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On the economic desirability of the West African monetary union: would one currency fit all?*

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Abstract

This paper investigates whether the West African nations will benefit from forming the *ECO* currency union. Using data from 15 countries over the 1999-2018 period, we assess heterogeneity between economies in terms of equilibrium exchange rates —i.e., the level of exchange rates consistent with the absence of macroeconomic disequilibria. Then, we address the sustainable exchange rate regime issue by evaluating whether the *ECO* should be pegged, freely floating, or something in between. We identify two homogenous groups of economies and find that neither a single currency peg nor a freely floating exchange rate regime would be preferable for any country or group of economies. Overall, our findings argue in favor of two *ECOs*, one for each of the two identified zones. Each *ECO* would serve as a virtual anchor for the considered group and would be determined by a basket of currencies mainly composed of euro and US dollar.

JEL Classification: F33, F45, C38, O55.

Keywords: Monetary integration; West Africa; CFA franc zone; ECOWAS.

* This paper reflects the opinions of the authors and does not necessarily express the views of the institutions to which they belong.

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1. Introduction

During the year 2019, the longstanding monetary union project of the Economic Community of West African States (ECOWAS) has undergone a considerable acceleration. This surge, mainly influenced by the CFA franc's popular rejection, peaked on June 29th in Abuja during the 55th ordinary session of the ECOWAS Conference of Heads of State and Government, where the latter agreed to launch a new currency, the "ECO" by 2020.¹ This paper tackles this issue and investigates whether the West African countries will benefit from forming a monetary union, i.e., adopting a common monetary policy.

The *ECO* project is not new and goes back to the early days of the ECOWAS. Delayed several times due to unfavorable economic conditions and/or political divergences, the relative calm of the last few years —in the abovementioned context of the CFA franc rejection— rekindled the popular desire for a regional currency. However, a fundamental problem remains, namely member countries' heterogeneity. Figure A.1 in Appendix A supports this point. The top left panel illustrates the —frequent— decoupling of economic growth between WAEMU (around 6% on average) and non-WAEMU (3% on average, but with a considerable dispersion) countries over the 2014-2018 period. Nigeria, the giant of the ECOWAS —two-thirds of the zone GDP and broadly half of the population— displayed poor performances, with an average GDP growth rate of 2% reflecting darkened prospects following the fall in the oil price in 2014. The other countries are not immune to terms of trade shocks. As visible in the top right panel of Figure A.1, their strong dependence on commodities, coupled with a very low diversification of their exports, exposes them to a sequence of different and considerable terms of trade shocks.² This perennial source of shock asymmetry naturally led to the asynchronicity of business cycles in the zone —hence challenging any convergence process (see the bottom-left panel of Figure A.1).³ This asynchronicity is all the more important and frequent given the weakness of endogenous growth factors such as intra-community trade (bottom-right chart of Figure A.1).⁴

¹ The CFA franc is the currency shared by eight countries of the ECOWAS. These countries form the West African Economic and Monetary Union (WAEMU thereafter) since 1945. The latter is composed of Benin, Burkina Faso, Côte d'Ivoire, Guinea-Bissau, Mali, Niger, Senegal, and Togo. The ECOWAS is formed by the WAEMU countries, Cabo Verde, Gambia, Ghana, Guinea, Liberia, Nigeria, and Sierra Leone.

² As shown, terms of trade shocks obviously vary across time, but also between countries with differences that can evolve between around 5 and 15 pp. depending on the considered year.

³ Countries (displayed in red on the graph) such as Nigeria or Sierra Leone are characterized by important asynchronicity compared to economies (shown in green) such as Cote d'Ivoire.

⁴ In almost a half-century of its existence, intra-ECOWAS trade had increased from 9% in 1975 to 16% in 2018. Intra-WAEMU trade, around 6% in 1975, is now about 12%. For the non-WAEMU countries, the trade flows have barely gained two percentage points. This weak level of trade

Structural differences between countries have been at the heart of the literature focusing on participation in a monetary union, whose main associated cost is the loss of monetary autonomy. As recently recalled by Adu et al. (2019), the importance of this cost depends on the relative effectiveness of nominal exchange rate flexibility as a buffer to adjust to asymmetric shocks, particularly in the case of small economies. On the contrary, the cost is lower for countries that are quite similar in terms of structural characteristics. This question of structural differences between countries represents the cornerstone of the Optimum Currency Area (OCA) theory, developed by Mundell (1961) —and extended by McKinnon (1963) and Kenen (1969)— which generally serves as a frame of reference for analyzing the implications related to participation in a currency union. The central tenant of the OCA theory is that two economies have an interest in sharing the same monetary policy (i.e., a peg or a common currency) if and only if the shocks they face are symmetrical. Consequently, the cost of participation arising from the loss of monetary policy autonomy is —significantly— reduced.⁵ However, if the shocks are asymmetrical, the loss of the exchange rate as an adjustment tool is less severe if alternative mechanisms are available —e.g., price and wage flexibility, labor mobility, and fiscal transfers. Following Mundell (1961), McKinnon (1963) puts forward the importance of regional trade integration and argues that the more these economies trade with each other, the higher the interest in stabilizing the exchange rates. Later on, Kenen (1969) emphasized the importance of diversification to mitigate the effects of specific shocks.⁶

With regard to these principles, the ECOWAS countries do not satisfy the *ex-ante* conditions for the “optimality” of a monetary union and, therefore, should not form one — especially since they do not meet the convergence criteria they agreed on (see Figure A.2 in Appendix A). This is also a common finding emerging from previous studies on the ECOWAS monetary union. Relying on variables related to the OCA criteria, Bénassy-Quéré and Coupet (2005) and Bangaké (2008) highlight the structural differences between the countries as a source of sub-optimality for the monetary union. Houssa (2008) and Chuku (2012) document the nature of shocks in the ECOWAS and find considerable asymmetries, particularly regarding supply shocks —that were found to be the most frequent ones with

integration is again explained by the specialization of these economies in commodities, the destination of their exports toward rich countries, and, most importantly, by the near absence of industries —and, in turn, of real wealth creation (see Table A.1 in Appendix A).

⁵ See, e.g., Buitier (2000), De Grauwe (2000), Mongelli and De Grauwe (2005), and Rubio and Comunale (2017).

⁶ Fleming (1962) and Mundell (1963) (thereafter, Mundell-Fleming) also enriched the debate by showing that a fixed exchange rate regime (ERR) should be preferably chosen by small open economies whose trade is more concentrated with member countries —in this case, trade and welfare gains are maximized thanks to lower exchange rate variability— while for countries with a higher incidence of real shocks, adopting a flexible ERR is a better choice.

lasting effects on outputs. In the same vein, focusing on the West African Monetary Zone (WAMZ)—composed of Ghana, Guinea, Liberia, Nigeria, and Sierra Leone— Adu et al. (2019) find significant asymmetric responses of the real effective exchange rates to different shocks (demand preference, oil price, and productivity), suggesting that a common monetary policy will be costly.

Despite the existing literature, there are still important research gaps. This follows from the fact that, even adopting different approaches, most studies remained —tightly— anchored to the OCA theory framework, which suffers from the issue of inconclusiveness as it is based on multiple criteria.⁷ In this paper, we go further than the existing literature in several ways.

First, we focus on a unique but all-encompassing policy indicator, the equilibrium exchange rate. The latter is defined as the level of the exchange rate allowing the economy to reach both its internal and external balances.⁸ Over the long run, the equilibrium exchange rate path can thus be considered as “optimal” or “sustainable” as it is consistent with the absence of currency misalignments reflecting macroeconomic disequilibria. Building on the fact that the main cost of participating in a monetary union is the loss of monetary policy autonomy, we depart from the traditional OCA criteria focusing on shocks/economic structure symmetry and investigate the similarities of equilibrium exchange rate paths between countries instead. The idea behind this approach is that a country would be more likely —or less harmed— to join a monetary union if its “optimal” or “sustainable” exchange rate path coincides with that of the other members.⁹ By proceeding in this way, we pay particular attention to the feasibility of policy coordination, i.e., we investigate whether a unique policy is economically desirable. Given the lack of political convergence and the difference between countries in terms of economic weight (Nigeria is the extreme example), this objective of minimizing currency misalignments is important for monetary union sustainability as it *(i)* targets macroeconomic disequilibria for each country —which is an objective acceptable to all members and likely to strengthen monetary policy credibility, *(ii)* allows us to gather different aspects of monetary union viability in a unified framework (e.g., competitiveness, uniqueness of policies), and *(iii)* includes national policies’ objectives in the regional

⁷ See Tavlas (1994) for a discussion on this point.

⁸ These balances are central for a stable and sustained economic development (Alberola et al., 1999; Berg and Miao, 2010; Schröder, 2013).

⁹ It is worth mentioning that previous studies have had the tendency to stress the important cost of giving up monetary policy, but this is only true if the implemented policies were optimal/sustainable. By focusing on the equilibrium exchange rate objective, we definitely improve the perception of these costs —both past and future— in the event of a common monetary policy.

integration perspective to identify the “natural” member countries.¹⁰ Relying on the Hierarchical Ascendant Classification (HAC) method—which does not impose any reference group or leading country—two distinct sets of economies with relatively similar sustainable exchange rate paths are identified: (i) WAEMU countries and Cabo Verde, and (ii) Gambia, Ghana, Guinea, Nigeria, and Sierra Leone. Liberia, although belonging to this second group, is an outlier.

Second, beyond the adoption of the common currency itself, the question of the exchange rate regime (ERR) is of crucial importance and was the subject of major debates.¹¹ However, the latter discussions have evolved based on beliefs on the virtues attributed to the different ERR. Relying on the equilibrium exchange rate paths, we are able to address the issue of the “sustainable ERR”, i.e., the regime underlying the sustainable exchange rate path for each of the ECOWAS economies as well as for the abovementioned groups.¹² Our findings show that neither a single currency peg nor a freely floating ERR would be desirable for any considered country and group of economies. Instead, our results suggest that a basket peg with a certain degree of flexibility would be preferable. In this respect, the contribution of the paper is particularly noticeable as, unlike previous studies, we delimit empirically the appropriate ERR for the *ECO* currency.

Third, while the literature usually mentions but does not document the structural causes of heterogeneity, we fill this gap by identifying such causes of heterogeneity—crucial to establish milestones in the convergence process—using factor analysis.

Overall, we go further than the previous literature (see Section 2) that shows that such heterogeneity within the ECOWAS hinders the launch of a monetary union (e.g., Bénassy-Quéré and Coupet, 2005; Tsangarides and Qureshi, 2008; Coulibaly and Gnimassoun, 2013; Dufrénot and Sugimoto, 2013), and, consequently, does not investigate the ERR choice.¹³ In particular, we show that countries’ apparent heterogeneity is not an insurmountable obstacle for their integration desire. Indeed, our results tilt in favor of the *ECO* as a common—but not

¹⁰ Our approach is also optimal from a social welfare perspective (see Engel, 2011).

¹¹ Indeed, on December 21, 2019, the president of Côte d’Ivoire, on behalf of his counterparts from the WAEMU, announced that the WAEMU countries will maintain the fixed parity with the euro inherited from the CFA franc. The members of the West African Monetary Zone strongly criticized the decision to peg the *ECO* to the euro, arguing that this choice will maintain the scope of regional monetary policy decisions. Moreover, this decision contrasts with the different alternatives contemplated for the *ECO* in its ECOWAS design.

¹² For an investigation of the link between currency misalignments and ERR, see Holtemöller and Mallick (2013) who show that the higher the flexibility of the currency regime, the lower is the misalignment.

¹³ Notably, we go further than Coulibaly and Gnimassoun (2013) and Dufrénot and Sugimoto (2013) who focus on currency misalignments (respectively, co-movements and minimization), assuming a single currency peg implicitly.

unique— currency, and the necessity of two distinct *ECO* zones in a first phase. Within each zone, countries would peg —with some flexibility— their national currency to the *ECO*, which itself would be defined by a consistent currencies' basket. Due to differences regarding the adjustment capacities, this first stage of the implementation of the *ECO* should be long enough to make both nominal and real convergence as feasible as possible —before proceeding further.

The rest of the paper is organized as follows. Section 2 briefly reviews the related literature. Section 3 is devoted to the methodology and data. In Section 4, we present and discuss our findings. Finally, Section 5 concludes.

2. The ECOWAS monetary union: a review of the literature

As previously mentioned, the OCA theory serves as the conventional reference framework for analyzing the economic desirability/feasibility of participating in a monetary union. The general framework relies on a cost-benefit analysis where the benefits are the expected trade gains, while the costs are related to the loss of monetary policy autonomy. As Mundell (1961) initially stressed, the loss of monetary policy autonomy is particularly costly in the presence of asymmetries and/or heterogeneity between countries (e.g., structural characteristics, business cycles, economic shocks). Accordingly, empirical studies have adopted different approaches, focusing on macroeconomic variables to appraise the similarities between countries or shock symmetries.

These previous empirical studies share a pessimistic view about the West African monetary union project due to countries' heterogeneity.¹⁴ Bénassy-Quéré and Coupet (2005), using a set of variables stemming from the OCA theory —and from the "fear of floating" literature (see Calvo and Reinhart, 2002)— rely on cluster analysis to investigate the monetary arrangements in 17 Central and West African countries. Although their results indicate that creating a monetary union including Nigeria is not economically viable, a union with the "core" of the WAEMU and Ghana, Gambia, and Sierra Leone can be relevant. Tsangarides and Qureshi (2008) also use cluster analysis to investigate the homogeneity of the potential members in terms of economic characteristics inspired by the OCA literature and the convergence criteria set by these countries. They show that countries belonging to WAEMU and WAMZ (i.e., non-WAEMU ECOWAS countries) do not form a homogenous group. Mobilizing the same methodology, Coulibaly and Gnimassoun (2013) focus on the

¹⁴ The main exception is Ogunkola (2005), according to whom governments have enhanced the convergence for a currency union by implementing structural adjustment programs in ECOWAS.

convergence and co-movements between West African countries' exchange rate misalignments. Their results show that the WAEMU area has a core composed of Burkina Faso, Mali, Niger, and Senegal, which can be joined by Ghana, Sierra Leone, and the Gambia. In the same vein, Bangaké (2008) investigates the relationship between bilateral exchange rates and some OCA criteria variables. He also identifies (i) a core group composed of the WAEMU countries to which Ghana could be linked, and (ii) an outlier, Nigeria, that should be part of neither the WAMZ nor the WAEMU.

Focusing on shocks and using a dynamic factor model, Houssa (2008) shows that supply shocks in the ECOWAS are more important than demand shocks. He finds a positive correlation between demand shocks—with a temporary effect on output—and significant asymmetry regarding supply shocks. As a result, he concludes that a monetary union would be costly. Chuku (2012), by testing for symmetry and speed of adjustment to supply, demand, monetary, and real exchange rate shocks, reaches the same conclusion: almost 85 percent of correlations in supply, demand, and monetary shocks among the countries are asymmetric.

More recently, Adu et al. (2019) studied the degree of asymmetry across WAMZ countries by assessing the dynamics of their real effective exchange rates (REER). More specifically, they consider fundamental shocks to REER and rely on the structural VAR methodology to assess how REER responds to three of those shocks: oil price, productivity, and demand preference shocks. They find that WAMZ countries' responses are asymmetric, highlighting heterogeneity across the five economies which exhibit important structural differences. Their result suggests that the responses to a common monetary policy shock would differ across WAMZ economies. Consequently, joining a monetary union will be costly for countries in a world where a monetary response to a shock is immediate. Overall, the huge differences amongst WAMZ countries constitute a major constraint to monetary union. These results go hand in hand with those of Dufrénot and Sugimoto (2013), who show that, given the heterogeneity of member countries and the incompatibility of objectives (e.g., internal and external competitiveness), the ECOWAS countries would not agree on the same anchor currency.

However, the static nature of the OCA theory has been challenged in the literature by the endogenous OCA theory advanced by Frankel and Rose (1998). According to the latter, a country's suitability to engage in a currency union depends on (i) its trade intensity with the union members and (ii) the correlation between its business cycles and those of the other members. If the OCA theory conditions are not satisfied *ex-ante*, the participation in the monetary union and the subsequent increase in the intra-community trade will (rein)force *ex-post* the synchronicity of the business cycles. In other words, the cost of the monetary union

would decrease over time.¹⁵ This point of view is shared by Ouédraogo (2003), Diop (2007), and Tapsoba (2009), who investigated its plausibility for the ECOWAS monetary union.

Concurring to the OCA theory or rather taking a bet on the latter theory of endogeneity, the above issue of intra-community trade is of crucial importance as the potential trade creation associated with a common currency will be a helpful guide for the ECOWAS deep integration agenda. As noticed by Rose and Van Wincoop (2001), Alesina and Barro (2002), and de Sousa (2012), countries engaged in a monetary union would trade more due to the elimination of exchange rate volatility, reduction in trading cost, and more straightforward comparison of prices across borders.

From an empirical viewpoint, Masson and Pattillo (2004) assess the effect of participating in monetary unions using a gravity model. They find that currency unions in Africa have increased trade among their members. Using also a gravity model, Carrère (2004) highlights that (i) the Sub-Saharan African regional trade agreements have promoted trade between members and (ii) monetary unions in the CFA zone have significantly accentuated this positive effect. The findings obtained by Bangaké and Eggoh (2009) go in the same way as they show that monetary unions in the CFA zone enhance trade. One may also mention the studies of Baxter and Kouparitsas (2005), Calderon et al. (2007), Inklaar et al. (2008), and Tapsoba (2009), which put forward that monetary unions increase intra-branch trade, and thus favor the synchronization of business cycles. Overall, the empirical studies show that currency unions play a key role in stimulating trade between their members, helping business cycles synchronize and, thus, reducing the cost of engaging in a currency union.

To sum up, the existing literature points to substantial heterogeneity among West African countries and suggests that forming a monetary union would be very costly for many economies. Based on this finding, the previous studies do not assess which exchange rate regime would suit those countries. In our paper, we explain the structural causes of this heterogeneity and, more importantly, go beyond heterogeneity to determine the most appropriate currency regime.

¹⁵ Note, however, that Krugman (1993) does not share this point of view. According to him, if a monetary union leads to an intensification of trade between the member countries, it will also lead *in fine* to a desynchronization of the economies because of specialization of these latter due to their comparative advantages.

3. Methodology and data

3.1. Methodology

Beyond the apparent divergences between the OCA and endogeneity of monetary unions' theories, these different approaches can be seen as complementary in that they stress key points for the viability of a monetary union. They agree that the benefits from a monetary union would transit through the intensification of trade. Hence, regardless of its geographical frontiers, the viability of the *ECO* zone is conditioned by the development of regional trade — which is paradoxical because the issue of the exchange rate regime relegates itself in second place. At the forefront are questions related to sustainable and inclusive growth/development. But, in this matter, if the benefits can be expected mainly —not to say only— through trade, one may question whether the monetary union would leave sufficient room to the member countries —in terms of funding— to initiate an industrialization process that is necessary to boost intra-community trade. This question is also accurate for the financing needs to face structural challenges (e.g., sustainable development goals). Say differently, one may wonder whether it is not too soon for establishing a fixed exchange rate between the countries given the associated constraints in terms of fiscal space or adjustments to macroeconomic imbalances that would inevitably result from catching-up effects.

Against this backdrop, a look through the equilibrium exchange rates allows us to take a different view on the long-run sustainability of the *ECO* project.¹⁶ Specifically, our approach ensures consistency between desirable domestic objectives —namely, steady growth of the domestic economy consistent with low levels of unemployment and inflation, and sustainability of the external position, all underlying the equilibrium exchange rate— and the regional integration perspective. This allows us to identify groups of countries for which (i) the coordination of national policies is possible/desirable and (ii) regional integration would be achieved at minimal cost thanks to the consistency of the unique monetary policy. These conditions will be satisfied by groups of countries that share similarities in their equilibrium exchange rates' dynamics.

3.1.1. Cluster analysis

The cluster analysis is particularly suitable to assess heterogeneity between the ECOWAS member countries as it allows us to identify the size of dissimilarities across economies. The Hierarchical Ascendant Classification (HAC) method enables us to partition

¹⁶ Recall that the equilibrium exchange rate is defined as the value of the exchange rate allowing the economy to reach both the internal and external balances.

the ECOWAS area into groups of nations sharing quite homogenous characteristics without imposing any reference group or leading country.

Formally, the HAC procedure begins by estimating the dissimilarities between any pair of objects (here the dissimilarities between the sustainable exchange rate paths for any pair of countries) using an appropriate metric (i.e., a measure of the distance between pairs of objects), such as the Euclidian distance. Let $X_{i,t}$ be the sustainable exchange rate for country i at period t ($t = T_1, \dots, T_N$), the dissimilarity coefficient defined by the Euclidean distance between the sustainable exchange rate of country i and country j is:

$$d(X_i, X_j) = \sqrt{\sum_{t=T_1}^{T_N} (X_{i,t} - X_{j,t})^2} \quad (1)$$

Using distance information, pairs of objects are then grouped into clusters that are further linked to other objects to create bigger clusters. The agglomeration is based on a metric measuring the distance between two clusters. For the sake of robustness, we retain four agglomerative methods: (i) Ward's linkage, (ii) the single-linkage, (iii) the complete-linkage, and (iv) the average-linkage.¹⁷

Let A and B be two clusters with, respectively, n_A and n_B as the number of objects, and \bar{A} and \bar{B} as the centroids. The following formulas give the different inter-cluster distances computed by the various hierarchical algorithms:

Ward's method:

$$d(A, B) = \frac{2n_A n_B}{(n_A + n_B)} d(\bar{X}_A, \bar{X}_B)^2 \quad (2)$$

Single-linkage:

$$d(A, B) = \min(d(X_{Ai}, X_{Bj})) \quad (3)$$

Complete-linkage:

$$d(A, B) = \max(d(X_{Ai}, X_{Bj})) \quad (4)$$

¹⁷ The Ward's method consists in joining two clusters that result in the minimum increase in the sum of squared errors (so the loss of within-cluster inertia is minimum). The single-linkage —or “nearest neighbor”— focuses on the smallest distance between objects in the two clusters. The complete —or “furthest neighbor”— concentrates on the largest distance between objects in two clusters. Finally, the average-linkage method uses the average distance between all pairs of objects in any two clusters. For more details regarding these measures, see Kaufman and Rousseeuw (1990).

Average-linkage:

$$d(A, B) = \frac{1}{n_A n_B} \sum_{i=1}^{n_A} \sum_{j=1}^{n_B} d(X_{Ai}, X_{Bj}) \quad (5)$$

where $i = 1, \dots, n_A$ (resp. $j = 1, \dots, n_B$) designates the i^{th} (resp. j^{th}) object in cluster A (resp. B).

3.1.2. Factor analysis

Besides the key issue of countries' groupings, identifying the causes of heterogeneity—frequently mentioned in the literature but rarely documented—is equally essential. Indeed, such an examination is of major interest to establish milestones in the convergence process. To that end, we perform a factor analysis with the aims of (i) identifying the common features shared by the different countries and (ii) double-checking the results of the HAC analysis regarding the partitions of the ECOWAS area. Accordingly, we collect data on several key variables reflecting macroeconomic structures/conditions as well as imbalances, and take full advantage of the factor analysis procedure to identify the structural economic differences between the ECOWAS countries.

Indeed, factor analysis is a powerful multivariate explorative analysis tool that allows us to gather together several variables with similar patterns and to contain most of the information into a few interpretable unobserved (underlying) variables, called factors. More specifically, factor analysis is a data reduction technique that aims to reduce the dimension of the observations by grouping p observed variables into a lower number, say k , of factors. For this purpose, the p variables are modeled as a linear combination of the potential factors (i.e., latent unobserved variables that are reflected in the behavior of the observed variables) plus an error term. Consequently, factor analysis is a useful tool to detect the structure of the relationships between the variables. Let us assume we have a set of p observable random variables (Y_1, \dots, Y_p). From these p observed variables, factor analysis aims at identifying k common factors which linearly reconstruct the original variables as follows:

$$Y_{ij} = Z_{i1}\gamma_{1j} + Z_{i2}\gamma_{2j} + \dots + Z_{ik}\gamma_{kj} + u_{ij} \quad (6)$$

where Y_{ij} is the value of the i^{th} observation of the j^{th} variable ($j = 1, \dots, p$), Z_{il} is the value of the i^{th} observation of the l^{th} common factor ($l = 1, \dots, k$), the coefficients γ_{lj} denote the factor loadings ($l = 1, \dots, k$), and the error term u_{ij} is the unique factor of the j^{th} variable.

While the promises associated with the factor analysis are attractive, they depend on the upstream variables' selection. This latter should be dictated by a search for parsimony and not comprehensiveness that would inevitably set out factors hardly interpretable. As a consequence, we select 9 determinants among a large set of variables, including fundamentals: (i) agriculture value-added, (ii) current account balance, (iii) fiscal balance, (iv) real growth, (v) industry value-added, (vi) inflation (based on consumer price index), (vii) currency misalignment, (viii) services value-added, and (ix) terms of trade volatility (proxied by the standard deviation). The selection of these variables obeys several imperatives, such as the need to account for the economies' internal and external balances —and their dynamics— as well as their key economic features. The inflation rate (measuring price stability), the fiscal balance (measuring the soundness and sustainability of public finances), and real GDP growth are considered to gauge the economies' internal equilibrium. Regarding the external balance, rather than including several —medium to long-term— key determinants such as the net foreign asset position, output gap, trade openness, and demographic variables (see e.g., Chinn and Prasad, 2003; Cheung et al., 2010), we take advantage of the all-encompassing —and so parsimonious— nature of the current account-to-GDP ratio that synthesizes several determinants. The nature of the economic structure is also taken into account through the sectoral (i.e., agriculture, industry, and services) value-added-to-GDP ratios. Finally, the terms of trade volatility proxies the sensitivity to real shocks, while currency misalignments account for imbalances —from various sources— not accounted for directly.¹⁸

3.1.3. Inferring the exchange rate regimes

An additional issue associated with the *ECO* project is the choice of the appropriate ERR. Indeed, while the determination of the different groups of economies fits more into the regional integration dimension of the project, that of the various countries' ERR plays a key role in their adjustment capacities towards their equilibrium exchange rates. To infer the nature of the ERR underlying the equilibrium exchange rates, we follow an approach commonly used in the literature to identify *de facto* regimes (see Frankel and Wei, 1994, 2008). This method is based on the estimation of hypothetical weights of different potential

¹⁸ It is worth mentioning that while other variables could have been considered, their availability or reliability played a key role in the selection. This was for instance the case for the unemployment rate, which is a crucial variable to gauge the internal equilibrium. This latter was left apart because only estimates —and by the way highly questionable— were available for the considered countries. In a somewhat different vein, we do not take into account the debt-to-GDP ratio since it does not reflect the soundness and sustainability of public finances due to various and considerable debt reliefs, including the HIPC (Heavily Indebted Poor Country) initiative.

anchor currencies. More specifically, it consists of regressing the dependent variable —the exchange rate in the case of the determination of the ERR— on a set of major currencies, with the constraint that all the coefficients associated with the currencies sum to one.

In our exercise, the dependent variable is the bilateral exchange rate *vis-à-vis* the Special Drawing Rights (*SDR*) underlying the equilibrium exchange rate (further details are provided in the Data section). We consider six currencies: the US dollar (*USD*), the euro (*EUR*), the British pound (*GBP*), the Japanese yen (*JPY*), the Chinese renminbi (*RMB*), and the Nigerian naira (*NGN*). The reasons for considering the first five —major— currencies as anchors are diverse and straightforward. First, these currencies correspond to those of the most important trade partners, and we can safely assume that in their strategy, the authorities would be interested in stabilizing their exchange rate against those of the major trade partners.¹⁹ This strategy also includes the desire to attract capital flows. Second, developing countries like those considered in this paper, borrow in foreign currencies —the *original sin*— and as a result, their external debt stocks are composed of a number of these currencies. We can also assume that countries would be willing to stabilize their exchange rate against these currencies to avoid considerable valuation effects. Finally, the inclusion of the Nigerian naira echoes the debate on the likelihood/desirability of the latter currency as the ECOWAS member countries’ anchor.

Under the null hypothesis of a basket peg, the equation to be estimated —for each country— to derive the anchor weights is the following:

$$\Delta e_{i/SDR_t}^* = \beta_0 + \sum_j^M \beta_j \Delta e_{j/SDR_t} + u_t ; \text{ with } j = \{USD, EUR, GBP, JPY, RMB, NGN\} \quad (7)$$

where $\Delta e_{i/SDR_t}^*$ denotes the log-change of the equilibrium bilateral exchange rate *vis-à-vis* the *SDR* of country *i*. Similarly, $\Delta e_{j/SDR_t}$ represents the log-change in the anchor currency *j* expressed in terms of *SDR*.

As previously mentioned, Equation (7) is estimated with the constraint that all the coefficients associated with the anchors sum to one. Doing so, β_j can be interpreted as the weight associated with currency *j* in the hypothetical basket peg. As Frankel and Wei (2008) note, this is a problem to which Ordinary Least Squares (OLS) regression is unusually well suited. Furthermore, the above framework (constraint + OLS estimation) is flexible enough to cover the full spectrum of ERR. Indeed, if none of the estimated weights are significant, that is to say, the domestic currency could not have been considered as a combination of the major

¹⁹ Note that Nigeria is also an important trading partner for neighboring countries (i.e., Benin, Niger).

currencies, then the basket peg hypothesis does not hold. Instead, a floating regime would have been preferable. If one of the β_j does not significantly differ from unity, and all others do not differ from zero, then a unitary peg to currency j would have been preferable for the domestic currency. In other cases, the basket peg fits the best.²⁰ Note also that the reason to work in terms of changes rather than levels is beyond the simple existence of a unit root. Indeed, using first-differences, we can include a constant term $-\beta_0$ in Equation (7)— which captures the average rate of appreciation or depreciation (as in the case of a crawling peg).

Finally, the choice of the *SDR* as the numeraire is motivated by two main reasons. First, monetary authorities generally do not monitor their exchange rate towards a single currency, but instead focus on several key currencies. Second, it should help minimize the possibility of correlation between the error term and the numeraire (see Frankel and Wei, 1994; Bénassy-Quéré, 1999).

3.2. Data

Given the plurality of empirical investigations we perform, we collect different data from various sources.

Regarding first the HAC analysis, the interest variables are the bilateral nominal exchange rates *vis-à-vis* the *SDR* underlying the equilibrium exchange rates (*NER**).²¹ Following Coudert et al. (2020)'s methodology, *NER** series are obtained by deconstructing the estimated equilibrium real exchange rates (*ERER*) (see Appendix B) using the *ERER* data from the *EQCHANGE* database (source: CEPII; see Couharde et al., 2018)²² as well as the included trade weights. For the sake of completeness, note that *ERER* data correspond to the average fitted values of the real effective exchange rates from different models including the following fundamentals:²³ (i) the relative productivity proxying the Balassa-Samuelson effect and measured as the relative GDP per capita (*vis-à-vis* the trading partners —weighted average, in PPP terms), (ii) the net foreign asset position, (iii) the terms of trade, (iv) the

²⁰ Equation (7) is particularly well specified (i.e., significant coefficients and R^2 close to 1) under the null hypothesis that the domestic currency is determined as a basket peg (or a crawling peg). Consequently, a low R^2 would indicate an intermediate or a flexible regime. Moreover, it should be noted that the null hypothesis of the model —i.e., a peg— is compatible with the need for credibility —in developing countries— to overcome market pressures, attract foreign investors, and find an anchor for the expectations of inflation.

²¹ Say differently, *NER** corresponds to the value of the exchange rate *vis-à-vis* the *SDR* that would have allowed the currency to be at its equilibrium level —*ceteris paribus*.

²² Consumer price index data are from the IMF *World Economic Outlook* database.

²³ The estimation results are available upon request to the authors.

government spending, and (v) the trade openness.²⁴ The *NER** data are quarterly and cover the 1999-2018 period.

Turning to the factor analysis, data on inflation, terms of trade as well as value-added (agriculture, industry, services) are from the *World Development Indicators* (WDI) database. We collect data on real GDP growth, current account, and fiscal balances from the *World Economic Outlook* (WEO) database. The currency misalignment series —i.e., the differences between the real effective exchange rates and their equilibrium levels— are derived from the CEPII's *EQCHANGE* database, and are consistent with the above discussed *ERER* data.

Finally, for our last investigation, i.e., the inference of the ERR, we collect data of the potential anchor currency exchange rates *vis-à-vis* the *SDR* from the IMF's *International Financial Statistics* database.

Table A.2 in Appendix A provides a summary of the data sources, as well as some details on the definitions/calculations.

4. Heterogeneity between ECOWAS countries and choice of the appropriate exchange rate regime

4.1. Assessing heterogeneity: HAC analysis

The results from the HAC analysis over the 1999-2018 period are reported in Figure 1. They are presented as dendrograms, which are "cluster trees", indicating the order in which the successive aggregations were made (and therefore the optimal groupings). While the horizontal axis displays the different countries, the dendrograms' vertical axis represents the distance between the objects (i.e., the countries' equilibrium exchange rate paths) and between the clusters (heights of the cluster junctions).

As can be seen, the results are consistent across the four different methods we rely on. Indeed, we identify the same groupings of countries that could delimit the *ECO* area's borders. A simplified —but still relevant— interpretation of the results leads us to distinguish two groups of countries. The first group is composed of Benin, Burkina Faso, Cabo Verde, Côte d'Ivoire, Guinea-Bissau, Mali, Niger, Senegal, and Togo. The second set of countries, relatively less homogenous, is made of Gambia, Ghana, Guinea, and Nigeria. As shown, our

²⁴ It is also worth noting that the selected *ERER* data do not only correspond to average values over different models, but also over different estimation samples (world, by development level, by geographical zone). Furthermore, for the same reasons of comprehensiveness and of multilateral consistency, we consider 186 trading partners with time-varying weights.

two clusters of countries correspond to the WAEMU countries and Cabo Verde for the first one, and most WAMZ countries for the other. Sierra Leone can also be included in the second set of countries, even if it appears as an outlier gravitating relatively close to this group. In contrast, Liberia is an outlier as it is joined at a much higher distance compared to the other countries. It is worth mentioning that Sierra Leone and Liberia are the two countries exhibiting the lowest GDP growth rates (Figure A.1), and very high inflation rates (more than 17% in Sierra Leone in 2017).

The identification of these two groups of economies attests to considerable heterogeneity between two sets of countries that could challenge the viability of the monetary union at the ECOWAS level. Such heterogeneity illustrates the absence of integration across West African countries. Indeed, as previously mentioned, they mainly trade with Europe, China, the United States, and other emerging Asian countries, but not with each other. Although we mobilize a different methodological approach, the groupings we identify are quite in line with those from previous studies. For instance, relying on the OCA theory, Tsangarides and Qureshi (2008) identify relatively similar groups of countries with, on the one hand, the WAEMU countries and Cabo Verde and, on the other hand, the WAMZ states. Our groups of countries are also consistent with those of studies based on other approaches (e.g., Bangaké, 2008; Coulibaly and Gnimassoun, 2013). Furthermore, our findings are in line with Alagidede et al. (2012) regarding the second group of countries as those authors also establish evidence of heterogeneity between WAMZ countries.

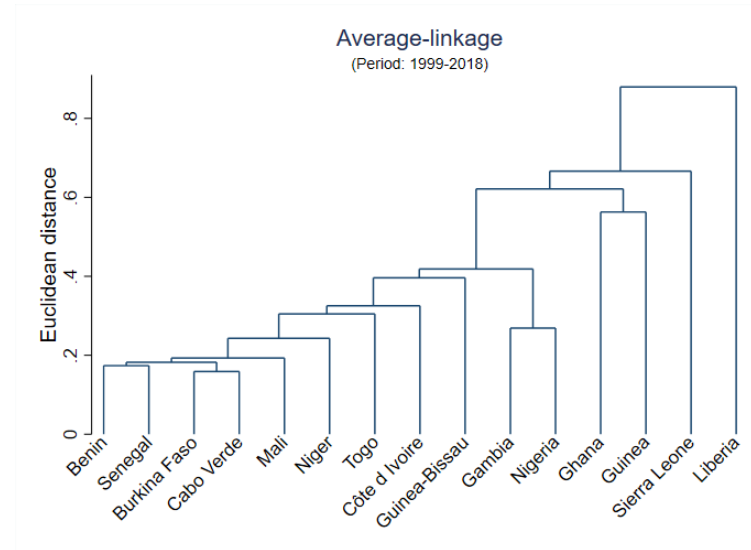
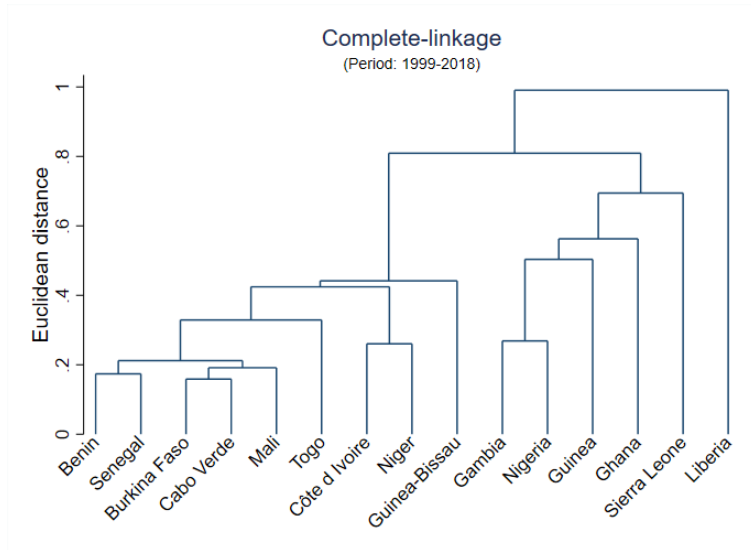
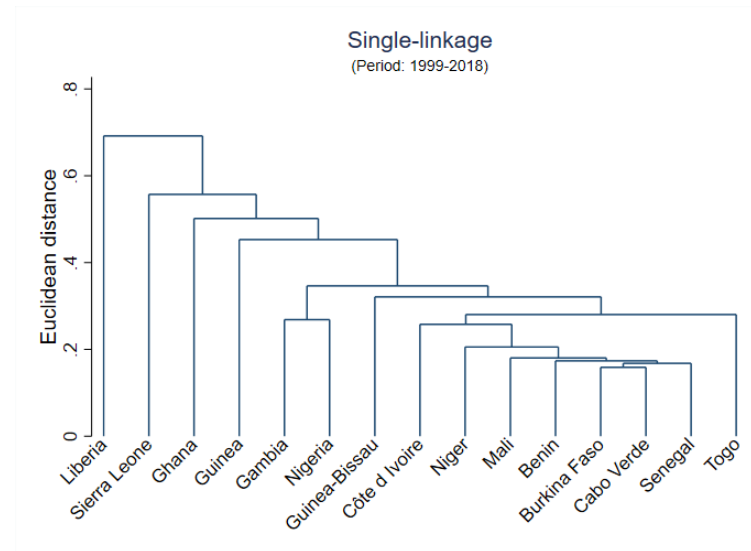
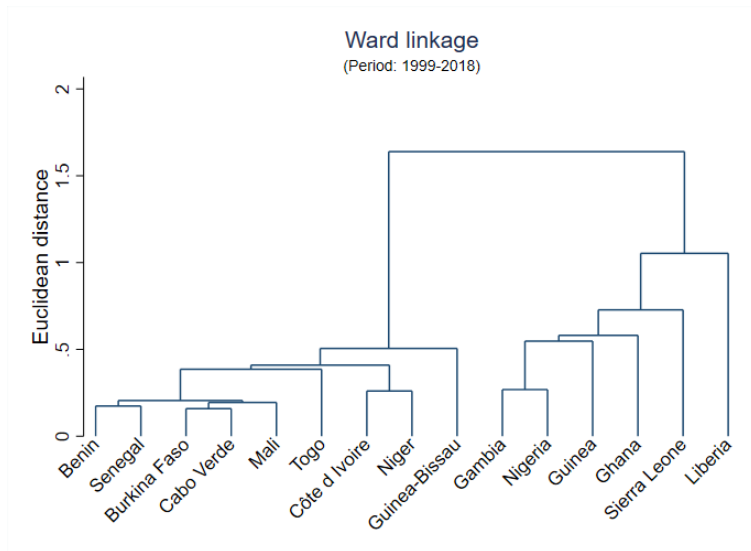


Figure 1 — HAC analysis results (1999-2018)

4.2. Explaining heterogeneity: Factor analysis

Given the descriptive nature of factor analysis, we focus on the 2010-2018 period, i.e., the period after the global financial crisis, the latter having fundamentally altered the 2000s economic picture (see IMF, 2018).²⁵

Table 1 — Factor analysis (principal factors, unrotated)

Factor	Eigenvalue	Difference	Proportion	Cumulative
Factor 1	2.47435	0.89746	0.3799	0.3799
Factor 2	1.57689	0.12652	0.2421	0.6221
Factor 3	1.45036	0.52374	0.2227	0.8448
Factor 4	0.92662	0.48687	0.1423	0.9871
Factor 5	0.43976	0.46438	0.0675	1.0546
Factor 6	-0.02462	0.0338	-0.0038	1.0508
Factor 7	-0.05842	0.03431	-0.009	1.0418
Factor 8	-0.09273	0.08704	-0.0142	1.0276
Factor 9	-0.17977	.	-0.0276	1

Notes: LR test: independent vs. saturated: $\chi^2(36) = 69.74$ $\text{Prob} > \chi^2 = 0.0006$. Eigenvalue: variance of the factor. Difference: differences between the current and following eigenvalues. Proportion: proportion of variance accounted for by the factor. Cumulative: cumulative proportion accounted for by the factor and all the previous ones. The proportions and cumulative proportions columns are computed using the sum of all eigenvalues as the divisor. This explains cumulative greater than 1.

As shown in Table 1, only the first five factors are retained —as the eigenvalues associated with the other factors are negative. However, to ease the representation and so the analysis and interpretation, we focus on the first three most meaningful factors —explaining the major part (around 84%) of the total variance.

The first factor (*Factor 1*) has, on the one hand, a high and positive correlation with the *current account balance*, *industry*, and *services*, and, on the other hand, a negative correlation with *agriculture* (see Table 2). Thus, *Factor 1* principally opposes predominantly agrarian economies (left side) and economies where industry and services are relatively more predominant. Accordingly, this first factor can be interpreted as the “type of economy” axis. On the left side (negative correlation), the second factor principally opposes *services*, and *real*

²⁵ The data are presented in Table C.1 in Appendix C.

GDP growth on the right side (positive correlation). Finally, *Factor 3*, for its part, principally opposes *inflation* and *currency misalignments*.²⁶

Table 2 — Factor loadings (pattern matrix) and unique variances

Variable	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Uniqueness
Mis	0.3875	0.2498	-0.5128	-0.275	0.3592	0.3198
Fiscal_bal	-0.0154	0.362	-0.3858	0.5556	-0.3166	0.3109
CA	0.7313	0.2959	-0.3208	0.1681	0.15	0.224
Inflation	-0.1867	-0.0357	0.7428	0.2355	0.269	0.2843
GDPG	0.0238	0.7307	0.3284	-0.2224	-0.1478	0.2864
Agriculture	-0.9094	0.2829	-0.1972	0.1434	0.1333	0.0157
Industry	0.7228	0.4266	0.4664	-0.07	-0.0983	0.0635
Services	0.6278	-0.6529	0.0453	0.2645	-0.0528	0.1048
ToT_vol	0.1007	0.2691	0.1326	0.5601	0.2522	0.5226

Notes: The factor loadings represent how variables are weighted for each factor and the correlation between the variables and factors. Uniqueness gives the proportion of the common variance of the variable not associated with the factors.

The factor analysis results (the first three factors) are synthesized in two three-dimensional graphics (see Figure 2). The top chart, i.e., the factor loadings plot, displays each variable's position in the space defined by the first three factors. Its aim is to identify clusters of variables with similar loadings. The bottom chart ("Scores") displays individual countries' scores on each factor, the values being provided in Table 3. The closer the country is to a variable, the more important the country's score regarding this variable.

²⁶ From a methodological point of view, our results are satisfactory given the low values of the uniqueness (Table 2). Indeed, recall that uniqueness measures the percentage of variance for the considered variable that is not explained by the common factors. Uniqueness could represent measurement error, which is likely if it takes a high value, typically larger than 0.6. Given that the values we obtain do not exceed this threshold, our retained variables are well explained by the identified factors.

Table 3 — Country scores on the factors

Country (ISO)	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Benin (BEN)	0.38555	-0.40754	-1.09870	-0.05709	-0.36268
Burkina Faso (BFA)	0.58221	0.85235	-0.01416	-0.31640	-0.44339
Côte d'Ivoire (CIV)	0.83983	0.44781	-0.40144	0.83912	-0.75229
Cabo Verde (CPV)	1.07933	-2.13196	-0.31798	-0.81758	0.55761
Ghana (GHA)	0.23373	0.77754	1.84907	-0.68846	0.89602
Guinea (GIN)	0.66053	0.46612	1.55007	-0.35824	-0.65094
Gambia (GMB)	-0.01444	-1.24381	-0.43943	0.36508	0.37780
Guinea-Bissau (GNB)	-0.80614	0.83650	-1.53356	0.74347	0.50938
Liberia (LBR)	-1.78487	-1.41546	1.08705	1.05895	-1.21546
Mali (MLI)	-0.44421	1.10752	-0.47978	0.19249	-0.10462
Niger (NER)	-0.39647	1.01218	-0.01737	-0.24714	-0.35002
Nigeria (NGA)	1.01872	0.10300	0.51499	1.87238	1.26149
Senegal (SEN)	0.92963	-0.38069	-0.11686	-0.34746	-0.76833
Sierra Leone (SLE)	-2.11262	0.05619	-0.01349	-0.43520	1.20910
Togo (TGO)	-0.17077	-0.07974	-0.56840	-1.80391	-0.16368

It is interesting to note the concordance of the countries' groupings between the factor analysis and the cluster analysis. Indeed, Ghana, Guinea, Guinea-Bissau, Sierra Leone, and Liberia appear clearly distant from the cluster formed by the —core— WAEMU countries (Benin, Burkina Faso, Côte d'Ivoire, Mali, Niger, Senegal, and Togo). These latter WAEMU countries are located in the space delimited by the current account balance, currency misalignments, fiscal balance, and real GDP growth. Therefore, these countries tend to exhibit the highest average scores (i.e., better performances) regarding the aforementioned variables. In contrast, Guinea-Bissau, which belongs to the WAEMU, has a remote position from the cluster. Its eccentric position is due to the difference regarding the scores on *Factors* 1 and 3 (see Table 3). Indeed, Guinea-Bissau appears to be not only a more agrarian economy than other WAEMU countries (*Factor 1*), but has also an overvalued real exchange rate (*Factor 3*) over the 2010-2018 period —in contrast with the other WAEMU countries except Benin. In line with the HAC results, Gambia and Nigeria fall between the two above noted and distinct groups. More specifically, their positions differ from the WAEMU cluster mostly due to one factor; *Factor 2* in the case of Gambia and *Factor 3* in the case of Nigeria. Indeed, Gambia registered on average lower real GDP growth rates, and the services sector's size is substantially different from that of WAEMU countries —except Côte d'Ivoire. For Nigeria, the main difference is related to the high inflation level that reflects a difference in the internal macroeconomic equilibrium. Also, as found in our previous analyses, Cabo Verde belongs to the —core— WAEMU cluster, but its position is here distorted due to both the relatively

lower growth rate observed over the 2010-2018 period, and the preponderance of the services sector —which is typical for a tourism-oriented economy.

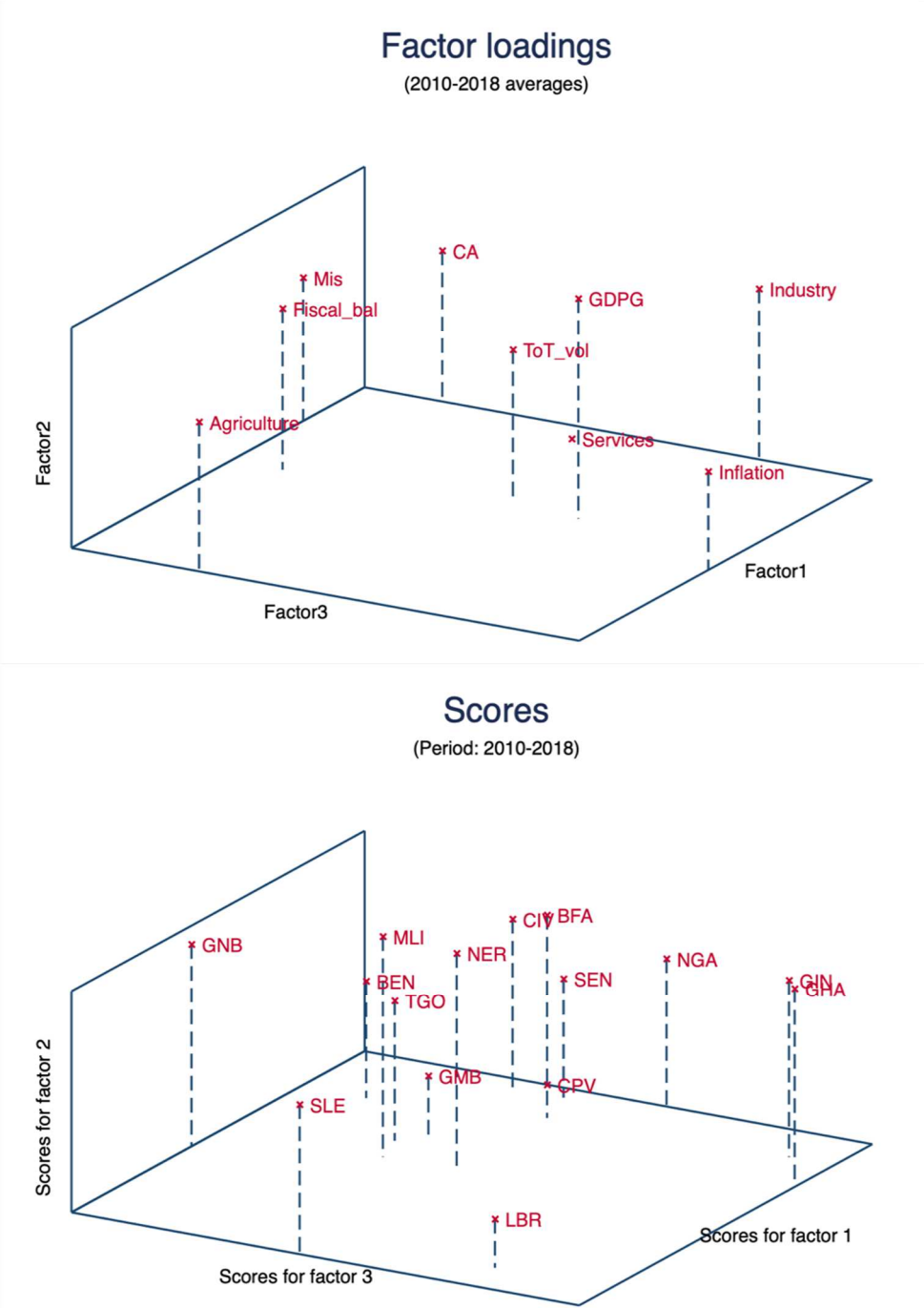


Figure 2 — Factor analysis results (2010-2018)

Notes: The height of the spikes indicates the score on *Factor 2*, while the basis of the spikes positions the variables or the countries in the *Factor 1-Factor 3* plane. “Agriculture” = agriculture value added (%GDP); “CA” = current account balance (%GDP); “Fiscal_bal” =fiscal balance (%GDP); “GDPG”= real GDP growth; “Industry” = industry valued added (%GDP); “Inflation”=CPI-based inflation; “Mis” = currency misalignments; “Services”= services value added (%GDP); “ToT_vol” = Terms of trade volatility. Country labels use International Organization for Standardization (ISO) country codes: “BEN” Benin; “BFA” Burkina Faso; “CIV” Côte d’Ivoire; “CPV” Cabo Verde; “GHA” Ghana; “GIN” Guinea; “GMB” Gambia; “GNB” Guinea-Bissau; “LBR” Liberia; “MLI” Mali; “NER” Niger; “NGA” Nigeria; “SEN” Senegal; “SLE” Sierra Leone; “TGO” Togo.

Results in Tables 2 and 3 can also be used to have a reading in terms of macroeconomic shocks within the ECOWAS. In fact, while the variables considered were intended to grasp the structural characteristics of the economies, some also offer the advantage to reflect the nature and importance of shocks the countries faced. As aforementioned, such analysis constitutes the bedrock of the OCA theory and, therefore, deserves scrutiny. By borrowing the Mundell-Fleming's reading grid, terms of trade volatility and the inflation rate can be reinterpreted as reflecting real and nominal shocks, respectively.²⁷ Similarly, currency misalignments, reflecting deviations from both internal and external equilibria, can also be interpreted as a generic indicator of macroeconomic shocks the countries faced, but also of their resilience. From that perspective, *Factors 3* and *4*, both negatively correlated with currency misalignments but positively defined by the inflation rate and terms of trade volatility, respectively, provide insights on shocks asymmetry within the ECOWAS. In this respect, Figure 3, displaying the space defined by *Factors 2*, *3* and *4*, shows countries' groupings in terms of macroeconomic shocks. Again, it is interesting to note the cluster formed by the WAEMU economies from which few countries slightly step out due to their low level of —average— inflation rate (Guinea-Bissau and Niger; *Factor 3*) and/or their weak terms of trade volatility and currency misalignments (Togo; *Factor 4*). The Gambia and Sierra Leone, while belonging to the same cluster on the plane defined by *Factors 3* and *4*, depart however from the WAEMU group regarding *Factor 2* which relates to growth regime and structural issues. Reflecting rather asymmetrical exposure to macroeconomic shocks, Ghana, Guinea, Liberia, and Nigeria appear at the top right periphery of the plane defined by *Factors 3* and *4*. Nigeria further distinguishes itself from the latter group regarding the magnitude of terms of trade shocks due to the importance of oil in its exports.

These interpretations corroborate our findings in terms of countries' heterogeneity. They are globally in line with those of Celasun and Justiniano (2005), who use dynamic factor analysis to assess the synchronization in output among ECOWAS member states. Indeed, they show that a monetary union is not desirable due to countries' heterogeneity in terms of harmonization with respect to output fluctuations. Similarly, Houssa (2008), using the same

²⁷ Note that the variables do not allow us to differentiate between the external and domestic origin(s) of the shock. Actually, both origins are embedded. The case of inflation, which could be influenced by both domestic (e.g., money supply, aggregate demand, productivity changes) and external (e.g., foreign price level, foreign interest rate) shocks, provides an illustrative example. Still, this does not constitute a problem since the insulating properties of exchange rate regimes discussed in the literature essentially obey the real-nominal dichotomy.

methodology, concludes that forming a monetary union in the ECOWAS would be economically costly as countries face asymmetric supply shocks. A similar conclusion is reached by Chuku (2012), who shows that most demand, supply, and monetary shocks within the ECOWAS are asymmetric, questioning the formation of a currency union. Highlighting also asymmetries in terms of shocks between the WAMZ countries, our findings appear consistent with those of Cham (2009), and Harvey and Cushing (2015).

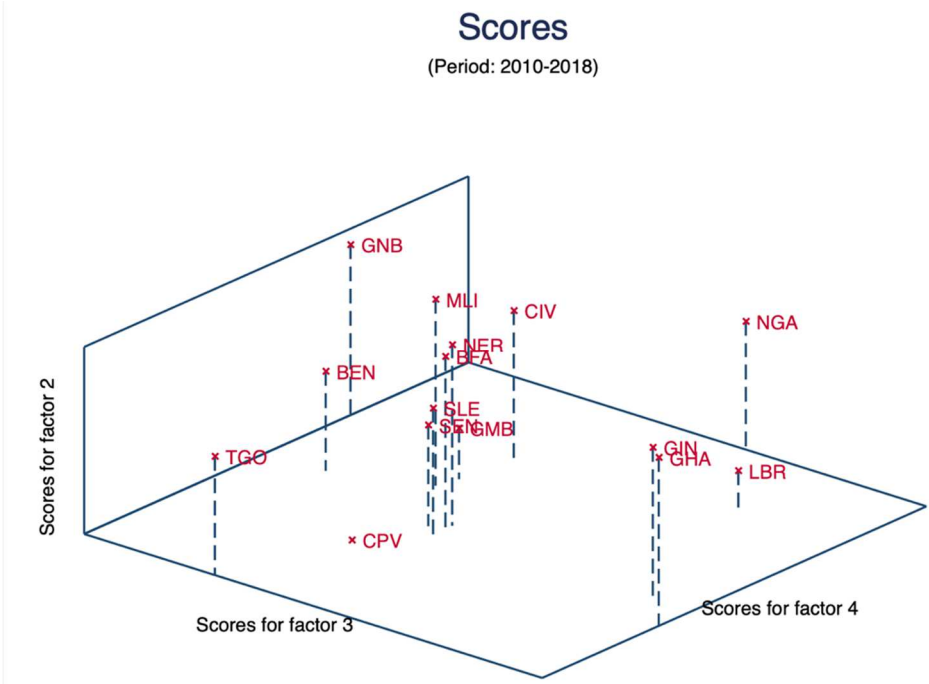


Figure 3 — Factor analysis results: (2010-2018)

Notes: The height of the spikes indicates the score on *Factor 2*, while the basis of the spikes positions the variables or the countries in the *Factor 3-Factor 4* plane. “Agriculture” = agriculture value added (%GDP); “CA” = current account balance (%GDP); “Fiscal_bal” =fiscal balance (%GDP); “GDGP”= real GDP growth; “Industry” = industry valued added (%GDP); “Inflation”=CPI-based inflation; “Mis” = currency misalignments; “Services”= services value added (%GDP); “ToT_vol” = Terms of trade volatility. Country labels use International Organization for Standardization (ISO) country codes: “BEN” Benin; “BFA” Burkina Faso; “CIV” Côte d’Ivoire; “CPV” Cabo Verde; “GHA” Ghana; “GIN” Guinea; “GMB” Gambia; “GNB” Guinea-Bissau; “LBR” Liberia; “MLI” Mali; “NER” Niger; “NGA” Nigeria; “SEN Senegal; “SLE” Sierra Leone; “TGO” Togo.

Overall, the cross-reading of the above results tends to support the conclusions of the HAC analysis. Indeed, both approaches highlight a relatively important level of heterogeneity between the ECOWAS countries. Furthermore, the agglomerative schemes arising from the two approaches are quite similar: while the WAEMU countries (excluding Guinea-Bissau) form a rather homogenous group regarding the different variables, the other countries’ positions appear more dispersed in the space defined by the factors, hence revealing significant structural differences. Furthermore, the country groupings are broadly consistent

with regard to macroeconomic shocks the countries faced. On the latter point, Figure 3 provides interesting takeaways from the broad OCA literature on the insulating properties of ERR. In fact, looking exclusively at macroeconomic shocks, an augmented WAEMU group appears consistent with the idea of a monetary union. However, for a remote country, especially Nigeria which is subject to —very— important terms of trade shocks (real shocks), joining a monetary union and, consequently, giving up its monetary policy autonomy would be burdensome, unless the regional monetary policy is calibrated on Nigeria. Given Nigeria’s economic and demographic importance, such contingency cannot be ruled out. Note that our finding is in line with Bénassy-Quéré and Coupet (2005), Bangaké (2008), and Coulibaly and Gnimassoun (2013), who show that forming a monetary union in ECOWAS with the inclusion of Nigeria is not economically conceivable. The same conclusion is reached by Masson (2006, 2008), according to whom a monetary union with Nigeria is not feasible due to substantial trade impacts among member countries. This brings to the forefront the issue of the policy coordination —embedded in that of the country “optimal”/sustainable ERR.

4.3. Choice of the appropriate exchange rate regime

As noted above, an additional issue raised by the *ECO* project is that of the ERR choice. While the previous results (Section 4.1) indicate the existence of two groups of countries with more or less similar sustainable exchange rate paths, they do not say anything about the ERR to be adopted. However, this ERR choice is of first importance as it conditions the adjustment capacities —and so the realization of the macroeconomic balances. The ERR issue could also serve as a double-check. Indeed, it is not inconceivable that two countries share the same underlying ERR despite the difference regarding their sustainable exchange rate paths.²⁸ Hence, we go further than the previous studies in the sense that our analysis passes the wall of heterogeneity between countries by also looking at their ERR.

Table 4 presents the estimation results of the countries’ hypothetical basket weights. We consider three alternatives for the basket composition: (i) US dollar and euro; (ii) US dollar, euro, British pound, and Chinese renminbi; and (iii) the previous currencies augmented by the Japanese yen and the Nigerian naira. As a reminder, the validity of the basket peg

²⁸ In fact, the previous analysis on the adequacy between the member states’ sustainable exchange rate paths incorporates two dimensions: (i) that of the (mis)match between the countries’ exchange rate levels, and (ii) that of the exchange rate dynamics. Two currencies can therefore display similar dynamics but different sustainable levels. While in the previous analysis the two dimensions were inseparable, focusing now on the issue of the ERR —for which only the dynamics are relevant— enlarges the perspectives on the feasibility and desirability of the monetary union.

hypothesis should be assessed not only through the estimated weights, but also through the goodness-of-fit —proxied by the R^2 . Looking first at the two anchors' hypothetical basket, both the euro and US dollar appear with significant weights for all countries. None of these currencies enters with weights statistically equal to one, indicating that a single peg to either currency would not have been preferable for any country. Furthermore, while both currency weights sum to one, the determination coefficients indicate that a tight peg to these currencies would have neither been preferable as well. The results thus suggest that, considering the euro and the US dollar as anchors, loose pegs or intermediate regimes which allow for some flexibility appear to be suitable. For some countries like Liberia, Sierra Leone, or even Ghana, Guinea-Bissau, and Togo, the low determination coefficients relocate the sustainable ERR between intermediate regimes and —managed— floats.

Considering the four major trading partner currencies (i.e., euro, US dollar, British pound, and the renminbi) does not significantly change the above findings. Indeed, where the previous two anchors basket found a positive echo, the US dollar and the euro still display significant weights. In most WAEMU countries, the inclusion of the pound and the renminbi slightly reshapes the estimated weights that ultimately —modestly— improved the goodness-of-fit. While the renminbi does not enter in any of these countries' basket, the British pound appears significant for Benin, but with moderate weight.²⁹ The inclusion of the above two currencies does not modify the results for the other countries, except for Nigeria where the British pound also enters the “basket”. As barely visible for Nigeria, the four-currency basket appears to underperform in many countries, particularly for Liberia where the R^2 plummeted —reflecting the non-significance of the model.

Turning to the six-currency anchor, the Nigerian naira could not have been considered a sustainable/affordable anchor for any country as it is either not statistically significant or appears with a very negligible weight —namely for Senegal.³⁰ In contrast, the Japanese yen enters in all baskets, except for Benin and Côte d'Ivoire.

²⁹ This is also the case for Cabo Verde.

³⁰ Note that in the case of Nigeria, we restrict the analysis to five anchor currencies.

Table 4 — The countries' anchor currency weights

	Benin			Burkina Faso			Cabo Verde			Côte d'Ivoire		
	(i)	(ii)	(iii)	(i)	(ii)	(iii)	(i)	(ii)	(iii)	(i)	(ii)	(iii)
<i>USD</i>	0.464 ^{***} (0.027)	0.442 ^{***} (0.081)	0.420 ^{***} (0.083)	0.463 ^{***} (0.032)	0.504 ^{***} (0.097)	0.418 ^{***} (0.090)	0.439 ^{***} (0.029)	0.504 ^{***} (0.087)	0.417 ^{***} (0.078)	0.458 ^{***} (0.043)	0.350 ^{**} (0.135)	0.328 ^{**} (0.138)
<i>EUR</i>	0.536 ^{***} (0.027)	0.472 ^{***} (0.039)	0.457 ^{***} (0.042)	0.537 ^{***} (0.032)	0.488 ^{***} (0.047)	0.427 ^{***} (0.046)	0.561 ^{***} (0.029)	0.512 ^{***} (0.042)	0.452 ^{***} (0.039)	0.542 ^{***} (0.043)	0.555 ^{***} (0.066)	0.558 ^{***} (0.070)
<i>GBP</i>		0.090 ^{**} (0.041)	0.099 ^{**} (0.044)		0.077 (0.050)	0.116 ^{**} (0.048)		0.079 [*] (0.044)	0.117 ^{***} (0.042)		-0.032 (0.069)	-0.055 (0.074)
<i>RMB</i>		-0.004 (0.083)	-0.014 (0.085)		-0.069 (0.100)	-0.107 (0.092)		-0.095 (0.090)	-0.135 [*] (0.080)		0.128 (0.139)	0.087 (0.142)
<i>JPY</i>			0.034 (0.028)			0.132 ^{***} (0.030)			0.133 ^{***} (0.026)			0.028 (0.046)
<i>NGN</i>			0.004 (0.023)			0.013 (0.025)			0.016 (0.022)			0.054 (0.038)
<i>Constant</i>	-0.000 (0.001)	0.000 (0.001)	0.000 (0.001)	0.000 (0.001)	0.000 (0.001)	0.001 (0.001)	0.000 (0.001)	0.001 (0.001)	0.001 (0.001)	0.000 (0.002)	-0.000 (0.002)	0.001 (0.002)
<i>R-squared</i>	0.798	0.856	0.952	0.735	0.811	0.934	0.755	0.854	0.951	0.591	0.669	0.876
<i>F test</i>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Gambia			Ghana			Guinea			Guinea-Bissau		
	(i)	(ii)	(iii)	(i)	(ii)	(iii)	(i)	(ii)	(iii)	(i)	(ii)	(iii)
<i>USD</i>	0.558 ^{***} (0.041)	0.094 (0.110)	0.027 (0.109)	0.436 ^{***} (0.058)	0.314 [*] (0.180)	0.206 (0.178)	0.579 ^{***} (0.046)	0.737 ^{***} (0.143)	0.664 ^{***} (0.142)	0.525 ^{***} (0.053)	0.547 ^{***} (0.166)	0.443 ^{***} (0.164)
<i>EUR</i>	0.442 ^{***} (0.041)	0.306 ^{***} (0.054)	0.257 ^{***} (0.055)	0.564 ^{***} (0.058)	0.482 ^{***} (0.088)	0.423 ^{***} (0.090)	0.421 ^{***} (0.046)	0.441 ^{***} (0.070)	0.374 ^{***} (0.072)	0.475 ^{***} (0.053)	0.469 ^{***} (0.081)	0.403 ^{***} (0.083)
<i>GBP</i>		0.140 ^{**} (0.056)	0.173 ^{***} (0.058)		0.104 (0.092)	0.123 (0.095)		-0.008 (0.073)	0.051 (0.076)		0.011 (0.085)	0.046 (0.088)
<i>RMB</i>		0.461 ^{***} (0.114)	0.434 ^{***} (0.112)		0.100 (0.186)	0.025 (0.182)		-0.170 (0.148)	-0.177 (0.146)		-0.026 (0.172)	-0.083 (0.168)
<i>JPY</i>			0.103 ^{***} (0.037)			0.159 ^{***} (0.060)			0.118 ^{**} (0.048)			0.157 ^{***} (0.055)
<i>NGN</i>			0.006 (0.030)			0.062 (0.049)			-0.030 (0.039)			0.035 (0.045)
<i>Constant</i>	-0.012 ^{***} (0.002)	-0.013 ^{***} (0.002)	-0.013 ^{***} (0.002)	-0.029 ^{***} (0.002)	-0.029 ^{***} (0.002)	-0.028 ^{***} (0.003)	-0.026 ^{***} (0.002)	-0.025 ^{***} (0.002)	-0.026 ^{***} (0.002)	0.004 [*] (0.002)	0.004 [*] (0.002)	0.005 ^{**} (0.002)
<i>R-squared</i>	0.709	0.631	0.909	0.421	0.551	0.782	0.670	0.609	0.840	0.559	0.543	0.793
<i>F test</i>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Notes: Symbols ***, **, and * denote significance at the 1%, 5%, and 10% statistical level. The estimations are based on the 1999-2018 period using quarterly data. "F test" reports the p-value associated with the Fisher test.

Table 4 — The countries' anchor currency weights (*Continued*)

	Liberia			Mali			Niger			Nigeria		
	(i)	(ii)	(iii)	(i)	(ii)	(iii)	(i)	(ii)	(iii)	(i)	(ii)	(iii)
<i>USD</i>	0.657 ^{***} (0.133)	-0.229 (0.397)	-0.458 (0.395)	0.484 ^{***} (0.034)	0.605 ^{***} (0.105)	0.532 ^{***} (0.102)	0.464 ^{***} (0.037)	0.344 ^{***} (0.113)	0.293 ^{**} (0.113)	0.523 ^{***} (0.041)	0.307 ^{**} (0.120)	0.192 [*] (0.107)
<i>EUR</i>	0.343 ^{**} (0.133)	0.071 (0.194)	-0.084 (0.201)	0.516 ^{***} (0.034)	0.498 ^{***} (0.051)	0.446 ^{***} (0.052)	0.536 ^{***} (0.037)	0.482 ^{***} (0.055)	0.460 ^{***} (0.058)	0.477 ^{***} (0.041)	0.350 ^{***} (0.059)	0.262 ^{***} (0.054)
<i>GBP</i>		0.283 (0.203)	0.377 [*] (0.211)		0.043 (0.054)	0.077 (0.054)		0.063 (0.058)	0.063 (0.061)		0.159 ^{**} (0.061)	0.222 ^{***} (0.055)
<i>RMB</i>		0.875 ^{**} (0.410)	0.765 [*] (0.405)		-0.146 (0.108)	-0.178 [*] (0.104)		0.111 (0.117)	0.066 (0.116)		0.184 (0.124)	0.145 (0.108)
<i>JPY</i>			0.349 ^{**} (0.133)			0.112 ^{***} (0.034)			0.074 [*] (0.038)			0.178 ^{***} (0.036)
<i>NGN</i>			0.051 (0.110)			0.011 (0.028)			0.044 (0.032)			—
<i>Constant</i>	-0.018 ^{***} (0.006)	-0.019 ^{***} (0.005)	-0.017 ^{***} (0.006)	0.003 ^{**} (0.001)	0.004 ^{**} (0.001)	0.004 ^{***} (0.001)	-0.002 (0.002)	-0.002 (0.002)	-0.001 (0.002)	-0.017 ^{***} (0.002)	-0.017 ^{***} (0.002)	-0.017 ^{***} (0.001)
<i>R-squared</i>	0.241	0.075	0.353	0.724	0.787	0.918	0.675	0.739	0.908	0.681	0.668	0.899
<i>F test</i>	0.000	0.116	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Senegal			Sierra Leone			Togo					
	(i)	(ii)	(iii)	(i)	(ii)	(iii)	(i)	(ii)	(iii)	(i)	(ii)	(iii)
<i>USD</i>	0.477 ^{***} (0.024)	0.464 ^{***} (0.075)	0.397 ^{***} (0.069)	0.520 ^{**} (0.078)	0.678 ^{**} (0.243)	0.535 ^{**} (0.239)	0.512 ^{***} (0.050)	0.379 ^{**} (0.155)	0.311 [*] (0.157)			
<i>EUR</i>	0.523 ^{***} (0.024)	0.499 ^{***} (0.037)	0.461 ^{***} (0.035)	0.480 ^{***} (0.078)	0.501 ^{***} (0.119)	0.433 ^{***} (0.122)	0.488 ^{**} (0.050)	0.420 ^{**} (0.076)	0.381 ^{***} (0.080)			
<i>GBP</i>		0.033 (0.038)	0.048 (0.037)		-0.011 (0.125)	-0.002 (0.128)		0.082 (0.079)	0.099 (0.084)			
<i>RMB</i>		0.004 (0.078)	-0.040 (0.071)		-0.168 (0.251)	-0.284 (0.246)		0.119 (0.160)	0.077 (0.161)			
<i>JPY</i>			0.100 ^{***} (0.023)			0.209 ^{**} (0.081)			0.101 [*] (0.053)			
<i>NGN</i>			0.034 [*] (0.019)			0.109 (0.066)			0.031 (0.044)			
<i>Constant</i>	0.002 [*] (0.001)	0.002 [*] (0.001)	0.002 ^{**} (0.001)	-0.016 ^{***} (0.003)	-0.016 ^{***} (0.003)	-0.014 ^{***} (0.003)	0.002 (0.002)	0.002 (0.002)	0.003 (0.002)			
<i>R-squared</i>	0.835	0.868	0.961	0.365	0.387	0.627	0.575	0.562	0.827			
<i>F test</i>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000			

Notes: Symbols ***, **, and * denote significance at the 1%, 5%, and 10% statistical level. The estimations are based on the 1999-2018 period using quarterly data. “*F test*” reports the p-value associated with the Fisher test.

Table 5 — The country groups' underlying exchange rate regimes

	Group 1						Group 2					
	WAEMU			WAEMU and Cabo Verde			WAMZ excluding Liberia			WAMZ and Liberia		
	(i)	(ii)	(iii)	(i)	(ii)	(iii)	(i)	(ii)	(iii)	(i)	(ii)	(iii)
<i>USD</i>	0.481 ^{***} (0.014)	0.454 ^{***} (0.042)	0.393 ^{***} (0.042)	0.476 ^{***} (0.013)	0.460 ^{***} (0.039)	0.395 ^{***} (0.038)	0.523 ^{***} (0.025)	0.426 ^{***} (0.078)	0.324 ^{***} (0.077)	0.545 ^{***} (0.031)	0.317 ^{***} (0.094)	0.194 ^{**} (0.093)
<i>EUR</i>	0.519 ^{***} (0.014)	0.485 ^{***} (0.021)	0.449 ^{***} (0.021)	0.524 ^{***} (0.013)	0.488 ^{***} (0.019)	0.449 ^{***} (0.019)	0.477 ^{***} (0.025)	0.416 ^{**} (0.038)	0.352 ^{**} (0.039)	0.455 ^{***} (0.031)	0.358 ^{**} (0.046)	0.279 ^{***} (0.047)
<i>GBP</i>		0.046 ^{**} (0.022)	0.062 ^{***} (0.022)		0.050 ^{**} (0.020)	0.068 ^{**} (0.020)		0.077 [*] (0.040)	0.109 ^{**} (0.041)		0.111 ^{**} (0.048)	0.154 ^{**} (0.050)
<i>RMB</i>		0.015 (0.044)	-0.024 (0.043)		0.002 (0.040)	-0.036 (0.039)		0.081 (0.081)	0.023 (0.079)		0.214 ^{**} (0.097)	0.147 (0.095)
<i>JPY</i>			0.092 ^{***} (0.014)			0.097 ^{***} (0.013)			0.154 ^{***} (0.026)			0.187 ^{***} (0.031)
<i>NGN</i>			0.028 ^{**} (0.012)			0.027 ^{**} (0.011)			0.037 [*] (0.021)			0.039 (0.026)
<i>Constant</i>	0.001 ^{**} (0.001)	0.001 ^{**} (0.001)	0.002 ^{***} (0.001)	0.001 ^{**} (0.001)	0.001 ^{**} (0.001)	0.002 ^{***} (0.001)	-0.020 ^{***} (0.001)	-0.020 ^{***} (0.001)	-0.019 ^{***} (0.001)	-0.020 ^{***} (0.001)	-0.020 ^{***} (0.001)	-0.019 ^{***} (0.001)
<i>R-squared</i>	0.661	0.710	0.889	0.669	0.725	0.895	0.517	0.488	0.770	0.402	0.319	0.645
<i>F test</i>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
<i>N° Obs.</i>	632	632	632	711	711	711	395	395	395	474	474	474

Notes: ***, **, and * denote significance at the 1%, 5%, and 10% statistical level. The regressions are based on quarterly data over the 1999-2018 period. WAEMU (West African Economic and Monetary Union) is formed of Benin, Burkina Faso, Côte d'Ivoire, Guinea-Bissau, Mali, Niger, Senegal, and Togo. The WAMZ (West African Monetary Zone) countries are Gambia, Ghana, Guinea, Liberia, Nigeria, and Sierra Leone. “*F test*” reports the *p*-value associated with the Fisher test.

Overall, the six-currency basket weights estimation depicts fairly well the extent of countries' heterogeneity regarding the sustainable ERR. However, WAEMU countries — augmented with Cabo Verde—appear to share relatively similar underlying ERR despite some minor differences. These findings are in line with our previous ones (i.e., HAC, and factor analysis). They also provide insights on the nature of the ERR, an issue upstream from those related to the choice and importance of anchor currencies. Specifically, our results bring new light on the issue of the ERR in the ECOWAS monetary union as they highlight two important common observations: (i) no single currency peg is suitable for any of the countries; and (ii) with varying degrees, flexibility is required. In this sense, we go further than the previous literature that focuses on a single currency peg and concludes that the absence of consensus regarding the anchor currencies would constitute an obstacle to the ECOWAS monetary union. Indeed, as Dufrénot and Sugimoto (2013), the other previous studies are also mainly limited to a single currency peg. Yehoue (2005) finds that the euro should be a good peg for regional currency blocks in West Africa, Southern Africa, and Central Africa from a trade criterion. A similar result is obtained by Buigut and Valev (2005) on some specific sub-regions. For the sake of completeness, note that given countries' heterogeneity, another strand of the literature has investigated the use of strong pegs as substitutes for monetary unions (Debrun et al., 2011; Qureshi and Tsangarides, 2012, 2015).

Drawing on the above results (i.e., the similarity of the ERR within the groups), we present in Table 5 the different anchor currency weights for each country group. We consider the same three alternatives as before.

Looking first at the WAEMU countries, we note that the R^2 varies between 0.661 for the two-anchor basket and 0.889 for the six-anchor basket. For each estimated model, the null of the Fisher test that all of the slope coefficients are zero is rejected, indicating the plausibility of the basket peg hypothesis. The latter should have been *a priori* mainly composed of euro and US dollar —with a slightly more important share of euro than US dollar.³¹ The *GBP*, the *JPY*, and the *NGN* could have also entered this basket, but with relatively weak weights (particularly for the naira). In contrast, the renminbi, over the period

³¹ Indeed, whatever the considered basket of currencies, (i) the coefficients associated with EUR and USD are both highly significant, and (ii) the coefficient related to EUR is always higher than that corresponding to USD (the share of EUR evolves between 44.9% for the six-anchor basket to 51.9% for the two-anchor basket, whereas the respective USD share varies between 39.3% to 48.1%).

considered, did not appear as a viable anchor.³² The picture for the WAEMU is unchanged when including Cabo Verde.

Regarding the second set of economies, the lower R^2 values suggest that these countries' need for flexibility has been larger than that of the economies belonging to the first group.³³ Besides, the basket appears more diversified in the sense that relatively more important weights are attributed to the *GBP* and *JPY* compared to the basket of Group 1. For the Nigerian naira, however, the weights between both groups appear identical—negligible. The inclusion of Liberia substantially changes the outcomes, particularly with a greater need for flexibility.

Given the broadly shared need for flexibility, we deemed it relevant to supplement the above analyses by addressing the issue of the real effective exchange rates convergence to their equilibrium levels, i.e., their adjustment speeds. In this respect, Table 6 provides the estimated adjustment speed towards each country's equilibrium exchange rate. The latter are estimated relying on the Cross-sectionally augmented Pooled Mean Group (CPMG) estimator, which corrects the Pooled Mean Group (PMG) estimator (Pesaran, 2006) for cross-sectional dependencies and allows heterogeneity in the short-run dynamics between countries.³⁴ The corresponding half-lives—indicating, *ceteris paribus*, the time necessary to reduce by half the currency misalignments—are calculated as $|\log(0.5)/\log(1 - \gamma)|$, with γ denoting the estimated value of the error-correction terms. As shown, there is substantial heterogeneity across countries regarding the time needed to absorb currency disequilibria.³⁵ Gambia, Burkina Faso, Ghana, and Senegal are among the states exhibiting the highest half-life values. For these countries, disequilibria are thus long lasting, especially in Gambia for which almost 15 years are needed for half of the currency misalignments to be corrected. This means that

³² Given the relatively tight link between the US dollar and the renminbi, the latter could be indirectly taken into account through the US dollar—see the correlations in Table A.3 in Appendix A.

³³ Indeed, despite the relatively low R^2 , the null of the F-test is rejected, indicating the plausibility of the basket peg.

³⁴ Like the PMG estimator, the CPMG estimator, provided that the null of long-run homogeneity is not rejected, constrains the long-run coefficients to be the same, while allowing the short-run coefficients, including the adjustment speed, to differ across panels (Binder and Offermanns, 2007). Consequently, this approach leads to correct inference and consistent estimates in the presence of cross-sectional dependencies and better captures heterogeneity across countries—compared to the DOLS and FMOLS procedures. Operationally, the adjustment speeds correspond to the error correction term coefficients obtained while regressing the real effective exchange rate on its fundamentals—to derive the equilibrium exchange rates and currency misalignments.

³⁵ It should however be noted that the estimated half-lives presented in Table 6 indicate the speed of the adjustments “all other things being equal” and particularly in the absence of shocks. Therefore, they should not be seen as definitive evidence regarding convergence between countries.

these countries have exchange rates which are disconnected from their economic fundamentals. Adequate economic, monetary, and budgetary policies should thus be implemented to resorb the disequilibria, depending on the structural characteristics of the concerned countries. In contrast, Sierra Leone, Côte d’Ivoire, Cabo Verde, and Benin tend to rapidly correct the imbalances: the disconnection of exchange rates from economic determinants is short-lived.

Table 6 – The adjustment speeds

	Error correction term		Corresponding half-life (years)
	Mean	Std. Dev.	
Benin	-0.264	0.156	2.96
Burkina Faso	-0.060 ^a	0.012	11.89
Cabo Verde	-0.302	0.155	2.63
Côte d’Ivoire	-0.507	0.082	1.69
Gambia	-0.048 ^a	0.009	14.88
Ghana	-0.083	0.010	8.69
Guinea	-0.171	0.106	4.39
Guinea-Bissau	-0.254	0.054	3.06
Liberia	-0.108	0.026	6.75
Mali	-0.108	0.038	6.77
Niger	-0.118	0.057	6.20
Nigeria	-0.244	0.083	3.17
Senegal	-0.089	0.003	8.17
Sierra Leone	-0.508	0.162	1.69
Togo	-0.157	0.011	4.75
Average			5.85

Notes: The entries correspond to the averages of the estimated error correction terms –statistically significant at the 10% statistical level– over the 5 estimated equilibrium exchange rate models. Std. Dev. stands for standard deviation. “*a*” indicates significance at the 1% level.

Overall, our different analyses put forward several insightful results regarding the implementation of the West African monetary union project. The bottom line is that of the *ECO*, in a first phase, as a *common* currency and not a single currency. Given the heterogeneity between the economies, two distinct “*ECOs*” are indeed desirable; one for each of the above-identified groups of countries. More specifically, for each group, the national currencies would be pegged to the *ECO* with a certain degree of flexibility —e.g., fluctuation bands— and the possibility to adjust the parities. In turn, the *ECO* would consist of a virtual course determined by the consistent basket of currencies. This first phase of the implementation of the ECOWAS monetary union presents additional advantages. As Table 6

indicates relatively far adjustment horizons, this first step could serve as a convergence period in both nominal and real terms. More importantly, on the one hand, by disposing of the two economic policy instruments —i.e., fiscal and monetary— and on the other hand, by focusing on national objectives, the authorities would be more likely to give impetus for the urgent structural changes.³⁶

5. Conclusion

This paper examines the economic desirability of the ECOWAS monetary union project by relying on a two-step methodology. The approach retained is based on the coordination of the candidate countries' sustainable exchange rate trajectories proxied here by the equilibrium exchange rate paths. The equilibrium exchange rate being defined as the value of the exchange rate allowing an economy to reach both its internal and external balances, our approach is thus articulated around the inclusion of national objectives from the perspective of regional integration.

Relying on a clustering method and a factor analysis, we identify two groups of countries in which economies appear homogeneous enough to share a common currency. The first group is composed of Benin, Burkina Faso, Cabo Verde, Côte d'Ivoire, Guinea-Bissau, Mali, Niger, Senegal, and Togo. The second set of countries is made of Gambia, Ghana, Guinea, and Nigeria. Sierra Leone can also be included in this second set of countries, even if it may be viewed as an outlier gravitating relatively close to this group. In contrast, Liberia is clearly found to be an outlier. While this heterogeneity within the region is presented as an obstacle by previous studies, we go further by investigating whether, despite their differences, the countries could actually share a similar sustainable exchange rate regime —i.e., the exchange rate regime underlying the sustainable exchange rate path. With regard to this second phase of the analysis, we show that neither a single currency peg nor a freely floating ERR would be preferable for any of the considered countries. Instead, our results indicate that a basket peg with some flexibility would be preferable. Therefore, our analysis helps evaluate the desirability of alternative monetary arrangements compared to the existing ones, and the results send a strong signal to the WAEMU countries that have decided to stick to their peg to the euro.

³⁶ Whether these two *ECO* zones would fuse in the future is too early to say. An evaluation —similar to the above exercises— should be made at the end of the —long— convergence period to assess whether this fusion is desirable or not. The latter would normally be obvious if things go well because the two *ECOs* would stabilize with the intensification of trade and capital flows.

Overall, our findings argue in favor of two distinct zones—in a first phase—as delimited by the cluster and factor analyses. Within each zone, countries should peg their national currency—with some flexibility (e.g., fluctuation bands, possibility to adjust)—to their *ECO*; the *ECO* itself should be determined by the consistent basket of currencies. However, this first step should last a sufficiently long period to ensure both nominal and real convergence.

Finally, from a policy viewpoint, it is worth recalling the key role that a real political determination will play in constructing this monetary union, particularly after the major shock that represented the Covid-19 pandemic—with potentially long-lasting scarring effects—and in a context of growing security threats in the Sahel band. The challenges are many, and the monetary union at the scale of the ECOWAS should obey the same calendar. As stressed by the factor analysis, real convergence should thus deserve particular attention. Obviously, business cycles' synchronization will not arise spontaneously by the sole effect of a monetary union. The relatively recent example of the euro area countries illustrates this point. As ECOWAS countries are characterized by both their strong dependence on commodities and low diversification of their exports, they are *(i)* highly vulnerable to sector-specific shocks and *(ii)* face asymmetric and asynchronous business cycles. A structural transformation toward more diversification of the ECOWAS' economies is thus needed. As Adu et al. (2019) pointed out, a way to achieve this goal is to transform raw materials and commodities efficiently into manufactured goods. Another crucial issue is the absence of political convergence among the various, independent ECOWAS countries that do not implement regional protocols and decisions. As indicated by the HAC analysis results, policies' coordination between the countries is possible, which could stimulate or trigger a kind of political convergence. The scope is important because it opens up a vast field of possibilities and makes it conceivable to reconcile the various national and regional objectives. In this regard, the ECOWAS should give an impetus by financing some of the objectives to boost intra-community relations (trade, finance), which would strengthen its role and would create a real sense of belonging with concrete elements. To pave the way for such political and popular convergence, the authorities should be encouraged to put in place a unified budget to promote financial transfers hampered by high government debts, and to establish a strong federal government.

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Appendices

A. Data

Table A.1 — Some indicators (average 2010-2018)

	ECOWAS	WAEMU	Non WAEMU
Manufacturing, value added (% GDP)	8.4	10.5	6.3
Foreign direct investment, net inflows (% GDP) ^a	4.4	3.3	5.9
Domestic credit provided by financial sector (% GDP) ^b	26.2	27.2	24.4
Lending interest rate (%) ^c	9.9	5.2	17.6
Inflation, consumer prices (annual %)	4.9	1.4	8.9
Revenue, excluding grants (% GDP) ^d	18.4	19.6	17.3
Tax revenue (% GDP) ^d	15.1	15.8	14.3
Population growth (annual %)	2.6	2.9	2.4
Age dependency ratio (% of working-age population)	86.0	91.1	80.2

Source: *World Development Indicators* (World Bank)

“a”: excluding Liberia (43%); “b”: excluding Cabo Verde (83%) and Liberia (850%); “c”: Missing data: Ghana, Guinea; “d”: Missing data: Côte d’Ivoire, Ghana, Mali, Togo.

Table A.2 — The variables

Variable	Source
Age dependency ratio (% of working-age population)	WDI
Consumer price index	WEO
Currency misalignments (%)	EQCHANGE
Current account balance (%GDP)	WEO
Domestic credit provided by financial sector (% GDP)	WDI
Equilibrium exchange rates	EQCHANGE
Exchange rate vis-à-vis the Special Drawing Rights	IFS
Fiscal balance	WEO
Foreign direct investment, net inflows (% GDP)	WDI
GDP growth	WDI
Inflation, consumer prices (annual %)	WDI
Lending interest rate (%)	WDI
Manufacturing, value added (% GDP)	WDI
Output gaps: cyclical component of GDP (HP filter); GDP are from the WEO database	
Population growth (annual %)	WDI
Public Debt (%GDP)	WEO
Reserves	WEO
Revenue, excluding grants (% GDP)	WDI
Tax revenue (% GDP)	WDI
Terms of trade	WDI
Trade flows (average imports and exports flows)	EQCHANGE
Value added (agriculture, industry and services; %GDP)	WDI

Notes: *EQCHANGE* (CEPII); *IFS*: *International Financial Statistics* (International Monetary Fund); *WEO*: *World Economic Outlook* (International Monetary Fund); *WDI*: *World Development Indicators* (World Bank).

Table A.3 – The anchor currencies' correlations

	USD	EUR	GBP	RMB	JPY	NGN
USD	1.000					
EUR	-0.852 (0.000)	1.000				
GBP	-0.434 (0.000)	0.354 (0.001)	1.000			
RMB	0.766 (0.000)	-0.685 (0.000)	-0.315 (0.005)	1.000		
JPY	0.007 (0.953)	-0.363 (0.001)	-0.522 (0.000)	-0.012 (0.915)	1.000	
NGN	0.225 (0.046)	-0.207 (0.067)	0.188 (0.098)	0.289 (0.009)	-0.205 (0.070)	1.000

Notes: Entries correspond to the correlation between the anchor currency changes over the 1999-2018 period. *p-values* are reported in parentheses.

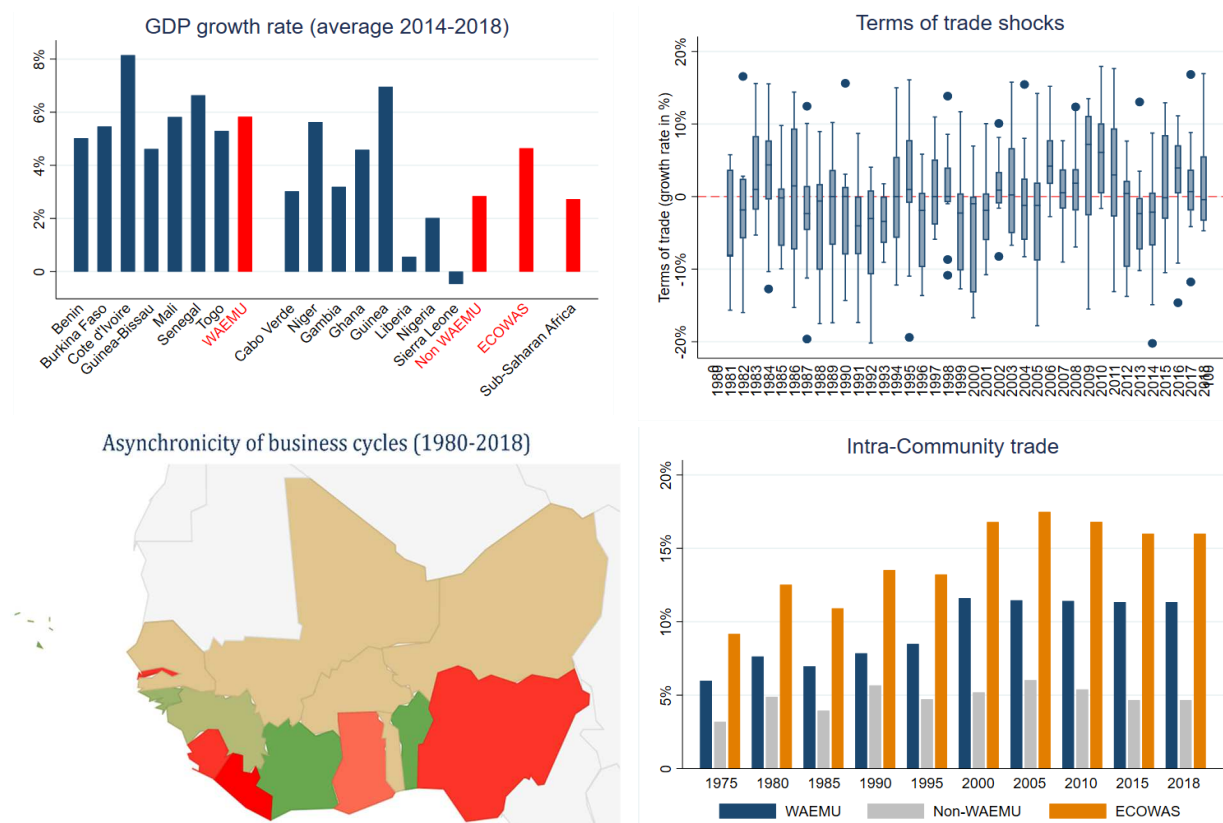


Figure A.1 — Favorable context despite structural headwinds

Notes: Data on GDP growth rates and terms of trade are from the *World Development Indicators* database (World Bank). The bottom left map is based on the results from a clustering method (Hierarchical Ascendant Classification) implemented by the authors. The input data are the output gaps derived by applying the Hodrick-Prescott filter to GDP (*World Economic Outlook*, IMF) over the 1980-2018 period. Statistics on intra-community trade flows are from the *EQCHANGE* database (CEPII).

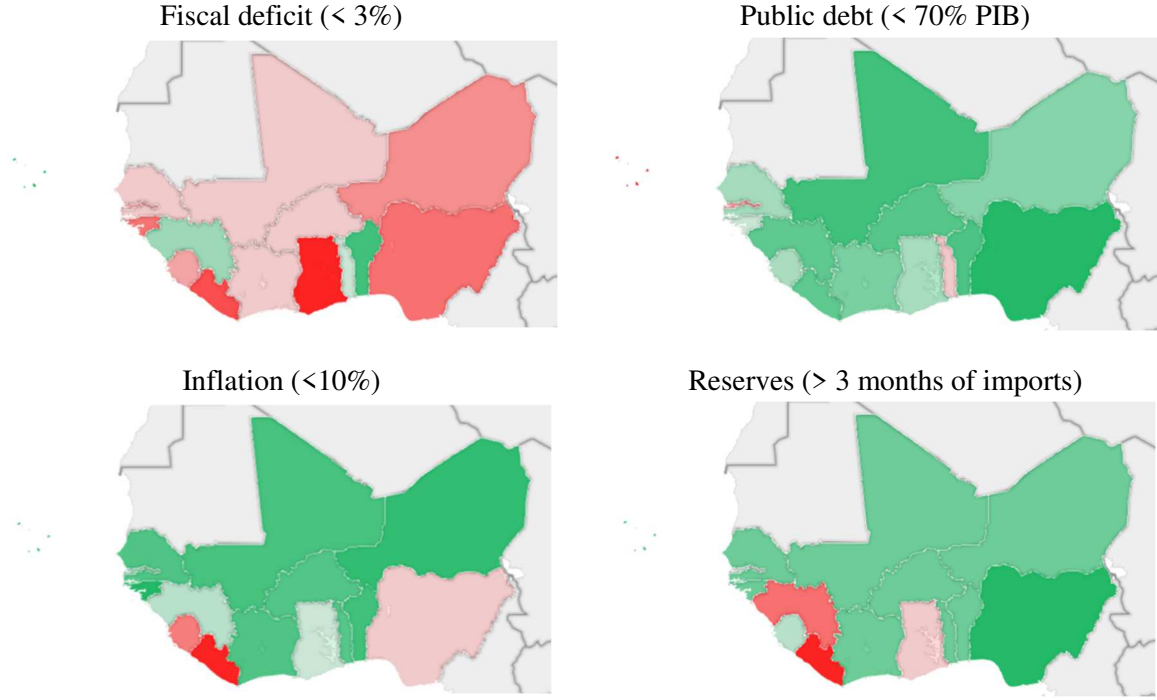


Figure A.2 — Convergence criteria in 2019

Notes: The color shades indicate the distance to the target. Shades of red indicate countries that do not satisfy the criteria; the more red is the country, the higher the distance to the target. Vice versa for countries in green.

B. Derivation of nominal equilibrium exchange rates (NER^*)

By definition, the real effective exchange rate of country i , $REER_{i,t}$, is calculated as the weighted average of country i 's real bilateral exchange rates against each of its N trading partners j :

$$REER_{i,t} = \prod_{j=1}^N RER_{ij,t}^{w_{ij,t}} \quad (\text{B.1})$$

where $RER_{ij,t} = NER_{ij,t} \times \frac{P_{i,t}}{P_{j,t}}$ is an index of the real bilateral exchange rate of the country i 's currency *vis-à-vis* the currency of the trading partner j in period t . $NER_{ij,t}$ is the index of the nominal bilateral exchange rate between the currency of country i and the currency of its trade partner j in period t (number of units of currency j per currency i), and $P_{i,t}$ (resp. $P_{j,t}$) stands for the price index of country i (resp. j). N denotes the number of trade partners, and $w_{ij,t}$ stands for country i 's trade-based weights for all its partners j . Note that an increase in $REER_{i,t}$ and $NER_{ij,t}$ denotes an appreciation of currency i .

The definition of the real effective exchange rate thus becomes:

$$REER_{i,t} = \prod_{j=1}^N NER_{ij,t}^{w_{ij,t}} \times \frac{P_{i,t}}{\prod_{j=1}^N (P_{j,t})^{w_{ij,t}}} = \prod_{j=1}^N NER_{ij,t}^{w_{ij,t}} \times \phi_{i,t} \quad (\text{B.2})$$

with $\Phi_{i,t} = \frac{P_{i,t}}{\prod_{j=1}^N (P_{j,t})^{w_{ij,t}}}$

Given the observed domestic and foreign price indexes and the trade-based weights, the equilibrium real effective exchange rate ($REER_{i,t}^*$) can be written in terms of the equilibrium nominal bilateral exchange rate ($NER_{i,t}^*$):

$$REER_{i,t}^* = \prod_{j=1}^N (NER_{ij,t}^*)^{w_{ij,t}} \times \phi_{i,t} \quad (\text{B.3})$$

where $\prod_{j=1}^N (NER_{ij,t}^*)^{w_{ij,t}} = NEER_{i,t}^*$ is the equilibrium nominal effective exchange rate.

We express the equilibrium bilateral nominal exchange rate (NER_t^*) of each currency relative to a numeraire currency. To this end, we use the no-arbitrage property on the foreign exchange market that makes all the cross rates consistent, namely: $NER_{ij,t} = \frac{NER_{i,t}}{NER_{j,t}}$ where

$NER_{i,t}$ denotes the exchange rate of country i against the numeraire. We choose the Special Drawing Rights (SDR) as the numeraire, as in Housklova and Osbat (2009) for instance. Frankel and Wei (2008) advocated for this choice of numeraire because monetary authorities generally do not monitor their exchange rate towards a single currency, but have rather to focus on several key currencies. Furthermore, the use of the SDR allows us (i) to define the value of each currency independently of the others, and, in turn, (ii) to derive an equilibrium exchange rate path specific to each country. Recalling that the equilibrium exchange rate of country i is independent from country j 's equilibrium exchange rate level, Equation (B.3) can thus be rewritten as follows:

$$REER_{i,t}^* = \prod_{j=1}^N \left(S_{iSDR,t}^* \times \frac{1}{S_{jSDR,t}} \right)^{w_{ij,t}} \times \phi_{i,t} \quad (\text{B.4})$$

where $S_{iSDR,t}^*$ is the equilibrium nominal exchange rate of the currency of country i vis-à-vis the SDR and $S_{jSDR,t}$ denotes the nominal exchange rate of the currency of country j vis-à-vis the SDR.

Equation (B.4) can be rewritten as:

$$REER_{i,t}^* = S_{iSDR,t}^* \times \frac{1}{\prod_{j=1}^N S_{jSDR,t}^{w_{ij,t}}} \times \phi_{i,t} = S_{iSDR,t}^* \times \frac{1}{\Omega_{i,t}} \times \phi_{i,t} \quad (\text{B.5})$$

where $\Omega_{i,t} = \prod_{j=1}^N S_{jSDR,t}^{w_{ij,t}}$ corresponds to the weighted average of the nominal exchange rate of the N trade partners vis-à-vis the SDR.

The equilibrium value of the currency of country i vis-à-vis the SDR that minimizes currency misalignments (i.e., that equalizes $REER_{i,t}$ and $REER_{i,t}^*$) is then given by:

$$S_{iSDR,t}^* = REER_{i,t}^* \times \frac{\Omega_{i,t}}{\phi_{i,t}} \quad (\text{B.6})$$

The time series of this equilibrium bilateral exchange rate allows us determining the paths of equilibrium parities $S_{iSDR,t}^*$ against the numeraire.

C. Factor analysis: data

Table C.1 — The data

Country (ISO)	Mis	Fiscal_bal	CA	Inflation	GDPG	Agriculture	Industry	Services	ToT_vol
Benin (BEN)	9.7	-2.4	-5.2	1.4	4.3	26.6	16.7	47.8	5.9
Burkina Faso (BFA)	-13.1	-3.5	-5.0	1.3	5.7	22.8	25.0	42.6	14.4
Côte d'Ivoire (CIV)	-23.0	-2.2	1.0	1.5	5.9	21.1	23.0	53.0	9.9
Cabo Verde (CPV)	5.6	-6.5	-9.3	1.2	2.1	7.8	18.1	61.2	4.4
Ghana (GHA)	-30.6	-6.6	-7.0	12.8	6.6	22.4	27.9	43.3	7.2
Guinea (GIN)	-42.5	-3.5	-10.7	11.3	5.4	17.7	29.5	42.9	5.4
Gambia (GMB)	-36.0	-4.3	-5.1	5.9	2.9	25.5	14.0	53.2	2.6
Guinea-Bissau (GNB)	6.6	-2.0	-2.9	1.3	4.1	45.6	13.1	38.1	9.2
Liberia (LBR)	-136.5	-3.4	-26.8	10.0	3.9	40.5	10.9	47.7	11.5
Mali (MLI)	-31.9	-2.9	-5.8	1.4	4.4	36.2	19.8	35.8	13.4
Niger (NER)	-11.1	-3.4	-13.5	1.3	5.7	34.9	21.5	37.8	14.5
Nigeria (NGA)	-14.7	-3.0	2.0	11.9	4.2	21.9	23.9	53.3	39.2
Senegal (SEN)	-17.7	-3.8	-6.5	0.6	4.8	14.4	23.1	52.7	5.1
Sierra Leone (SLE)	-6.3	-5.0	-21.5	9.0	4.8	54.9	9.4	32.8	9.7
Togo (TGO)	-13.6	-5.0	-7.6	1.7	5.7	29.1	16.3	36.3	5.9

Notes: . “Agriculture” = agriculture value added (%GDP); “CA” = current account balance (%GDP); “Fiscal_bal” =fiscal balance (%GDP); “GDPG”= real GDP growth; “Industry” = industry valued added (%GDP); “Inflation”=CPI-based inflation; “Mis” = currency misalignments (%); “Services”= services value added (%GDP); “ToT_vol” = Terms of trade volatility.