the exchange of
BCEAO banknotes between authorized intermediaries and their correspondents outside the
WAEMU is prohibited. The export of BCEAO banknotes between licensed intermediary
banks and their correspondent banks outside the WAEMU is strictly prohibited. The
exchange system is free of restrictions on payments and transfers for current international
transactions.

16.   **In the case of the WAEMU limited capital mobility and different credit risks are
also reflected in a substantial and persistent differential between the policy rates in the
euro area and in the WAEMU**. Until recently, the changes of the BCEAO policy rate have
broadly followed the trend—but have not reflected the level—of the European Central Bank
(ECB) policy rates. Since 2009 the BCEAO maximum lending rate has been historically
higher than the ECB marginal lending facility rate by 250 basis points (Table 1). The gap
between the BCEAO's minimum bid rate and the ECB's deposit facility rate has been even
larger, at 300 basis points for the minimum policy rate, reflecting aggressive interest rate cuts
by the ECB to forestall the impact of the financial crisis. The gap between both minimum
and maximum policy rates declined in 2013 to 250 basis points as the BCEAO cut its policy
rates three times during the year. In 2014, the differential increased again to over 300 basis
points. This persistent divergence of policy rates may have reflected differences in
macroeconomic priorities. While the ECB was concerned mainly with providing additional
stimulus to the economy to address the crisis in the euro area, there was no visible crisis in
the WAEMU area, and the BCEAO focused primarily on handling the second-round
inflationary pressures from import prices and domestic supply shocks.

Table 1. BCEAO and ECB Policy Rates

	Ceiling Policy Rate			Central Policy Rate			Floor Policy Rate		
	ECB	BCEAO	Differential	ECB	BCEAO	Differential	ECB	BCEAO	Differential
	Marginal lending facility rate	Marginal lending rate		Main refinancing operations rate (fixed rate)	n.a.	n.a.	Deposit facility rate	Minimum bid rate	
2006	4.50	4.25	-0.25	3.50	n.a.	n.a.	2.50	3.25	0.75
2007	5.00	4.25	-0.75	4.00	n.a.	n.a.	3.00	3.25	0.25
2008	3.00	4.75	1.75	2.50	n.a.	n.a.	2.00	3.75	1.75
2009	1.75	4.25	2.50	1.00	n.a.	n.a.	0.25	3.25	3.00
2010	1.75	4.25	2.50	1.00	n.a.	n.a.	0.25	3.25	3.00
2011	1.75	4.25	2.50	1.00	n.a.	n.a.	0.25	3.25	3.00
2012	1.50	4.00	2.50	0.75	n.a.	n.a.	0.00	3.00	3.00
2013	1.00	3.50	2.50	0.50	n.a.	n.a.	0.00	2.50	2.50
2014	1.00	3.50	2.50	1.50	n.a.	n.a.	1.00	2.50	1.50

Sources: ECB and BCEAO.

D. Monetary Control

17.   **Several approaches have been suggested in the literature for checking monetary policy independence under the fixed exchange rate regime**. The first approach, suggested by Shortland and Stasavage (2004) and Veyrune (2007), implies checking for cointegration between reserve money (RM) and net foreign assets (NFA) of the central bank. The second approach is based on assessing the deviation of inflation, as the main target of monetary policy, in the country of interest from the country of the peg. Finally, the third approach views monetary independence as the ability of countries to set their own nominal interest rates (Frankel et al., 2004) and implies testing the sensitivity of the local interest rate to the foreign rate.

18.   **The first approach is based on the assumption that, with a fixed exchange rate, central banks cannot control money supply because they have to buy and sell foreign exchange to maintain the peg**. Therefore, their balance sheets and the changes in reserve money may largely reflect the movements of NFA, without leaving space for monetary policy, unless such movements are fully sterilized. In the case of the WAEMU, if the BCEAO is indeed successful in controlling its reserve money, irrespective of the fixed exchange rate arrangement, then there should be no correlation between its RM and NFA. If changes in RM correlate with the changes in NFA, the BCEAO most likely cannot control the NFA counterpart of RM and therefore has no scope for an independent monetary policy. On the contrary, if changes in RM do not correlate with the changes in NFA, this may mean the BCEAO has scope for an active monetary policy aimed at changing its RM by influencing its key counterparts. The problem with this approach is that changes in net domestic assets (NDA) also may lead to changes in reserve money. The results of this approach should hold only if the impact of NDA on RM is controllable by the national governments and the BCEAO, which may be the case as NDA depends largely on the change in the net government position vis-à-vis the banking system and credits extended by the BCEAO to the commercial banks in the area. Therefore, in principle, the BCEAO in close cooperation with the government can control its NDA and the impact of its changes on RM.

19.   **The second approach to assessing monetary independence would consist of looking at the deviation of regional inflation in the WAEMU from inflation in the euro area**. The efficiency of an active monetary policy could be then assessed by the degree of deviations between regional inflation and the inflation in the euro area. Because of exogenous price shocks affecting WAEMU countries, the WAEMU-euro area inflation differential may have justified an interest rate differential between the euro area and WAEMU rates. However, in the WEAMU context, large inflation differentials may not signal directly the absence of monetary control because inflation in the WAEMU is highly sensitive to WAEMU-specific shocks.

20.   **In this paper, the third approach is used to check directly the impact of changes in the interest rates in the euro area on the interest rates in the WAEMU area** (Annex 1)**.** If the rates in the euro area and the WAEMU are each nonstationary and individually integrated, but a certain linear combination of them has a lower order of integration, then they could be considered cointegrated. Assuming changes in WAEMU rates depend mainly on changes in the rates in the euro area, in this case the BCEAO would not be able to conduct

an independent monetary policy. In the opposite case, if no cointegration is found between the two rates, the BCEAO may have some scope for monetary policy. These results should be interpreted with caution. The existence of a cointegration relationship does not imply that changes in euro rates are directly translated to WAEMU rates. Cointegration would simply mean that the interest rates tend to move together in the long run.

21.   **Marginal lending facility rates, as reported by the ECB and the BCEAO, are used for the estimation**. This is in line with the approach used by Frankel et al. (2004), who tested monetary independence using the marginal lending facility rates rather than the interbank or deposit rates, because such rates reflect better market forces. The data used are average monthly marginal lending facility rates (called in the WAEMU money market rates) for 2008–2013 (through October) for the ECB and the BCEAO. The BCEAO published weekly, monthly, and quarterly marginal lending rates. The choice of the average monthly rate was based on the fact that it represents a weighted average rate for liquidity injections at both weekly and monthly liquidity auctions. Alternatively, interbank rates could have been used but in the case of the WAEMU, these rates are not representative of the financial system as the interbank market is very limited. Although other researchers used mainly OLS regressions of the domestic interest rate on a foreign interest, this paper applies a more sophisticated cointegration framework which allows testing simultaneously for a potential short-term and long-term impact of ECB marginal lending facility rates on the corresponding BCEAO rates.

22.   **In the WAEMU, econometric testing finds no cointegration between ECB and BCEAO rates.** A multivariate test for stationarity of each variable strongly suggests that both BCEAO and ECB rates are not stationary and that the search for a cointegration is legitimate. The cointegration rank is zero, which may be interpreted as evidence of no cointegration vectors between the two rates (Annex 1, Table 5). The trace statistic with a degree of freedom adjustment is well below the 95 percent critical value. The estimated adjustment coefficient in the BCEAO regression is negative and in the ECB is positive, but both are not statistically significant. This suggests their linear combination cannot potentially converge to the steady state suggesting lack of a cointegration vector.

23.   **Therefore, the BCEAO has all institutional characteristics jointly needed for an independent monetary policy, at least in the short run:** (i) a monetary policy framework with price stability as a primary target; (ii) capital controls, mainly on outflows; and (iii) the ability to set nominal interest rates in the region that are not sensitive to the changes in the euro area rates.

III. BCEAO'S MONETARY POLICY INSTRUMENTS

24.   **Does the** Central Bank of West African States **(BCEAO) have adequate monetary policy instruments, and can it effectively control them?** In principle, the BCEAO has at its disposal two main monetary policy instruments: interest rates and reserve requirements (Annex 2). Both are set by discretionary decisions of the Monetary Policy Committee in pursuit of the goals of the BCEAO's monetary policy. Since 2009, it has changed the policy rates five times, of which four times after 2012, and amended the reserve requirements three times.

A. Interest Rates

25.   **The BCEAO sets discretionarily two policy rates and targets the level of the interbank rate as an operational indicator for its monetary policy** (Box 1).

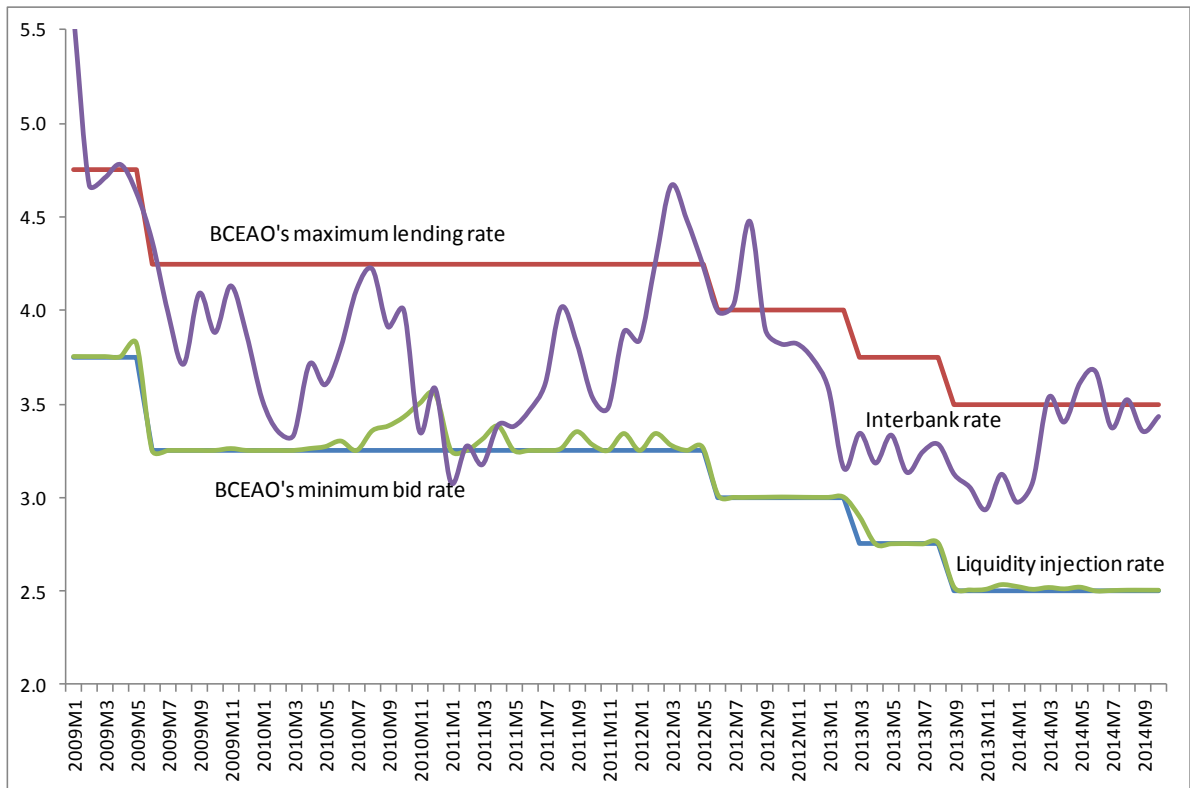**Box 1. BCEAO: Interest Rates**

Policy interest rates
- The minimum bid rate *(taux minimum de soumission)* is the minimum rate at which commercial banks can submit their bids for liquidity at weekly or monthly liquidity auctions conducted by the BCEAO. It is the main policy rate.
- The maximum lending rate (*taux du guichet de prêt marginal*) is the maximum policy rate at which banks can borrow liquidity from the BCEAO outside auctions for one or seven days against an appropriate collateral. It is currently set at 100 basis points above the minimum bid rate.

Market interest rates. Other rates depend on market conditions. The money market rate—the marginal rate of liquidity injections (*taux marginal*)—is set by multiple rate auctions for the BCEAO's liquidity injections. Historically, the BCEAO's marginal rate of liquidity injections has always been close to the minimum bid rate, largely making the BCEAO a price- -maker at liquidity auctions. The interbank rate (*taux interbancaire*) is set in the interbank market. For statistical purposes, the BCEAO calculates an average weighted rate (*taux moyen pondéré*) and a "reference" rate (*taux de référence contreparties éligibles*) for the collateral used in each auction.

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26.   **The BCEAO targets the interbank interest rate as its operational target.** In the past few years, the BCEAO has broadly succeeded in keeping the interbank rate within the corridor between the two policy rates. The one-week interbank rate has largely stayed within the targeted interval, with the exception of a period of high volatility in mid-2012 and again in mid-2014, although its behavior remains very erratic (Figure 1). Such behavior of the interbank rate may show that the interbank market is very narrow, segmented between a few relatively large international banks and many small local banks, and banks with abundant liquidity seem unwilling to lend to other relatively weaker banks. Moreover, the interbank rate is set mainly in transactions between banks of the same groups. Therefore smaller banks, which do not belong to such groups, largely do not have access to liquidity on the interbank market.

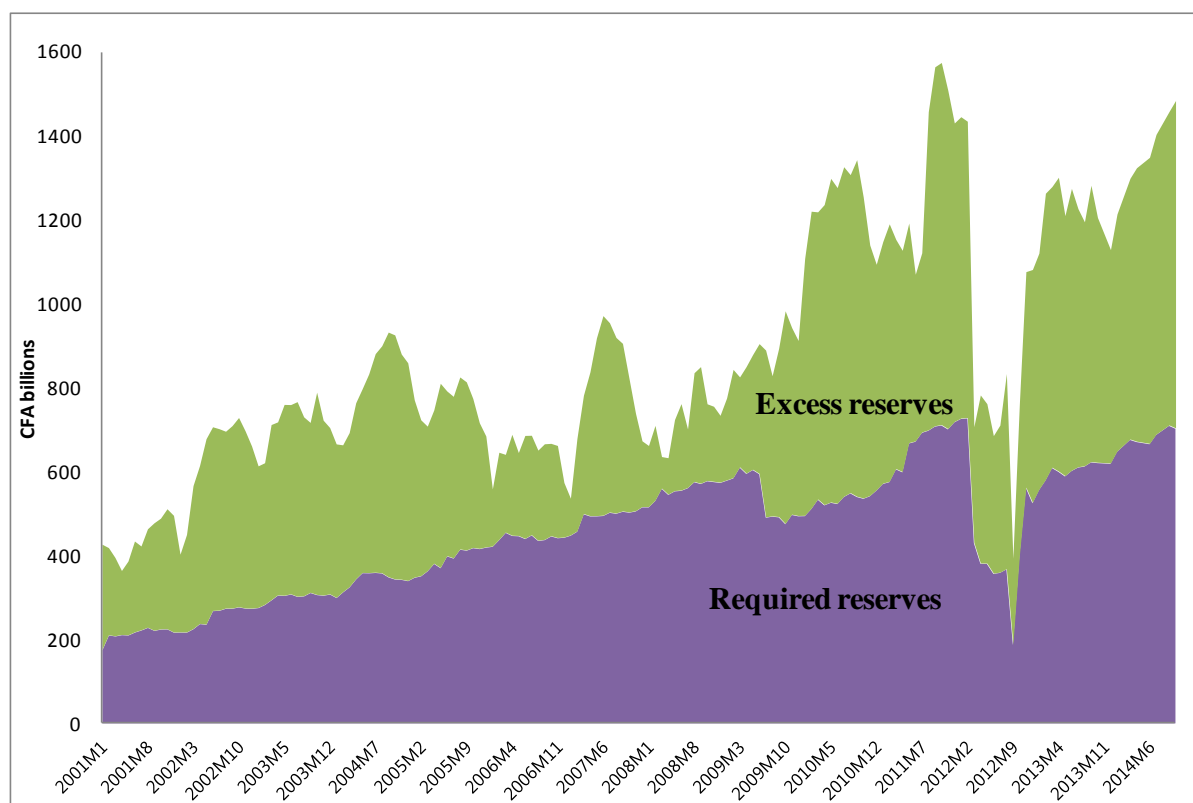Figure 1. WAEMU: Policy and Market Interest Rates (Percent)

Source: BCEAO.

27.   **To steer the interbank rate within the corridor, the BCEAO uses liquidity injections operations**. Short-term (one-week) liquidity injections are made mainly by a weekly tender (*guichet hebdomadaire des appels d'offres*). The amounts injected at each auction largely depend on the change in the interbank rate required to keep it within the corridor and forecasts of cash requirements by banks. The BCEAO offers liquidity at the marginal liquidity injection rate, which generally has been close to the minimum bid rate, currently set at 2.5 percent. Although historically the marginal liquidity injection rate diverged from the minimum bid rate, in particular at end-2010, later the gap between the minimum bid rate and the marginal rate narrowed sharply to almost zero. Long-term (1–12 month) liquidity injections are performed by a monthly tender (*guichet des appels d'offres à un mois*). Through this window the BCEAO offers liquidity at auctions at variable or fixed interest rates. Monthly amounts offered at weekly liquidity auctions in 2014 amounted to about CFA 5,000 billion compared to CFA 750 billion injected at monthly auctions.

B.   Liquidity Injections

28.   **In the past several years, the WAEMU region has been characterized by structural liquidity surpluses.** In 2002–14, commercial banks held on average half of the reserves in excess reserves with the BCEAO (Figure 2).

Figure 2. WAEMU: Required and Excess Reserves (CFA billions)

Source: BCEAO.

29.   **In spite of excess liquidity, the BCEAO has injected additional liquidity.** In addition to steering the interest rate, an important reason for these injections was that the BCEAO had to step in for a narrow and highly segmented interbank market and help weaker banks to get liquidity that they could not obtain from the interbank market. As a result, the level of reserves in the banking system stayed broadly unchanged. Moreover, their composition remained also broadly unchanged, with roughly half attributable to required reserves and half to excess reserves (Table 2).

Table 2. Banks' Reserves: Composition and Sources of Financing (Percent)

	Dec-11	Jun-12	Sep-12	Dec-12	Mar-13	Jun-13	Sep-13	Dec-13	Mar-14	Jun-14	Sep-14	Dec-14
Composition of reserves	100	100	100	100	100	100	100	100	100	100	100	100
Required reserves	51	42	44	49	48	47	49	55	52	49	49	47
Excess reserves	49	58	56	51	52	53	51	45	48	51	51	53
Sources of reserves	100	100	100	100	100	100	100	100	100	100	100	100
BCEAO refinancing	41	66	73	89	83	88	92	134	131	145	140	134
Banks' own reserves	59	34	27	11	17	12	8	-34	-31	-45	-40	-34
Own reserves/required reserves	1.1	0.8	0.6	0.2	0.4	0.2	0.2	-0.6	-0.6	-0.9	-0.8	-0.7
BCEAO refinancing/excess reserves	0.8	1.1	1.3	1.7	1.6	1.7	1.8	3.0	2.7	2.9	2.7	2.5

Source: IMF staff calculations based on BCEAO information.

30.   **However, the sources of financing of banks' reserves have changed**. In the past, accumulation of net foreign assets (NFA) was a main factor behind the fluctuations of banks'

excess reserves. But since mid-2011 banks' own reserves, i.e., reserves net of BCEAO interventions, have been declining, reflecting decline of NFA driven by a growing current account deficit and nonrepatriation of export proceeds by some exporters (Figure 3). The coverage ratio of banks' required reserves by their own reserves fell from 1.4 to -0.7 in 2011–2014. Banks found themselves in a structural liquidity deficit. The BCEAO had to step up injections and became the leading source of liquidity, providing 134 percent of all banks' reserves, compared to 41 percent just three years earlier. Therefore, the BCEAO became virtually the single source of both required and excess reserves in the region.

Figure 3. Evolution of Banks' Own Reserves[4] (CFA billions)

Source: BCEAO.

31.   **A relatively narrow group of strong banks holds most excess liquidity in the region.** This excess liquidity is well isolated from the rest of the banking system, as stronger banks cannot use it at all to buy government securities because most of them have already reached their internal statutory ceilings on country-specific exposures imposed by their headquarters. These banks do not lend to the private sector either because outside seasonal financing of agricultural campaigns there are not enough feasible projects that merit financing in the region. Finally, they do not lend to weaker banks through the interbank

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[4] Bank reserves=Bank own reserves + BCEAO injections.

market either as strong banks simply do not trust them. At the same time, the majority of banks in this fragmented banking system have so little liquidity that they are not able to meet the reserve requirement ratio.

32.   **Therefore, the BCEAO has an active tool for monetary policy in the form of liquidity injections and can in principle, influence the level of the interest rate in the region.** However, this interest rate does not fully reflect liquidity conditions as the interbank market is very shallow and consists of several relatively weak banks trading with each other, with stronger banks not participating in it at all. Moreover, in addition to managing interest rate, the BCEAO has to use these injections also to provide liquidity to banks facing structural liquidity needs mainly to preserve the integrity of the financial system. Such injections allow weaker banks to engage in the carry trade by acquiring government paper and remain afloat profiting from the interest rate differential.

33.   **In sum, interest rates and liquidity injections are the BCEAO's most active monetary policy instruments.** Liquidity injections have played an important role in steering the interbank rate, signaling to market participants the BCEAO's clear intention to conduct a more active monetary policy and influence financial conditions in the area. Such injections have also sent an important signal of the BCEAO's ability to step in temporarily for an inactive interbank market and address liquidity shortages in certain parts of the segmented financial system to preserve its stability. At the same time, the BCEAO's role in the financial system became substantial, which poses prudential risks and may delay market development.

C. Reserve Requirements

34.   **The BCEAO sets reserve requirements and uses them as a monetary policy instrument mainly and as a tool of prudential regulation.** The reserve requirement ratio is calculated as a share of banks' deposits, short-term credit, and gross external assets. For many years, the required reserve ratios were differentiated by country to address country-specific problems, primarily differences in liquidity conditions among individual countries (Table 3). Because the differentiated reserve requirements led to a number of distortions, the BCEAO gradually reduced the differences in the required coefficients among the WAEMU countries and ultimately unified the reserve requirements at 5 percent for all banks in the region in 2012.
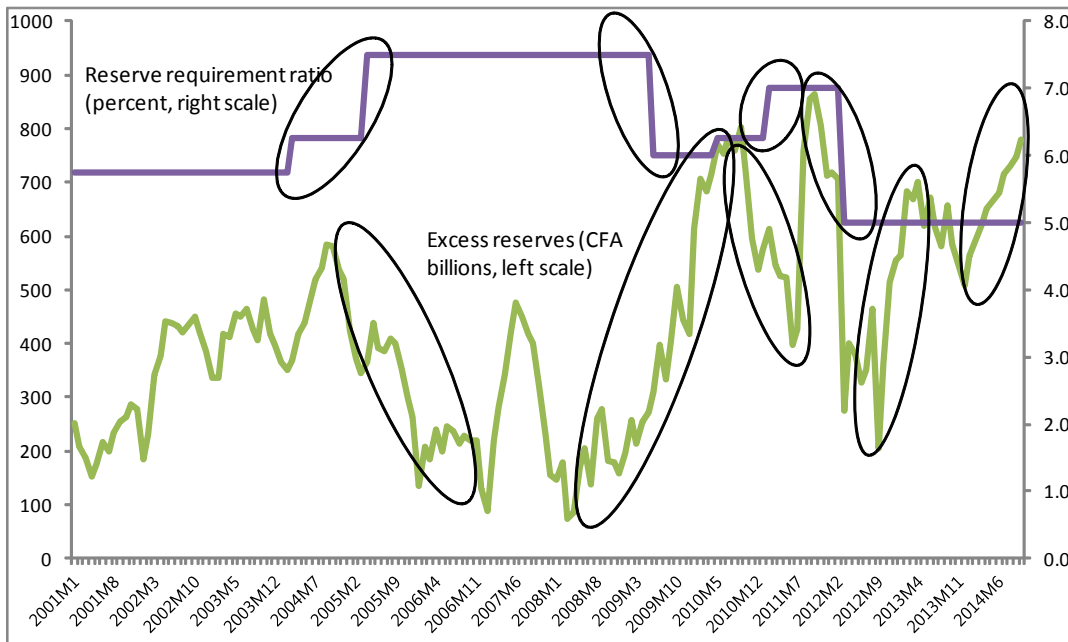
Table 3. Reserve Requirements Ratio (Percent)

	11/16/2000- 04/15/2002	04/15/2002- 03/15/2004	03/16/2004- 06/15/2005	05/16/2005- 05/15/2009	06/16/2009- 05/16/2010	05/16/2010- 12/16/2010	12/16/2010- 03/15/2012	After 03/15/2012
Benin	9.00	9.00	13.00	15.00	9.00	7.00	7.00	5.00
Burkina Faso	3.00	3.00	3.00	7.00	7.00	7.00	7.00	5.00
Cote d'Ivoire	5.00	5.00	5.00	5.00	5.00	5.00	7.00	5.00
Guinee-Bissau	3.00	3.00	3.00	3.00	3.00	5.00	7.00	5.00
Mali	3.00	9.00	9.00	9.00	7.00	7.00	7.00	5.00
Niger	5.00	5.00	5.00	9.00	7.00	7.00	7.00	5.00
Senegal	9.00	9.00	9.00	9.00	7.00	7.00	7.00	5.00
Togo	3.00	3.00	3.00	3.00	3.00	5.00	7.00	5.00
Average	5.00	5.75	6.25	7.50	6.00	6.25	7.00	5.00

Source: BCEAO.

35. **Reserve requirements have had an impact on excess reserves in the region.** Based on historical trends, there has been an obvious correlation between the reserve requirement ratio and the level of excess reserves (Figure 4). For example, in 2002–05, the BCEAO increased in steps the average reserve requirement, which was associated with a decline in excess reserves. At the same time, the cuts in the reserve requirement ratio in 2009 and 2012 were associated with increased excess reserves. In 2005–9, however, when the reserve requirements did not change, the trend in excess reserves was not clear, with sharp swings in both directions.

Figure 4. Reserve Requirements and Excess Reserves

Source: IMF staff calculations and the BCEAO.

36. **Therefore, reserve requirements can be viewed as a supplementary monetary policy instrument available to the BCEAO.** Obviously, as many other factors affect excess reserves in addition to the reserve requirement ratio, this visible correlation suggests that

potentially reserve requirements also can be used as instruments of monetary policy, in particular to create and, if needed, to enlarge a structural liquidity shortage needed for effective conduct of monetary policy.

IV. MONETARY POLICY TRANSMISSION MECHANISM IN THE WAEMU

37.   **Is there a functioning transmission mechanism between** Central Bank of West African States' (**BCEAO's) instruments and market interest rates?** The monetary transmission mechanism describes how changes in monetary policy instruments affect inflation, output, and employment. In a pursuit of broad macroeconomic objectives, the BCEAO sets policy rates or changes the reserve requirements to control a certain financial market variable, which serves as an intermediate target (the money market rate, the interbank interest rate, the level of reserves in the banking system). The value of this intermediate target is linked through a feedback rule to the ultimate target, which in the West African Economic and Monetary Union (WAEMU) is the level of inflation and growth.

A.   Channels of Monetary Policy Transmission

38.   **The monetary transmission mechanism in the WAEMU can be presented in a stylized way as follows** (Figure 5)**.** However, not all channels of monetary policy transmission are active.

39.   **The *credit channel* allows the BCEAO to affect the volume of banks' lending and influence market interest rates indirectly**. Through this channel the BCEAO changes the volume of funds available for lending, this adjusts their costs for potential borrowers. Cuts in the policy rate, liquidity injection, or reduction in reserve requirements increase banks' free liquidity, which would allow them to increase the volume of loans and reduce the lending rate. In parallel, the lower lending rates would attract potential borrowers, increasing demand for credit. With higher credit, borrowers would increase their investment or consumption expenditure with a direct impact either on real growth, inflation, or both.

40.   **The *interest rate channel* consists of the BCEAO influencing directly interbank rates.** Cutting the policy rate would reduce the marginal rate of liquidity injection at which the BCEAO provides liquidity to regional banks at their demand. With the liquidity available at lower cost from the BCEAO, banks will be induced to reduce the rates on the interbank market at which they trade liquidity with each other. The overall lower cost of funds would allow banks to reduce their lending rates, not only to the private sector but also to governments therefore driving down the cost of government borrowing. The impact on the volume of credit and nominal demand for credit would be broadly as in the credit channel.

41.   **The *exchange rate channel* is applicable only under a flexible exchange rate regime.** Cuts in the policy rate usually lead to a nominal depreciation of the local currency as deposits in local currency become less attractive. Depreciation makes domestic goods cheaper in foreign currencies and stimulates net exports. Expenditure switches in favor of domestically produced goods. Export demand increases and stimulates growth. This channel

for the transmission of the monetary policy is not applicable in the WAEMU because of the fixed exchange rate arrangement.
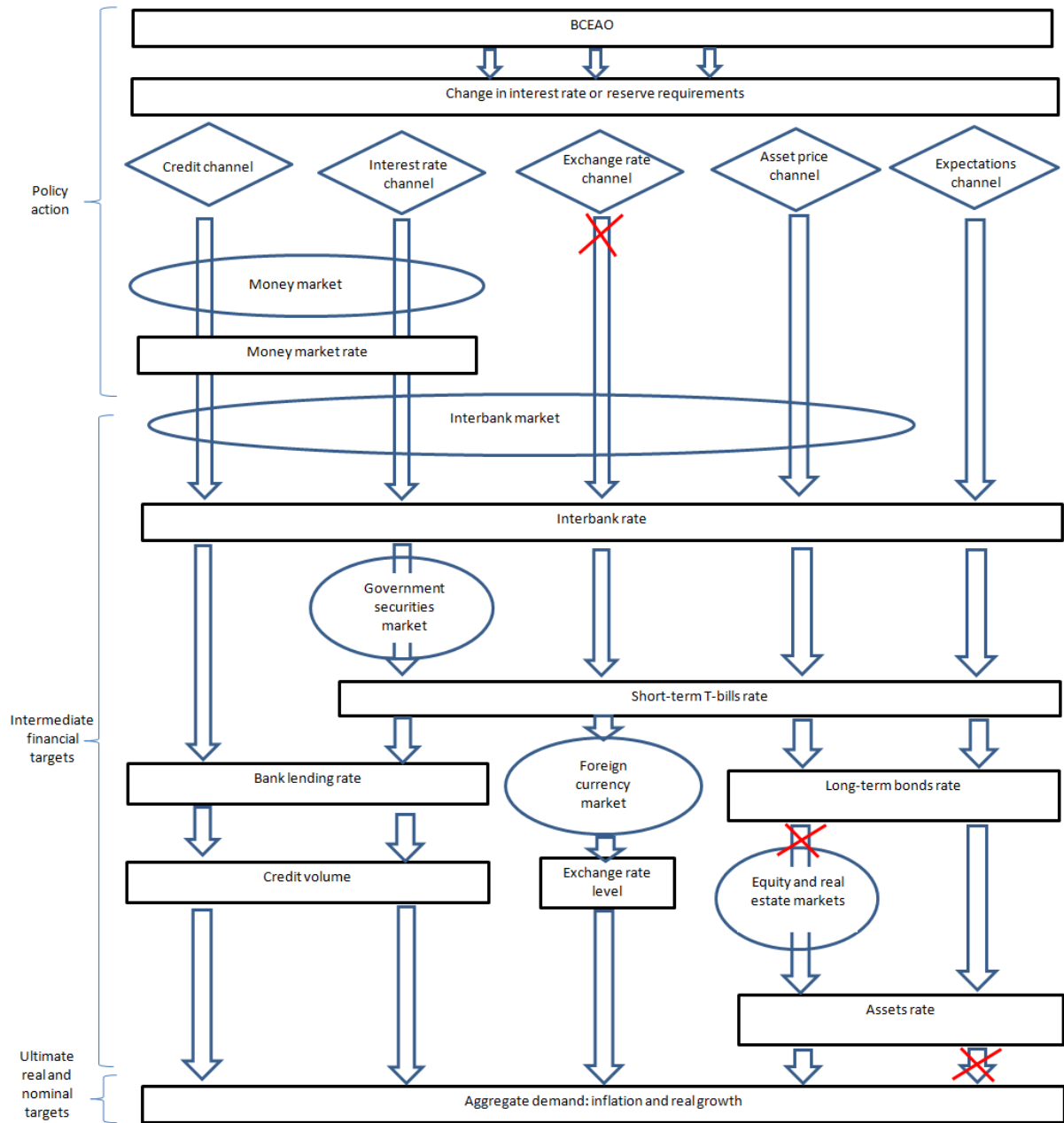
42.   **The *asset channel* should allow the BCEAO to influence stock prices and real estate prices, which exert wealth effects on private investment and consumption.** Regarding stock prices, cuts in interest rates tend to raise stock prices and reduce the cost of capital, expanding investment and growth. Such policy also has balance sheet effects as higher stock prices increase the net worth of firms and households and lead to higher lending, higher investment and consumption expenditure, and, ultimately, higher growth. Regarding real estate prices, an expansionary monetary policy reduces the cost of housing financing, leading to higher real estate prices, and higher individual wealth, consumption, and expenditure.

43.   **Finally, the impact of monetary policy through the *expectations channel* is most uncertain because it depends on the public's perception of monetary policy signals**. In principle, the BCEAO's changes in monetary policy stance can affect expectations of the general public in the region regarding inflation, employment, and growth. For example, a cut in the policy rate may be viewed as a signal that the economy is going to expand in the future, boosting confidence to consume and invest. On the other hand, cuts in policy rates may also be viewed by the public as evidence that the economy is weaker than previously expected, thus forcing the central bank to take policy measures, and therefore lowering confidence and ultimately consumption and investment.

Figure 5. Transmission Mechanism of Monetary Policy

Source: Author's presentation.

B. Financial Markets and Monetary Policy

44.   **For monetary policy to be efficient, financial markets should be fully operational to serve as a conduit of monetary policy signals.** Four financial markets (Figure 5) should be capable of efficiently redistributing liquidity and transmitting policy signals from the BCEAO to the real economy. These include the money market (between the BCEAO and commercial banks), the interbank market (among commercial banks), the public debt market (between mainly the banking sector and governments), and the assets market (among private agents and banks). Unfortunately, none of them is sufficiently developed in the WAEMU.

45.   **The *money market* is critical for an appropriate functioning of the credit and interest rate channels of monetary policy.** In the WAEMU, this market is relatively large but is essentially limited to the BCEAO's liquidity injections. Using the two available windows, the BCEAO regularly auctions liquidity and sets the marginal rate of liquidity injections. On a monthly basis, the BCEAO calculates an average weighted rate of the monetary market and communicates this rate to all banks in the region. The banks usually use this rate as the base for setting their deposit rates. There are no other highly liquid instruments with short maturities available for trading. Moreover, only weak local banks, which represent a small part of the banking system, usually bid for the BCEAO's liquidity injections. Therefore, the average money market interest rate set in this market cannot be viewed as fully representative of the market conditions in the regional banking system as a whole and cannot be seen as a basis for a representative short-term reference interest rate. With the absence of such a rate, the expectation channel lacks the reference point and would not be fully functional either.

46.   **The *interbank market* is also needed for the credit, interest rate, and asset price channels to function.** In the WAEMU, this market is very small and interbank loans do not exceed 2 percent of total loans. While loan maturity has increased in recent years, and a yield curve emerged, the interbank market does not yet have a major role in the reallocation of liquidity. The banking system remains segmented, weaker banks that need liquidity cannot get it from larger banks that have abundant liquidity but cannot lend it out because of their internal restrictions, risk management procedures, and absence of collateral.

47.   **The regional *debt market* is needed to make the interest rate channel more active**. In the WAEMU, this market is limited to the primary market for mainly short-term government paper. Governments issue most of their debt to banks through auctions organized by the BCEAO in T-bills with short average maturities. There is no significant secondary market for government debt. Debt securities have also been issued by private companies and governments on the regional stock exchange. With the capitalization at about 2 percent of GDP at end-2014, debt securities do not represent a significant source of financing for the private sector. There is no significant secondary market for both government and private paper. Without a secondary debt market for debt and given a very weak transmission through the bank lending channel, the BCEAO cannot fully influence the short-term interest rates on government T-bills and, thus, the cost of government borrowing.

48.   **Finally, the regional *equity market* is needed for the asset prices channel of monetary transmission to work properly.** In the WAEMU, this market is also very

shallow. With less than 40 listed companies, equity market capitalization is only about 10 percent of GDP. Most activities consist of bond issuances by governments, while private stock trading is very secondary. The market is dominated by investors from Côte d'Ivoire, and there are very few foreign investors. With the BCEAO's very limited impact on interest rate policy for short-term T-bill rates, this impact does not translate into the long-term rates on government bonds, and with the shallow equity market does not visibly affect most asset prices. Therefore, the assets channel of monetary transmission cannot fully function either.

49.   **Therefore, the limited depth of financial markets reduces the effectiveness of BCEAO's instruments of monetary policy.** Among all available channels of transmission, only the credit channel seems relatively active, with a visible impact on the volume of credit, mainly to governments, through liquidity injection. The interest rate channel has some marginal impact on interbank and lending rates in individual countries. Shallow financial markets obstruct the transmission of monetary policy signals. Only the money market is relatively active but still very limited in scope and depth.

C. The Impact of Monetary Policy on Inflation

50.   **Finally, is there a link between BCEAO policy actions and inflation?** Our estimations are based on a distributed lag model. It links key variables in the monetary transmission chain as $Y_t = \alpha_0 + \alpha_{r+1}X_{t-r} + \varepsilon_t$, where Y_t is the dependent variable of interest regressed on an independent variable X_t and r of its lags. The independent variable X_t is sequentially represented by the BCEAO policy rate, the marginal rate of liquidity injections, and the interbank rate under the assumption that these three common interest rates are directly linked to BCEAO's monetary policy actions, and then by the deposit and lending rates of each individual WAEMU country. The dependent variable Y_t is sequentially represented by the marginal rate of liquidity injections, by the deposit and lending rates, and by the core and overall inflation in the region. Separate estimates are performed for each possible transmission link.

51.   **The estimation strategy aims at establishing dynamic causal effects from changes in BCEAO's policy rates on all other interest rates and inflation**. The strategy consists of three steps: (i) run an ordinary least squares (OLS) regression on the effects of unit changes in each X_t on Y_t and get the contemporaneous (zero period) dynamic multiplier or impact effect; (ii) if the impact coefficient is significant and has the right sign, augment the model by adding 12 lags of the independent variable; (iii) choose the appropriate lag structure by an autometric model reduction (Ericcson, 2011). The estimation period is February 2007– September 2013 on monthly data (80 observations). The selected estimation period reflects the most active recent period of BCEAO's monetary policy when it started managing liquidity more actively by introducing liquidity injections in February 2007 and discontinued the discount rate (*taux d'escompte*), which was used mainly for penalty calculations. At the same time the BCEAO established the marginal lending window with a corresponding maximum lending rate, which replaced the repo rate (*taux de pension*), and the minimum bid rate at liquidity auctions.

52.   **BCEAO's changes in the policy rates have been associated with some changes in interest rates in the region, other than the deposit rate** (Table 4). For example, there seems to be a statistically significant impact of changes in BCEAO policy rates on the money market rate and the interbank rate, at the average lending rate and average inflation in the region. However, the impact of the money market rates has been probably the most pronounced as both estimates, with and without lags, give approximately the same results: an increase by 1 percentage point (pp) in the BCEAO policy rates is associated with about a 1.4 pp increase in the money market rate and a 1.9 pp increase in the interbank rate, a 0.7 pp increase in the lending rate, 0.03 pp decline in core inflation, and a 0.05 pp decline in overall inflation. The impact is either contemporaneous or with one lag, because coefficients on both lags are significant and close in magnitude. There is, however, no significant impact on the average deposit rate, and even the sign of the coefficient is wrong.

Table 4. The Impact of Policy Rate Changes on Market Interest Rates and Inflation

a. Policy interest rate on	Lags	Coeff.	t-value	Sign		Lags	Coeff.	t-value	Sign
money market rate	0	1.35	12.3		**c. Interbank rate on**				
	0	0.70	2.78		average deposit rate	0	-0.12	-5.33	wrong
	1	0.97	3.49			1	-0.13	-5.85	wrong
interbank rate	0	1.91	8.11		average lending rate	0	0.06	1.01	
	0	1.89	9.66			10	0.17	2.04	
average deposit rate	0	-0.22	-3.35	wrong	average core inflation	12	-0.02	-2.68	
	3	-0.24	-3.45	wrong	average inflation	0	-0.01	-1.55	
average lending rate	0	0.69	4.79			12	-0.01	-2.59	
	1	0.72	5.53						
	11	0.67	3.88		**d. Average deposit rate on**				
average core inflation	0	-0.03	-1.95		average lending rate	0	-0.10	-0.35	wrong
	12	-0.04	-3.50		average core inflation	5	0.04	2.72	wrong
average inflation	0	-0.05	-3.95		average inflation	5	0.04	2.35	wrong
	1	-0.05	-2.77						
b. Money market rate on					**e. Average lending rate on**				
interbank rate	0	1.36	11.2		average core inflation	0	-0.02	-2.43	
	0	1.00	5.61		average inflation	0	-0.03	-3.95	
	2	0.48	2.65			0	-0.02	-2.32	
average deposit rate	0	-0.14	-3.52	wrong		3	-0.03	-3.16	
	1	-0.15	-3.56	wrong					
average lending rate	0	0.25	2.56						
	6	0.44	4.35						
average core inflation	12	-0.02	-2.29						
average inflation	0	-0.02	-3.07						
	12	-0.03	-2.52						

Source: IMF staff estimates. The number of zero lags appears twice as the model was estimated in two specifications—with no lags (first zero) and, if the coefficient is significant, again with up to 12 lags. In the cases of the money market rate and the interbank rate, the model with lags, the zero lag (second zero) and some other lags were significant. Only statistically significant coefficients are shown in the table.

53.   **Although there may be some impact from BCEAO's policy actions on regional interest rates and inflation, this impact is very marginal.** The main reason is that the strength of transmission from the BCEAO's policy rates to the intermediate targets (the interbank rate) and from the intermediate target to its ultimate targets (inflation and GDP) is different. The transmission between the policy rates and the interbank is already relatively weak because of shallow financial markets and usually breaks at the points marked by an X

on Figure 5. But the overall transmission mechanism seems to be even weaker because of substantial problems in the transmission between the interbank rate and the ultimate target. The main underlying reason may lie in the segmented interbank market where the intragroup rates differ substantially from the rates set among small independent banks and in largely rigid deposit rates, which do not respond at all to the changes in the policy rate and where even the signs of coefficients are wrong. This leads to the low efficiency of both BCEAO's monetary policy instruments and the weaknesses of the transmission mechanism.

54.   **The BCEAO is undertaking important reforms to improve the effectiveness of its monetary policy**. The authorities are continuously upgrading their model for inflation and liquidity projections. To improve the transmission mechanism of monetary policy, the BCEAO has launched an electronic platform to computerize liquidity injections and absorptions, auctioning of government securities, and monitoring banks' compliance with the established reserve requirements. Also, the WAEMU Securities Agency was created to help governments mobilize resources on the capital markets needed to finance their economic development policies, provide assistance to national treasuries, and coordinate their activities. In addition, a regulatory framework for primary dealers/market was adopted. The authorities have embarked on a set of projects to upgrade their regulations to international standards and strengthen prudential supervision. A deposit insurance fund is expected to start operations later in 2015. A number of other important initiatives are also underway.

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Annex 1. Empirics of Monetary Control

1. **Fitting a simple error-correction model (ECM) may help clarify the relationship between BCEAO and European Central Bank (ECB) money market rates**. Based largely on Ericsson (2011), the methodology suggests that if ECB rates and Central Bank of West African States (BCEAO) rates are each I (1), that is nonstationary and individually integrated, but if a certain linear combination of them has a lower order of integration such as I(0), then ECB rates and BCEAO rates could be considered cointegrated. Therefore, changes in ECB rates would translate directly in changes in BCEAO rates. If changes in BCEAO rates depend only on the changes in ECB rates the BCEAO cannot conduct an independent monetary policy. In the opposite case, if no cointegration is found, the BCEAO may have some scope for monetary policy.
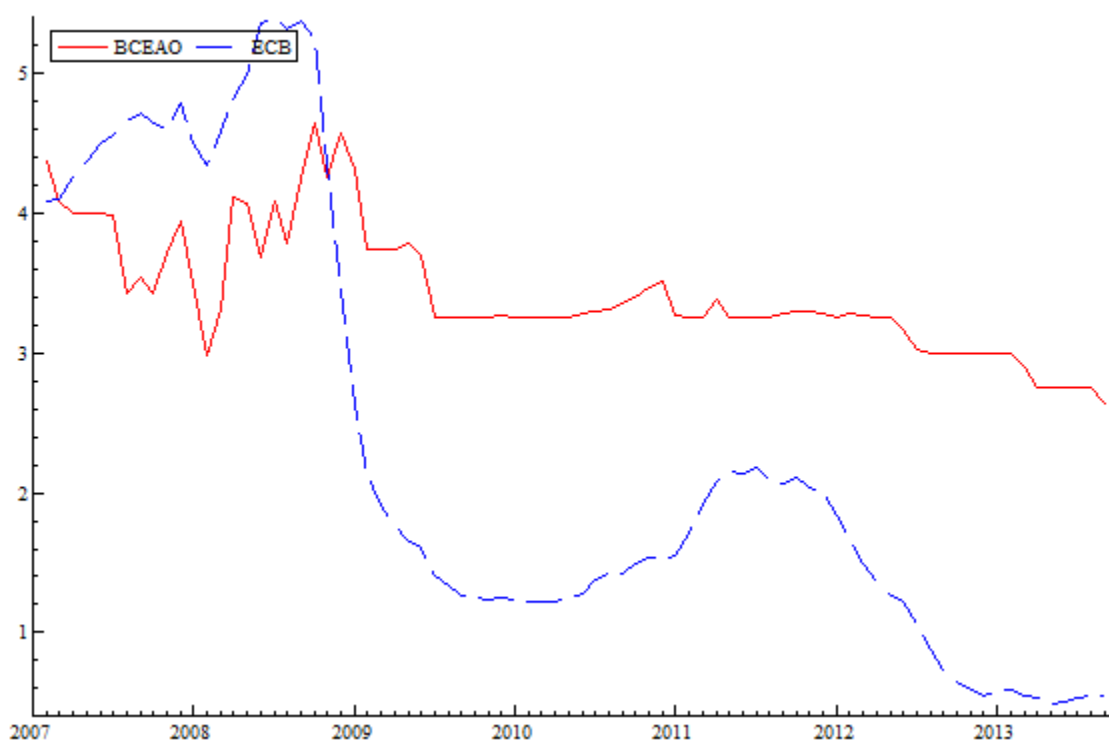
2. **The estimated model is**
$$\Delta BCEAO_t = \alpha \Delta ECB_t + \beta(BCEAO_{t-1} - \gamma ECB_{t-1}) + \varepsilon_t$$
where $\alpha \Delta ECB_t$ can be interpreted as an immediate impact of the change ECB rates on the change in BCEAO rates and, therefore, α as a short-run elasticity; $\beta(BCEAO_{t-1} - \gamma ECB_{t-1})$ can be viewed as a disequilibrium effect, with $BCEAO_{t-1} - \gamma ECB_{t-1}$ as an error-correction term, β as a feedback coefficient, and γ as a long-run elasticity. With short-term rates and long-term elasticities built into the model, testing for cointegration between BCEAO rates and ECB rates would reveal the time-dependent properties of the model, because the impact of ECB rates on BCEAO rates may differ, depending on the time horizon. The cointegration framework tests two hypotheses: (i) in the short run, there may be some scope for an independent monetary policy; in this case $\alpha = 0$, and BCEAO rates and ECB rates are not cointegrated; (ii) in the long run, there may still be scope for an independent monetary policy; in this case, $\gamma = 0$ and BCEAO and ECB rates are not cointegrated. However, the opposite may also be true, in this case, $\gamma \neq 0$, and BCEAO rates and ECB rates are cointegrated.

3. **The test for cointegration between BCEAO rates and ECB rates is performed in four steps**: (i) visual analysis of data plots in level, logs, and first differences to assess their time-varying properties and comovements; (ii) evaluation of the order of integration of each variable by an augmented Dickey-Fuller (1988) test; only non-stationary variables integrated of order 1 and above can be cointegrated; (iii) estimation of the cointegration vector by the Johansen (1991) procedure; and (iv) testing the restrictions on the long-run and short-run elasticities.

4. **The data plot suggests several important statistical properties of BCEAO rates and ECB rates**. Both series are trending downward and most likely are not mean stationary. It is difficult to establish whether they follow the same pattern, other than in late 2008 to mid-2009 when both decreased substantially as both central banks cut their policy rates in response to the financial crisis. The distance between two series changes insignificantly and they even switch signs in late 2008, as ECB money market rates, which exceeded BCEAO rates, suddenly become substantially lower than those of the BCEAO (Figure 6).
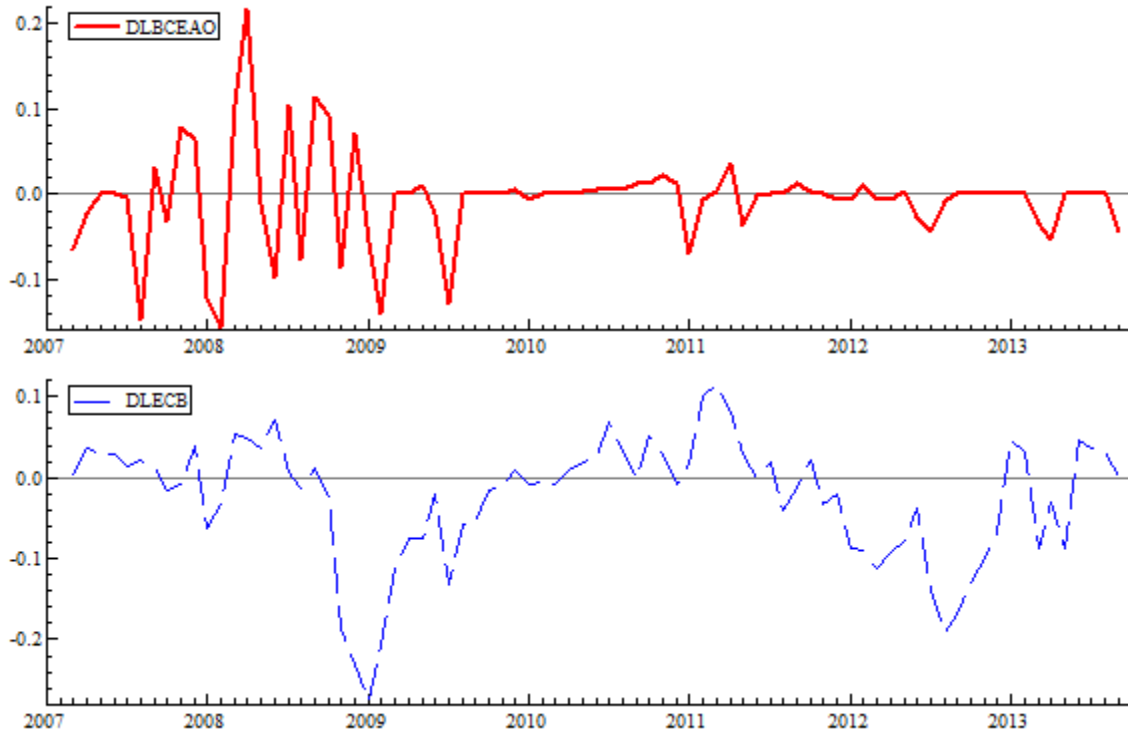
Figure 6. Evolution of BCEAO and ECB Money Market Rates, 2007–2013
(Level in percent)

Source: BCEAO and ECB.

5. **Plotting the same data in first differences the same series may be stationary, suggesting an I (1) process**. RM is more volatile than net foreign assets (NFA), in particular after 2003 (Figure 7).

Figure 7. BCEAO and ECB Money Market Rates in First Differences (logs)

Source: BCEAO and ECB.

6. **A more formal test for the order of integration confirms that both series are integrated of order 1.** The augmented Dickey-Fuller (1981) statistics and the tested leg length are selected by the Akaike information criterion (AIC) on a model with a maximum of six lags, with an intercept and no trend or seasonal component (Table 4). The ADR tests are presented for the levels of both variables (LBCEAO and LECB), their first differences (DLBCEAO and DLECB), and second differences (DDLBCEAO and DDLECB), all in logs. The null hypothesis presence of a unit root is not rejected at the 1 percent critical level for levels of both variables but is strongly rejected for the first differences of BCEAO rates and second differences of ECB rates. Therefore, BCEAO and ECB money market rates in levels do not seem to be stationary, and ECB rates may not be even stationary in first differences, Both series should be differenced at least once or more to achieve stationarity. Therefore, both series can be treated as at least I (1), and their cointegration analysis in levels is possible.

Table 5. AFD Statistics for BCEAO and ECB Money Market Rates,
Monthly 02/1997–09/2013 (T=80)

Variable	Null hypothesis	Selected lag length	t_{ADF}	Estimated root	σ	AIC
LBCEAO	I(1)	5	-1.08	-0.05	0.0386	-6.407
DLBCEAO	I(2)	4	-3.578**	-1.00	0.0387	-6.418
DDLBCEAO	I(3)	4	-8.798**	-4.24	0.0413	-6.284
LECB	I(1)	1	-2.005	-0.02	0.0497	-5.959
DLECB	I(2)	0	-2.863	-0.24	0.0509	-5.927
DDLECB	I(3)	0	-8.309**	-1.05	0.0540	-5.807

Source: Author's estimates.

7. **Testing for cointegration using the Johansen procedure suggests no cointegration between ECB and BCEAO rates.** The multivariate test for stationarity of each variable using a wider information set than the regular ADF test and taking into account the potential for cointegration, strongly suggests that both BCEAO and ECB series are not stationary and that the search for a cointegration between them is legitimate. All eigenvalues are small and statistically are not different from zero (Table 5). The eigenvalue statistic λ_τ accepts the null hypothesis of no cointegration and assigns it the cointegration rank $r = 0$. This may be interpreted as evidence of no cointegration vectors between ECB and BCEAO money market rates. The trace statistic λ_{max}^a with a degrees of freedom adjustment is well below the 95 percent critical value. The normalized eigenvector β' in a common notation presented in the table with the opposite signs can be normally written as $BCEAO = 0.19ECB$ if the cointegration relationship is present. The estimated adjustment coefficient for the BCEAO equitation, which shows how much of its past disequilibrium affects the current disequilibrium, is -0.049 and negative. This suggests the linear combination of variables may potentially converge to the steady state. The estimated coefficient on the ECB rate is 0.01, very small and positive suggesting their possible divergence from the steady state. Moreover, both coefficients are not significant for the potential cointegration vector.

Table 6. Cointegration Analysis of BCEAO and ECB Money Market Rates

(Logs, with 12 lags and unrestricted intercept, 2008[2] – 2013[9)])

$$\Delta BCEAO_t = \alpha \Delta ECB_t + \beta(BCEAO_{t-1} - \gamma ECB_{t-1}) + \epsilon_t$$

rank of π	r= 0	r≤ 1	r≤ 2
Log-Likelihood log(L_τ)	249.58	256.64	256.72
Eigenvalue λ_τ	-	0.1875	0.0023

	Null Hypothesis		
Trace Statistic λ_{max}	14.12	0.16	0.1
95% Critical Value	47.21	29.68	15.41

Variable	Eigenvectors	
BCEAO	1.00	-29.50
ECB	-0.19	1.00

Variable	Adjustment coefficients	
BCEAO	-0.4862	0.00023
ECB	0.01489	0.00097

Statistics for testing the significance of a given variable in β'x

	BCEAO	ECB
$X^2(1)$	3.6692**	32.450**

Multivariate statistics for testing stationarity

	BCEAO	ECB
$X^2(2)$	10.619**	1.2308

Source: Author's estimates.

8. **The ECM model may still contain useful information about the long- and short-run elasticities of responses to changes in ECB on BCEAO rates.** The restrictions on parameters $\alpha = 0$ and $\gamma \neq 0$ can be tested in their autoregressive distributed lag (ADL) presentation of the ECM. From $\Delta BCEAO_t = \alpha \Delta ECB_t + \beta(BCEAO_{t-1} - \gamma ECB_{t-1}) + \epsilon_t$ it follows that $BCEAO_t - BCEAO_{t-1} = \alpha(ECB_t - ECB_{t-1}) + \beta(BCEAO_{t-1} - \gamma ECB_{t-1}) + \epsilon_t$. Removing the lagged term $BCEAO_t = \alpha_0 ECB_t - \alpha_1 ECB_{t-1} + \alpha_1 BCEAO_{t-1} + \epsilon_t$, where $\alpha = \alpha_0$; $\beta = \alpha_2 - 1$ and $\gamma = -\dfrac{\alpha_0 + \alpha_1}{\alpha_2 - 1}$.

9. **Testing amounts to exclusion restrictions on parameters in the ADL equation**. The estimated ADL equation is

$$BCEAO_t = \underset{(0.691)}{0.0572}\,ECB_t \;-\; \underset{(-0.066)}{0.0582}\,ECB_{t-1} + \underset{(7.571)}{0.6592}\,BCEAO_{t-1}.$$ The restriction $\alpha_0 = 0$
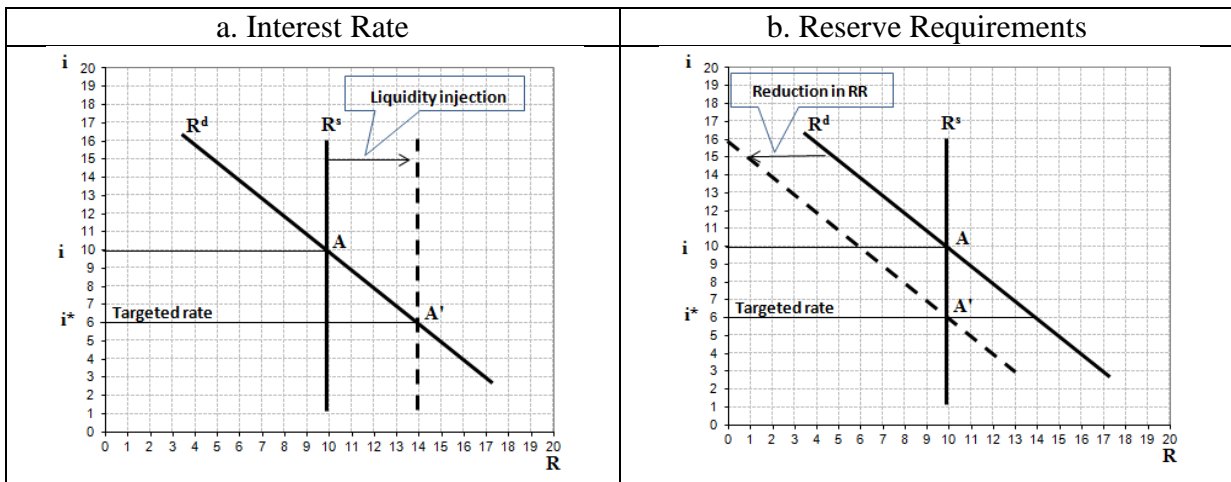
has test statistics $\chi^1(1) = 0.47748\ [0.4896]$ and the null hypothesis that $\alpha = 0$ in the ECM equation is not rejected. From $\gamma = -\dfrac{\alpha_0 + \alpha_1}{\alpha_2 - 1} = -\dfrac{0.0572 - 0.582}{0.6592 - 1} = -0.029$, which is clearly very close to zero. Therefore, it seems that the fact that in the ECM equation $\alpha = 0$ supports the hypothesis that in the short run there may be some scope for an independent monetary policy because changes in the ECB money market rates do not affect BCEAO rates contemporaneously. Because $\gamma = 0$, there may be some scope for an independent monetary policy even in the long run, because changes in the ECB money market rates still do not affect the BCEAO rates even after a lag.

Annex 2. BCEAO's Monetary Policy Instruments: a Stylized Presentation

1.   **For the** Central Bank of West African States **(BCEAO), the concept of liquidity refers to the monetary base**. Demand for liquidity means the public's demand for currency as determined by the degree of monetization of the economy, the opportunity cost of holding money, and the banking system's demand for reserves. To meet this demand, the BCEAO supplies liquidity in currency and bank reserves and, by doing so, attempts to influence liquidity conditions, the level of the interbank rate, and to ensure the overall stability of the financial system.

2.   **Setting interest rates and reserves requirements are the two main tools at BCEAO's disposal**. To achieve the desired level of the interbank rate, the BCEAO uses liquidity injections, which increase the supply of banks' reserves. Shifts in the supply curve to the right against an unchanged demand curve, reduces the interbank rate to the targeted level (Figure 8a). The same effect can be achieved by reducing the reserve requirement ratio, which would reduce banks' demand for reserves and would shift the demand curve to the left against a stable reserve supply curve (Figure 8b).

Figure 8. BCEAO's Monetary Policy Instruments

3.   **Monetary transmission may be both weak and unreliable in most low-income countries (LICs).** In an extensive study, Mishra, Montiel, and Spilimbergo (2012) show that for the monetary policy transmission to function properly, countries should have a strong institutional setup: an independent central bank; well-functioning interbank, government securities, equities, and real estate markets; a high degree of capital mobility; and a floating exchange rate. In LICs the interbank market is the only financial market, which usually exists but is very weakly developed. This may suggest that the bank credit channel should be marginally effective for the transmission of monetary policy signals. At the same time, in most cases, there is no secondary market for government securities; or this market is very limited and shallow, not allowing the interest rate channel to perform its transmission function. Many LICs either maintain a fixed exchange rate arrangement or target a certain level of a floating exchange rate, which makes the exchange rate channel obsolete. Finally,

while stock exchanges exist in many LICs, their market capitalization is very small and listing is limited, which impedes the functioning of the assets channel.

4. **A fixed exchange rate provides a long-term anchor for prices**. In this framework, the central bank should only be concerned about stabilizing short-term deviations of prices and output from their long-term trend. However, downward rigidities in prices can result in an unsustainable deviation of the real effective exchange rate from its equilibrium level through a cumulative price differential; conversely, an appreciation of the equilibrium real exchange rate (manifested in a long-term appreciation of the prices of nontradable items vis-à-vis those of tradables) can result in persistent—but sustainable—inflationary pressures. In a currency union, these issues are usually further complicated by cross-country differences in cycle and economic structure.