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Pegging the future West African single currency in regard to internal/external competitiveness: a counterfactual analysis[♣]

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Abstract

This paper compares different nominal anchors in the case of a fixed exchange rate regime for the future single regional currency of the Economic Community of the West African States (ECOWAS). We study the anchor choice when the countries focus the exchange rate policy to promote internal and external competitiveness. We consider four foreign anchor currencies: the us dollar, the euro, the yen and the yuan. Using a counterfactual analysis, we find little support for a dominant peg in the ECOWAS zone. In attempting to select an anchor currency, as regards internal and external competitiveness, several aspects need to be taken into consideration: the variability of the commodity prices, adverse downward trend movements, the stability of export revenues and the invoicing currency. A discriminating element is the direction toward which the anchor currency moves, while the world price of commodities evolves in the opposite direction. Our simulations show that the countries would not agree on the same anchor if they pursue several goals: maximizing the export revenues, minimizing their variability, stabilizing them and minimizing the real exchange rate misalignments from its fundamental value.

JEL Classification: F31, O11, O55.

Keywords: West Africa, peg, counterfactual analysis, commodity prices

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1.- Introduction

There is today a renewed interest in the formation of monetary unions in Africa. Several common currencies are planned for the future years, in the Economic community of West African States (ECOWAS), in the East African Community (EAC), in the Common Market for Eastern and Southern Africa (COMESA). Even, a single currency is envisaged at the level of the African continent.

This paper focus on the case of ECOWAS, where preparation towards a single regional currency seems to be more advanced in comparison with the other regions. Though the ECOWAS comprises countries with fixed and flexible exchange rates (see Table A.1 in appendix), a monetary area is already in place since nearly 60 years (the CFA zone). Moreover, the preparation of a new regional currency is relatively advanced in the West African Monetary Zone (WAMZ) where a single currency is going to be born during the transition to the ECOWAS single currency[1].

Not surprisingly, an abundant literature has studied the challenges of a single currency in the ECOWAS zone, by examining several issues:

-the benefits of a single currency as regards the optimum currency area criteria (see, among others, Bangaké (2008), Dupasquier et al. (2005)), trade and financial market integration (Gbetnkom (2006), Goretti and Weisfeld (2008), Masson (2008), Sy (2008);

-the regional or idiosyncratic nature of shocks facing the countries (Bénassy-Quéré and Coupet (2005), Tsangarides and Qureshi (2008), Xiaodan and Yoonbai (2009), Dufrenot (2009a);

-the coordination of macroeconomic policies as regards the possibility of bail-out and free-riding behaviours (Debrun et al. (2005), Masson and Patillo (2001, 2002) and nominal convergence (Alagidede et al. (2008), Dufrenot (2009b)).

From these studies, a consensus seems to be that the venture should be put on a hold, because of the heterogeneity of the countries' sensibility to shocks, the many obstacles to regional integration, the failure to build common policy institutions making their influence on the countries' commitment and the fact that the ECOWAS countries should allow for stepped-up efforts to make the funds available to the regional institutions (conversely to Europe, there are no equivalent of the "structural funds").

[1]The CFA zone was born in the fifties and is a monetary area in West Africa with a partially convertible currency, the CFA Franc. The convertibility, vis-à-vis the Euro, is guaranteed by the French Treasury. The CFA zone overlaps with the WAEMU area (West African Economic and Monetary Union) that comprises mostly French speaking countries which were former colonies of France (except Guinea-Bissau): Benin, Burkina Faso, Côte d'Ivoire, Guinea-Bissau, Mali, Niger, Senegal and Togo. The West African Monetary zone (WAMZ) is expected to be created in 2014 and would comprise Ghana, the Gambia, Guinea, Sierra-Leone, and Nigeria. Today, these countries have their own domestic currencies which are inconvertible. In 2014 they countries will abandon their domestic currencies and use a single currency within the WAMZ (the West African Currency Unit, WACU). After that, in 2020, the two zones (CFA and WAMZ) will merge and all the countries will use the future single currency, the ECO.

Notwithstanding the "cautious" views that emerge from the academic works, the project of building a single currency for the ECOWAS countries is receiving a widespread support by the governments and the heads of states in member countries. Their debate touches on the benefits of the precursor CFA zone whose birth resulted from a political decision (between France and its former colonies) nearly 60 years ago, though the economic requirements needed for a monetary area were not satisfied. The CFA zone country benefited from low inflation rates, more fiscal discipline than the non-CFA countries, a more stable economic and financial environment (see Gulde and Tsangarides (2008), Dufrénot and Sakho (2008), Masson and Patillo (2004)). Accordingly, the politicians' leitmotiv is "let us go ahead". As a consequence, this has re-energized a new direction of research during the recent years with a focus on the problems the countries will face once the single currency is in place (the approach is now prospective).

Among the new questions, the choice of the exchange rate regime is at the forefront of the discussions though the academic work at still in a burgeoning step and rare. Some authors are concerned with the trade-off between floating and fixed exchange rate. For instance, Batte et al. (2008) study such a trade-off by simulating a two-country Dutch disease model in a dynamic stochastic general equilibrium framework. They examine how the terms of trade would spread across the zone and conclude that the countries may disagree about the optimal exchange rate regime. However, as pointed out by Gulde (2008), the West African policymakers have a "fear of floating". This stems from the fact that central bankers are aware of the need for credibility in order to overcome the market pressures, attract foreign investors, avoid the negative impact of the commodity price volatility on the economy, fond an anchor the expectations of inflation. Most of all, they lack the monetary and financial infrastructure to manage a flexible rate system. Against this background, many advocate for a fixed exchange rate[2].

Fixed exchange rates regimes can be defined under different systems: managed float (as is the case of Ghana and Nigeria today with the US dollar as the benchmark currency), currency board (as is the case of the CFA zone countries though the central bank does not officially declare it as its exchange rate system), and dollarization. As regards the current debate, this paper assumes that policy-makers in the ECOWAS countries will have a preference toward an exchange rate peg – an anchor to an internationally traded currency - and that their choice will consist in examining which external peg would be the best (we do not consider the case of a peg to a basket of currencies[3]; neither do we study the case of crawl pegs).

There are many ways of examining this question that are not examined here. Indeed, we could study whether the ECOWAS countries form an optimum currency area with the countries to which they would peg their currency, or look at other determinants of anchor choices (such as the share of trade with the anchor country, the proportion of the countries' external debt denominated in the anchor currency, the synchronicity of business cycles with

[2] However, the dilemma between fixed and floating exchange rate regimes in the ECOWAS zone is still an open debate. For the pro arguments in favor of floating regimes, see Michailof (2007), Diboglu and Sissoko (2006).

[3] A peg to a single currency may be preferred to an anchor to a basket of currency because of its greater transparency.

the anchor country, portfolio motives, the need for low inflation rates, etc). However, the main focus of the paper is on competitiveness, neglecting other aspects that may be relevant for the choice of a currency peg.

We want to study the anchor choice when the countries focus the exchange rate policy to promote internal and external competitiveness. We consider four foreign currencies: the us dollar, the euro, the yen and the yuan. Following Frankel and Saiki (2002), we consider an external anchor through a rigid peg to these currencies[4]. This assumption implies that, under a peg, we would observe a convergence of the inflation rates between the African countries and the foreign countries whose currency serves as the anchor. Another implication is that the African countries would have scarce ability to run an independent monetary policy (as is the case today of the CFA Franc zone countries vis-à-vis France's monetary policy). The reason for considering the euro and the US dollar as possible anchor currencies is straightforward. We also consider the yuan since China now occupies the bulk of the exports of some ECOWAS countries. Moreover, since the last 10 years, the ECOWAS countries have been trading more with the emerging countries in East Asia. Up until now, many of these countries have retained the dollar as their invoice currency. However, due to their increasing regional integration with Japan and the current dollar turmoil, they may decide in the future to use the yen as an invoice currency.

As to the methodology, the paper builds on a counterfactual analysis. Our goal is to see what would have happened, had the countries been pegged to international currencies. We do not attempt to build and calibrate a realistic full macro or micro-founded models. We simply explore "toy" models that can help isolate some salient features that may influence the choice of the future peg as regards internal and external competitiveness. Both these objectives are important for the ECOWAS countries because they are small exporting commodity countries. Their heavy dependence on export revenues affects the other macroeconomic indicators: fiscal positions, debt ratios, real incomes, etc. That is why, central to our analysis is the role played by the real prices of exported commodities. The latter influences the profitability of exports and the degree of misalignments of the real exchange rates.

One conclusion that emerges from this paper is that little support can be found for a dominant peg in the ECOWAS zone. In attempting to select an anchor currency, as regards internal and external competitiveness, several aspects need to be taken into consideration: the variability of the commodity prices, adverse downward trend movements and the stability of export revenues. A discriminating element is the direction toward which the anchor currency moves, while the world price of commodities evolves in the opposite direction. Our simulations show that the countries would not agree on the same anchor if they pursue three goals: maximizing the export revenues, minimizing their variability and stabilizing them. A similar contradiction between the countries is found when the objective is external competitiveness, in particular when they search to minimize the misalignments of the real exchange rate from its fundamental value. What is at play here is the contradictory evolutions

[4] The authors study the comparative advantages of pegging a domestic currency to an international currency and to the price of commodities in commodity exporting countries. They sample include the ECOWAS countries, but they mainly discuss the advantages of a commodity currency, which is out of the scope of this paper.

of the anchor currency and the currency in which the countries invoice their export prices. The main ECOWAS trading partners differ somewhat across countries, so that some invoice their price in euro while others do so in dollar, thereby implying different degrees of misalignments.

The rest of the paper is organized as follows. Section 2 briefly reviews some stylized facts concerning the ECOWAS countries' dependence on commodity exports. Section 3 discusses the implications on the internal competitiveness under alternative pegs. Section 4 deals with external competitiveness by studying the misalignments of the real exchange rates if the countries had been pegged respectively to the dollar, the euro, the yen and the yuan. Finally, section 5 concludes.

2.- Some stylized facts on the ECOWAS countries' dependence on commodity exports

Usually, the African countries' dependence on a few commodities for the bulk of their export earnings presents serious challenges in terms of internal and external competitiveness. The controversies over the former concern the impact of price changes, their variability and resistance to shocks on the profitability of exports. The latter is taken as a proxy of internal competitiveness because lower export incomes yield a decrease in the activities of the export sector and a shift of resources to the sectors of non-traded goods. Conversely, higher export revenues imply a reduction in the resources allocated to the non-traded good sector.

Table 1 shows the export shares of the ECOWAS countries' main commodities during the period from 1999 to 2008. It is seen that for a majority of them the share exceed 50% and even the ratio is above 75% in some countries (for instance Guinea, Guinea-Bissau, Mali, Nigeria, Sierra-Leone) which reflects an overwhelming dependence on export revenues from the exported commodities. To explain why such a commodity-dependence enhances important questions regarding the exchange rate peg regime, we take some illustrations of events that happened during the last decade.

The prices of the commodities exported by the ECOWAS countries increased sharply since 2002 in comparison with their previous levels. Even, the substantial rises in the commodity prices were exacerbated by the depreciation of the dollar against the other international currencies. For instance, between 2006 and 2007, the depreciation was 27% against the euro. However, the substantial price increases did not fully reflected in the export revenues of those countries whose currencies were pegged to currencies that appreciated against the dollar. This was the case for the WAEMU countries. UNCTAD(2008) evaluates that, when corrected by the variations of the exchange rate, the prices increases in the countries not pegged to the dollar was half of the others. Between May 2007 and May 2008 (a period of the highest price increases) the surge in food, mineral and other non-fuel commodity was of 41.9% in dollar prices, but only of 23.3% in euro. As a consequence, the export profitability was weakened in some countries. This was accentuated in the WAEMU region by the fact that the rise of oil prices, although limited by the peg to the euro, increased the cost of production of the exported commodities (higher transport costs, rise in the prices of the fertilizers and in the cost of exploitation of minerals).

As shown by figure A1, in appendix, while evolving on an upward trend since the beginning 2000's, the commodity prices have been also highly volatile. A rise in the volatility of commodity prices implies an instability and unpredictability of export earnings, thereby implying both an uncertainty on the investment and a rise in the cost of financing. Ample fluctuations in the commodity price are not a recent phenomenon, but the measures undertaken so far to stabilize the export revenues have been more or less successful (compensatory financing schemes, stabilization mechanisms, risk, management instruments, etc).

Table 1. Main exporting commodities and their shares in West Africa

Member countries	Main exporting commodities and shares
Benin	Cotton 62.4%
Burkina Faso	Cotton 65.7%
Cape Verde	Oils petroleum 40.8% Cargo containers 12.1%
Côte d'Ivoire	Cacao 23.2% Oils petroleum 21.8%
Gambia, The	Ground-nuts 30.6%
Ghana	Gold 30.3% Cacao 28.4%
Guinea	Aluminum 69.6% Gold 20.2%
Guinea-Bissau	Vegetables 51.6% Fish 28.3%
Mali	Gold 64.9% Cotton 23.8%
Niger	Uranium 47.2%
Nigeria	Oils petroleum 97.2%
Senegal	Oils petroleum 18.7% Phosphate 11%
Sierra Leone	Coffee 86.5%
Togo	Portland cement 15% Phosphate 13.6% Cotton 10.3%

Source: UN Comtrade database. The exporting commodity shares are averaged index during the period of 1999-2006. We refer to only the shares more than 10%.

Since the beginning 2000's, new suggestions have emerged concerning the role that monetary and exchange rate policies could play in helping the countries to cope with the negative effects of commodity price volatility on the exports earnings. In a series of papers, Frankel (2003, 2005) argues that small countries which are dependent on commodity exports should peg their currency to an export price index. Such a proposition has not receive as much enthusiasm as it should have, but even if one does not share Frankel's view, it is usually agreed that countries with pegged currencies face less volatile commodity prices than those with a flexible exchange rate. Such a conclusion holds for the ECOWAS countries, as shown by Cashin et al. (2002).

The authors compare the volatility of the real exchange rate of commodity currencies in the developing countries (countries for which there exists a level relationship between the real effective exchange rate and their commodity export prices) over the years 1980-2002. Though the authors conclude that, on average, the exchange rate regime does not matter, Table 2, which contains their results for some ECOWAS countries, shows that the exchange rate volatility is more than the double in a country with a managed float like Ghana compared with others with a pegged currency (like Côte d'Ivoire, Mali, Niger or Togo).

Moreover, the ratio of volatility (volatility of the nominal exchange rate deflated by the volatility of the relative price) indicates that the observed differences in volatilities come from the variations of the nominal exchange rate. So, pegging one's currency seems to have been a better choice to attenuate the commodity price volatility. In this paper, we go a step further by examining which foreign currency would have been the best external anchor yielding the lowest variability in the export revenues.

Table 2. Volatility of the real exchange rates of some ECOWAS countries 1980-2002 - (Source Cashin et al. (2003))

Countries	Exchange rate regime	Volatility of real effective exchange rate	Volatility of nominal effective exchange rate	Volatility of relative price levels	Ratio of volatility
Côte d'Ivoire	peg	0,043	0,044	0,014	3,1
Ghana	freely floating	0,114	0,122	0,026	4,7
Mali	peg	0,044	0,042	0,027	1,6
Niger	peg	0,051	0,043	0,025	1,7
Togo	peg	0,047	0,043	0,018	2,4

Another important issue for the ECOWAS countries concerns the impact of the commodity price on their real exchange rate and external competitiveness (as reflected by the misalignment of the real exchange rate in regard to its fundamental level). In a recent paper, Coudert et al. (2008) argue that peg regimes influence the degree of misalignments of the real exchange rates in countries that are commodity-dependent. For instance, they show that over the years 1980-2007, countries pegged to the euro faced an overvaluation of their currencies while those pegged to the dollar (or with a floating exchange rate) experienced an undervaluation. They conduct a panel data-based analysis and their sample includes only 5 ECOWAS countries (among which 4 from WAEMU). From their study, one would expect the WAEMU countries' external competitiveness to have deteriorated over the recent years, while conversely, the other ECOWAS members in particular Ghana and Nigeria would have benefited from the depreciation of the dollar. However, the studies based on time series do not corroborate this intuition for the individual countries. Abdih and Tsangarides (2008) show that, since the beginning 2000's, real exchange rate misalignments have been very small in the WAEMU countries (they find no statistically significant difference with the estimated

equilibrium level) though their regressions include the fluctuations in the terms of trade as one key determinant of the real exchange rate. Aliyu (2009) and Iossifov and Loukoianova (2007) conduct a similar study respectively on Nigeria and Ghana. The authors show that the real world prices of these countries are important determinants of the real exchange rate. However, their conclusions in terms of misalignments of the exchange rate since the 2000's are mixed: the currencies alternate between under- and overvaluation.

So to speak, it is still difficult to say which exchange rate regime is better to minimize the misalignment of the real exchange rate in the ECOWAS countries. However, the results obtained previously in the literature can be criticized on the point that they use a theoretical framework that does not suit the situation of the commodity-dependent countries. In particular, it is not straightforward that variables such as the Balassa-Samuelson effects, the interest rate differences or capital inflows are good explanatory variables for the ECOWAS countries that still have non-matured financial system, capital control and weak industrial bases. As a consequence, we propose re-examining the question of the implication of the peg regimes on the real exchange rate of these countries by using a theoretical framework more suitable for the ECOWAS countries (a dependent economy model for small commodity exporting countries).

3.- Which peg would have been the best for internal competitiveness?

This section evaluates competing pegs according to their ability to lead the highest and more stable export profitability or internal competitiveness. The counterfactual experiment consists in examining what would have been the dynamics of the real commodity prices if the ECOWAS countries had peg to the dollar, the yen, the yuan, the euro. We also consider the case of a peg to the price of the commodities, as suggested for instance by Frankel. The simulated paths are compared with the exchange rate policy the countries actually followed. We concentrate on the evolution of the real commodities themselves without examining the impact for the performance of debt ratio, exports, growth, etc. Our main interest is to see whether the countries have an incentive to move to the production of exported commodities from other activities, or in the opposite direction. Further, we want to see whether pegging to a foreign currency would have stabilized the real price of the commodities.

3.1.- A definition of internal competitiveness

Internal competitiveness can be apprehended in several manners. A wisdom definition for the small dependent countries, as reflected by the Salter-Swan approach, is the ratio of the relative prices of the traded-good to non-traded goods. This reflects how the same goods (some being produced locally, while others are imported) compete in the domestic markets. Such a definition is used to account for the impact of productivity shocks stemming from the sector of tradable on the prices of the nontradable. This approach is appropriate, if there is indeed a competition on the domestic markets between imports and locally produced goods,

which is not necessarily the case in the ECOWAS countries (imports and non-traded goods and services have different usages)[5].

Another wisdom definition of internal competitiveness, for the countries that are exporters of commodity goods and for which the export sector accounts for an important share of GDP, is the relative profitability of non-tradable and export production. It indicates whether domestic producers have an incentive to shift resources from one sector to another.

Consider a small open country with an economy categorized as producing a domestic non-traded good and an exportable good (primary commodity such as agricultural or mineral product). The production of both the exported and domestic goods is obtained with labor as the only factor and the production functions are:

$$y_X = \alpha_X L_X \quad \text{and} \quad y_N = \alpha_N L_N \quad , \tag{1}$$

where y_X is the output of the exported good, y_N is output of the non-traded good, L_X and L_N are the amounts of labor employed in the sectors of exported and non-traded good, α_X and α_N capture labor productivity in the respective sectors.

It is assumed that labour is freely mobile across both sectors and that there is perfect competition in the non-traded good sector. Noting p_y the GDP deflator and Y the volume aggregate output, the aggregate production in the economy is given by:

$$p_y Y = P_N Y_N + EP_X Y_X \ . \tag{2}$$

Dividing by Y and denoting the share of exports to GDP S_X yields:

$$p_y = P_N Y_N / Y + EP_X Y_X / Y \quad ,$$

$$P_N = (p_y - S_X EP_X) / (1 - S_X) \ , \tag{3}$$

where P_X and P_N are the prices of the exported and of non-traded commodities. P_X is assumed to be exogenous. E is the nominal exchange rate, defined as the amount of local currency per foreign currency.

From the demand side, the economy is composed of a continuum of consumers that supply labor inelastically and consume the non-traded good and an imported good. The consumer price index (CPI) is a weighted average of both goods and is written as

$$P = E^{1-\gamma} P_N^{\gamma} P_M^{1-\gamma} , \tag{4}$$

where P_M is the price of the imported good supposed to be exogenous. We assume a perfect index.

Dividing both sides of (3) by P yields

[5] Using panel data techniques, Drine and Rault (2003) find that the Balassa-Samuelson effect is strongly rejected for many West African countries.

$$\frac{P_N}{P} = \frac{(p_y/P - S_X EP_X/P)}{(1 - S_X)} \quad . \tag{5}$$

Assuming that the wages are indexed to the CPI, equation (5) says that the margin rate in the non-traded good sector (as measured by the ratio of the unit price to unit labor cost) varies inversely with the margin rate in the export sector (as measured by the ratio of export prices in domestic currency to unit labor cost).

From a domestic producer, there is a trade-off between producing in the non-traded good sector and producing in the export sector. A decrease in the nominal export price diminishes the profitability of the activity in this sector but raises the unit margin rate in the non-traded good sector. Against this background, an increase in the real price of the exports is synonymous of higher internal competitiveness for the exported goods, while a decrease means lower internal competitiveness.

3.2.- Data

We construct a new monthly dataset of country-specific nominal and real export price over the period from 1999 to 2008. The nominal export price indices are weighted averages of world commodity prices in dollar using the ECOWAS countries' export shares as weights. The prices are then converted in local currency, the bilateral exchange rate being the parity of the anchor currency vis-à-vis the dollar. We make the assumption that a peg is strong enough and permanent to achieve convergence of inflation rates and therefore deflate the nominal commodity price by the consumer price index of the country which serves as the anchor[6].

For lack of data, Liberia is excluded from our sample. The frequency of the data is monthly. We begin in 1999 because this corresponds to the year of adoption of the euro and because we do not want our data to be "contaminated" by the effects of the 1994 devaluation of the CFA Franc in the WAEMU countries. The monthly real commodity prices are formed as set out below.

For each country, we select the three main commodities exported, as reflected by their share in total exports. The latter are taken from UN COMTRADE data provided by the UN statistical department. Then, we calculate for each commodity, their share in the total exports of the three main commodities. This gives us weights that are used to construct a monthly index of commodity export price. This index is thus defined as a geometric weighted average of the nominal prices of the three main commodities exported by a country. The dollar-based nominal prices of the commodities are taken from the IMF's IFS database and AFRISTAT data.

To define the real prices, we also consider the consumer price indices of both the ECOWAS countries and the countries whose currency serves as an external anchor (China,

[6]The assumption of convergence of inflation rates is not strong given the current situation of some countries within the ECOWAS area, the CFA zone countries, that have pegged their currency to the euro and which have inflation rates that evolve in phase with the inflation rate of the euro zone.

Euro zone, Japan, the United States). Similarly, to express the prices in local currency we choose both the bilateral exchange rates of the ECOWAS and industrialized countries vis-à-vis the dollar (see the next section).

The countries included in the sample are the ECOWAS countries, except Liberia: Benin, Burkina Faso, Cape Verde, Côte d'Ivoire, the Gambia, Ghana, Guinea, Guinea-Bissau, Mali, Niger, Nigeria, Senegal, Sierra Leone and Togo.

3.3.- Construction of the simulated paths

The path of the real commodity prices are constructed according to alternative peg configurations. We follow Frankel and Saiki (2002)' s methodology. The currency regimes are defined as follows:

1/ Actual exchange rate regime: $RP_x = E^{lc} P_x / P^{lc}$,

2/ Dollar peg: $RP_x = (P_x / P^{US})\, C_{US}$,

3/ Yen peg: $RP_x = (E^J P_x / P^J)\, C_J$,

4/ Euro peg: $RP_x = (E^{eur} P_x / P^{eur})\, C_{eur}$,

5/ Yuan peg: $RP_x = (E^{chn} P_x / P^{chn})\, C_{chn}$,

6/ Commodity peg: $RP_x = C_x$.

P_x is the us-based index of the nominal commodity price, P^K and E^K are the consumer price index of the country K and country K's bilateral exchange rate vis-à-vis the dollar (K=domestic country, the USA, Japan, the euro zone, China). C_K (*K=US, J, eur, chn, x*) are constants calculated so as to express all the real prices in the same base and allow comparisons. More specifically, the constants are calculated so as to make the logarithm of the commodity over period the 1999-2008 equal under a given regime to what it was in actual history. We compute the logarithmic deviations between the real prices under a given peg and the real price under actual history.

3.4.- An anchor for three goals : maximization and stabilization of the export revenues and minimization of their variability

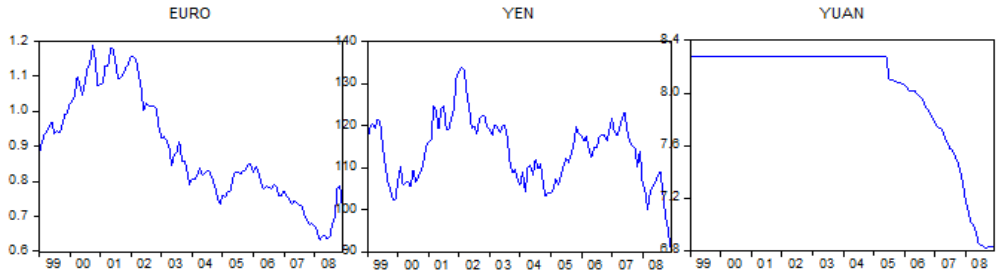
Figure 1 plots the evolution over time of the nominal exchange rates of the yen, the yuan Renminbi and the euro against the dollar. Up until the mid 2005 the yuan renmibi remain stable and then appreciated being on a stable uptrend from July 2005 to the end 2008. The euro depreciated from its launch in January 1999 to the beginning 2002's and then appreciated steadily from 2002 onwards. The parity of the yen was slightly more cyclical with periods of rises and falls that alternated over the years.

Figure A.2 in appendix shows the simulated real commodity prices under alternative currency pegs (in deviation from actual history). For a majority of countries, we distinguish two distinct periods corresponding to the years from 1999 to 2002 and from 2003 to 2008.

They correspond respectively to downward and upward trends in the world price of the main commodities exported by the countries.

During the years of declining prices (1999 to 2002), the highest real prices are obtained when they are expressed in terms of the euro or in terms of the commodity prices themselves. This means that if all the countries had been pegged to the euro, their export revenues would have been higher compared to the real prices that they actually faced. This was indeed the case for the CFA zone countries which compensated the declining commodity prices in the world markets by a depreciating CFA franc (pegged to the euro) against the dollar. The line representing the real commodity price under a peg to the euro (in comparison to the historical prices) is thus around zero for the WAEMU countries. A similar conclusion holds for Cape Verde. During the period of the late 1990s to the beginning 2000s, Ghana and Nigeria floating exchange rates and their exchange rate regimes yielded a better situation than they would have faced if they would have been tied to an international foreign currency other than the euro (the curves representing the simulated path for the yen, the yuan and the dollar are under the zero lines). Whatever the degree of flexibility of their exchange rates, the Gambia, Sierra Leone and Guinea gave more weight to the dollar and this is shown by the curve corresponding to the dollar peg fluctuating around zero.

Figure 1. Nominal exchange rates per US dollar (1999-2008)



1999-2002: period of decreasing world commodity prices

However, for all the countries, pegging directly their currency to the price of their main exported commodities would have been a better choice than a peg to a foreign currency, even if the latter was depreciating when the real commodity prices in dollar were declining in the world markets. The question of commodity-based exchange rates was a hotly debated issue in the beginning 2000s as an appropriate medium-term nominal anchor in the developing countries specialized in the production of minerals or agricultural goods. The idea was popularized in several papers by Frankel (see the references above). Such a policy would have had several advantages for the ECOWAS countries.

Firstly, a peg to the commodity prices would have enhanced their internal competitiveness and boosted their exports over their actual levels (supply responses to higher export revenues) and this would have had positive effects on their external equilibrium thereafter (by lowering

their debt constraint). Indeed, the weak commodity prices, in dollar terms, paved the way to debt and balance of payment crises that appeared later during the 2000s.

An additional advantage of a commodity peg would have been the following. This nominal anchor would have avoided the pro-cyclical negative effects of export revenue fluctuations on debt crises. Indeed, the period of declining commodity prices was characterized by outflows of capital (especially in the non-CFA zone countries) which obliged the countries to borrow money in the international capital markets with increased risk premia. Beyond this period, when the prices began to re-increase, the foreign investors were not back immediately in the domestic financial markets. So, even with higher export revenues the governments had to continue borrowing abroad. With a nominal anchor such as the commodity prices, capital flows would have been stable because exports revenues exert a smoothing effect on the financial cycle (the investors know that the countries borrow during bad times and reimburse once the commodity prices began to re-increase). What matters under a commodity peg are not the fluctuations of the prices but their medium-term levels.

2003 onwards: period of increasing world commodity prices

As expected, the highest real prices are obtained with a peg to the yen, which depreciated against the dollar, more than the other international currencies, during the years of surge of the commodity prices. For the CFA zone countries, pegging to the euro was their worst choice (putting aside the commodity peg). Indeed, this peg implied an appreciation of the CFA franc against the dollar and "reduced" the export income in local currency. Shifting the input resources to non-traded good sectors was more profitable and such a situation led the policymakers to question whether the euro peg was still appropriate for the WAEMU countries.

Minimizing real price fluctuations

It is noteworthy that a commodity peg would induce no variability at all. However, it is not desirable to have zero variability in the export prices. For instance, in times of rising debt service, the countries may search to boost the export revenues and thus to experience a sharp increase of the real prices. As a consequence, we shall not consider explicitly the case of commodity peg. Whether or not the prices are characterized by ample fluctuations around their mean value is important owing to the need of stabilizing export revenues to service debt obligations (especially in a context where countries face external borrowing constraints). Moreover, an increased variability of the real prices influences the supply of the commodity because it means a greater uncertainty for the producers. Finally, the large movements in commodity prices have bad consequences on real incomes and fiscal positions of the countries.

We consider two measures of price variability. We first compute the coefficient of variation (ratio of standard deviation over the mean over the whole period) and further consider the percentage of months outside 50% of mean. These are computed for both the nominal and real price commodities (Table 3). Under actual history, some of the variability of

the real commodity prices was due to the effect of the denomination of the commodity prices in dollars at a time of fluctuating exchange rates, especially in those countries with a completely floating exchange rate, like Ghana, Guinea and Nigeria. In the latter, the coefficient of variation is at least twice as high for the nominal prices as for the real prices (Ghana, Guinea, and Nigeria). For the CFA zone countries, the higher variability of the nominal prices owes to slow adjusting national price levels during the period under study. Since the CFA franc has been tied to the euro, the countries imported a portion of their inflation from the euro zone (their main trading partner) and the latter was not volatile. Moreover, in a majority of these countries, the prices of non-tradables remained stable over the period under examination. However, two exceptions are Benin and Burkina Faso, where the real price are more volatile than the nominal prices. The movements of domestic inflation in Nigeria affect the volatility of the CPI in Benin because of the importance of frontier trade. In Burkina Faso, the CPI is more volatile than in the other countries because of the high proportion of food commodity in the basket of non-traded goods (this country has been more severely affected by exogenous shocks, such as drought, than the others).

Table 3. The Variability of the real prices under a given peg

3.1. Standard Deviation / Average

	Type1 **Actual** History	Type2 Hypothetical **Dollar** peg	Type3 Hypothetical **Yen** peg	Type4 Hypothetical **Euro** peg	Type5 Hypothetical **Yuan** peg
Benin	0.19	0.15	0.16	0.18	0.14
Burkina Faso	0.21	0.14	0.15	0.19	0.14
Cape Verde	0.37	0.51	0.56	0.37	0.46
Côte d'Ivoire	0.19	0.33	0.39	0.21	0.29
Gambia, The	0.39	0.33	0.37	0.21	0.29
Ghana	0.22	0.28	0.34	0.16	0.24
Guinea	0.33	0.24	0.31	0.15	0.22
Guinea-Bissau	0.16	0.20	0.25	0.16	0.19
Mali	0.14	0.27	0.33	0.14	0.23
Niger	0.76	0.85	0.94	0.74	0.83
Nigeria	0.31	0.51	0.57	0.37	0.46
Senegal	0.44	0.62	0.67	0.46	0.53
Sierra Leone	0.27	0.25	0.30	0.21	0.23
Togo	0.39	0.58	0.61	0.42	0.48
ALL	---	0.36	0.42	0.22	0.31

To compare the cases for each country, the indexes like standard deviation divided by the average are used.

3.2. Percentage of months outside 0.5 of mean

	Type1 **Actual** History	Type2 Hypothetical **Dollar** peg	Type3 Hypothetical **Yen** peg	Type4 Hypothetical **Euro** peg	Type5 Hypothetical **Yuan** peg
Benin	0.8%	0.0%	0.0%	0.8%	0.0%
Burkina Faso	3.3%	0.0%	0.0%	1.7%	0.0%
Cape Verde	12.5%	20.8%	30.8%	11.7%	20.8%
Côte d'Ivoire	1.7%	9.2%	13.3%	3.3%	5.0%
Gambia, The	12.5%	9.2%	10.0%	4.2%	8.3%
Ghana	0.8%	8.3%	9.2%	0.8%	2.5%
Guinea	15.0%	2.5%	13.3%	0.8%	0.8%
Guinea-Bissau	0.8%	2.5%	5.0%	0.8%	3.3%
Mali	0.0%	6.7%	11.7%	0.0%	0.8%
Niger	46.7%	71.7%	72.5%	42.5%	70.0%
Nigeria	8.3%	22.5%	31.7%	14.2%	25.0%
Senegal	10.8%	13.3%	17.5%	10.8%	13.3%
Sierra Leone	3.3%	2.5%	5.8%	5.0%	3.3%
Togo	10.0%	10.0%	10.8%	10.0%	10.0%
ALL	---	10.0%	14.2%	5.0%	7.5%

Percentage of months in which the real price would have deviated more than 50 % from the mean.

Except in Benin and Burkina Faso, a peg to the euro would have been the best choice to minimize the variability of the prices in the ECOWAS countries. Indeed, the coefficient of variation reveals that there would have been less monthly variability in the real prices if the countries had been pegged to the euro compared with a situation where they had been pegged to other currencies. Similarly, there would have been substantially fewer months outside 50% of mean under a peg to the euro. A striking feature concerns the non-CFA zone countries, most of which followed flexible exchange rate regimes during the period under examination. It is seen, from Table 3, that they would have experienced more stable export revenues, in nominal terms, if they had adopted a peg regime. The reason is simply that during the fall of the prices of the exported commodities, their external balance deteriorates, thereby implying a collapse of the domestic currency; however, this translated in much higher local currency revenues in the subsequent years. This is remarkable in regard to the fact that, theoretically, a flexible exchange rate is recommended to help offsetting the effects of adverse price movements. The counterpart may be a higher volatility. For these countries, a peg to the euro would have been the best both in terms of maximizing the exports revenues and minimizing the volatility.

In the policy circles, there have been periodic proposals that non-CFA zone countries in ECOWAS adopt the CFA franc (such an idea has been recurrent in Guinea and Ghana). The

results from the above simulations could have been an argument in favour of such a choice. Meanwhile, Nigeria would have been confronted to a trade-off. We see, in Table 5, that the floating exchange rate regime (actual history) leads to a smother path as compared with any other peg regimes (lowest variability). So, for Nigeria pegging to a currency would have been better to maximize its export revenues (being tied to the euro being the best choice), but the floating regime was the best to avoid too much volatility in the real prices.

The case of Benin and Burkina Faso is appealing owing to the fact that their main exported commodity is cotton. A substantial variability of the price of this commodity in the international markets stems from variations in the demand for cotton by the main importers, among which China is a leader buyer. We see from the tables that Benin and Burkina Faso would have experienced a decrease in the variability of the real commodity prices, if their currency had been tied to that of China or in dollar (the yuan and the dollar have been intimately linked to each other)[7].

Stability of commodity prices under alternative pegs

An additional criterion that may help to judge whether a given anchor currency might have been suitable is the persistence of the nominal and real commodity prices. The idea is to examine the length of time it takes for any initial shocks (stemming from either the CPI, the nominal exchange rate against the dollar or the dollar price of the commodities) to dissipate or to revert to their means of a deterministic trend. This question is important, both in the case of negative shocks (price variations implying a decrease in the export revenues) and positive shocks (price rises inducing a higher income). Persistent negative shocks result in debt and balance of payment crises, as well as in a substantial decrease in the income. Persistent positive shocks translate into Dutch disease with a decline of the economic sectors other than the exported sector (most resources are shift away from the non-traded sectors to the latter).

It is known that shocks to world commodity prices (nominal) have a slow mean reversion taking at least three years to dissipate. Indeed, they are described by cycles with a long duration (see, among others, Cashin et al. (2002)). The important point is that they are mean-reverting. Consequently, any "infinite" persistence in the ECOWAS countries' prices may come from the exchange rates, the CPI or both.

Theoretically, it is believed that floating exchange rate allows a more automatic adjustment to price shocks compared with fixed regimes, which implies that the nominal and real commodity prices under floating regimes should be more mean-reverting than under a peg regime.

Tables 4.1 through 4.4 contain unit root tests applied to the nominal and real prices under the actual history and the alternative peg. Considering the individual countries, the conclusions that emerge from the tables is that none of the exchange rate regimes led or

[7] All these conclusions remain true when the variability is captured by GARCH models (estimations available upon request to authors). As far as the size of the shocks is concerned, the best anchor currency for many countries proves to be the Euro except the Yen for Nigeria. On the contrary, according to the convergence speed, we could not get the consistent results.

would have led to a stable (mean-reverting) dynamic, except the commodity peg. Owing to the fact that we have a "short" sample of ten years (even if the frequency of the data is monthly), the acceptation of the unit root hypothesis does not mean that the shock hitting the commodity prices never dissipates, but simply that they do so at a (very) slow rate. And there seems not to be strong differences between the countries that adopted a peg (the CFA countries and Cape Verde) and those operating with a flexible exchange rate (non-CFA zone countries). Only a "commodity standard" could work well in influencing the duration of shocks.

A picture that emerges from the above the developments is that the countries would not agree on the foreign currency to which they should have pegged their currencies. Even, it is not sure that pegging the domestic currency would have been a good choice for all them.

Table 5 summarizes the best choice according to the three goals: maximizing the export revenues, minimizing their variability and reducing the persistence of shocks.

In attempting to draw policy conclusions from the above analysis, specifically concerning the choice of a common peg by the countries, it seems that there are several alternatives. Some economists would say that more important is the choice made by Nigeria because this country accounts for more than the half of ECOWAS' GDP and population. In this regard, concerns matter about the question as whether pegging the future common currency would be a better choice than keeping a floating currency (in particular, if one considers the second goal). So, if the countries give the leadership to Nigeria for the conduct of monetary policy, then the trade-off between the three goals would depend on their respective weight in the central banker's preferences.

However, although Nigeria weights more than the half of the income of the ECOWAS region, the successfulness of the exchange rate policy in the future currency union may depend on the stability of the "social utility" that is the aggregation of the utility functions of both the CFA zone countries (represented by the BCEAO) and all non-CFA zone countries (represented by the future WAMZ).

Table 4.1. The unit root ADF test for individual nominal & real prices under the actual history

	Nominal prices			Real prices		
	T-statistics	P-values	Stability	T-statistics	P-values	Stability
Benin	-2.94	0.04	Stable	-1.89	0.34	non-stable
Burkina Faso	-2.84	0.06	non-stable	-2.05	0.27	non-stable
Cape Verde	-1.96	0.30	non-stable	-2.05	0.27	non-stable
Côte d'Ivoire	-2.17	0.22	non-stable	-2.53	0.11	non-stable
Gambia, The	-1.53	0.51	non-stable	-1.87	0.34	non-stable
Ghana	1.28	1.00	non-stable	-2.70	0.08	non-stable
Guinea	-1.01	0.75	non-stable	-1.54	0.51	non-stable
Guinea-Bissau	-3.16	0.03	Stable	-2.32	0.17	non-stable
Mali	-0.44	0.90	non-stable	-1.69	0.43	non-stable
Niger	-1.30	0.63	non-stable	-1.81	0.38	non-stable
Nigeria	-2.09	0.25	non-stable	-2.66	0.08	non-stable
Senegal	-2.68	0.08	non-stable	-3.34	0.02	Stable

Sierra Leone	-0.42	0.90	non-stable	-1.97	0.30	non-stable
Togo	1.71	1.00	non-stable	-0.16	0.94	non-stable

Null Hypothesis: Each variable has a unit root. Exogenous variables: Constant, not trend.
ADF test: More (less) than 5% of P-values means non-stable (stable) of each variable.

Table 4.2. The group unit root test (1)

The null hypothesis is set under the assumption of ***common*** unit root process, i.e., Levin, Lin & Chu test.

	Nominal prices			Real prices		
	T-statistics	P-values	Stability	T-statistics	P-values	Stability
Actual history	0.97	0.83	Stable	-1.51	0.07	non-stable
Dollar peg	1.34	0.91	non-stable	1.69	0.95	non-stable
Yen peg	0.51	0.70	non-stable	0.63	0.74	non-stable
Euro peg	-0.10	0.46	non-stable	0.40	0.65	non-stable
Yuan peg	-0.91	0.18	non-stable	-0.27	0.39	non-stable
Commodity peg	-1.56	0.06	non-stable	-1.66	0.05	Stable

Table 4.3 The group unit root test (2)

The null hypothesis is set under the assumption of ***individual*** unit root process, i.e., Im, Pesaran and Shin W test. (The results of ADF-Fisher Chi-square test or PP-Fisher Chi-square test can be found in the excel file)

	Nominal prices			Real prices		
	T-statistics	P-values	Stability	T-statistics	P-values	Stability
Actual history	0.56	0.71	non-stable	-2.23	0.01	Stable
Dollar peg	1.06	0.85	non-stable	0.69	0.75	non-stable
Yen peg	-0.03	0.49	non-stable	0.16	0.56	non-stable
Euro peg	-1.07	0.14	non-stable	-1.21	0.11	non-stable
Yuan peg	-1.08	0.14	non-stable	-1.06	0.14	non-stable
Commodity peg	-0.30	0.38	non-stable	-1.77	0.04	Stable

Table 4.4. The ADF unit root test for all index (3)

	Nominal prices			Real prices		
	T-statistics	P-values	Stability	T-statistics	P-values	Stability
Dollar peg	-1.60	0.48	non-stable	-1.57	0.49	non-stable
Yen peg	-2.01	0.28	non-stable	-1.92	0.32	non-stable
Euro peg	-1.94	0.31	non-stable	-2.13	0.23	non-stable
Yuan peg	-1.63	0.46	non-stable	-1.72	0.42	non-stable
Commodity peg	-1.10	0.71	non-stable	-1.15	0.69	non-stable

4.- Misalignments of the real effective exchange rate alternative pegs

We now turn to analyzing the effect of alternative pegs on the real exchange rate misalignments. The latter are defined as the discrepancy between the observed exchange rates and their fundamental value. A wisdom methodology is to derive the fundamental value from a theoretical model. Here, we depart from the classical specifications of the determination of the fundamental value of the exchange rate (notably, models including Balassa-Samuelson

effects, net external assets). The ECOWAS countries lack developed financial markets and there are important controls of capital flows. Further, the potential output remains low and many hurdles to productivity growth are still at play. Instead, we consider a dependent economy model for small commodity exporting countries.

Table 5. Best choice according to the different goals

	Goal 1 Maximizing the export revenues	**Goal 2** Minimizing the export variability	**Goal 3** Reducing the persistence of shocks
Benin and Burkina Faso	1/ During price decreases : Euro peg or Commodity peg 2/ During price increases : yen peg	Dollar peg or Yuan peg	Commodity peg
Nigeria	1/ During price decreases Commodity peg 2/ During price increases : yen peg	Flexible exchange rate	
The other countries	1/ During price decreases : Commodity peg 2/ During price increases : yen peg	Euro peg	

4.1.- An exchange rate model of small commodity-dependent country

In this model the nominal and real exchange rates are defined for small commodity exporting countries, which are supposed to be price-takers in the world markets. The equilibrium exchange rate is expressed as a function of the countries' trade prices, money supply and of the production on non-traded goods. The framework is inspired from previous papers dealing with "commodity currencies" (see for instance, Chen and Rogoff (2002), Clinton (2001), Djoudad et al. (2000), Sjaastad (1998) and for a recent presentation Kearns (2007)).

We consider an economy endowed with a fixed quantity of a commodity, *X*, that is exported (but not consumed by the domestic residents) and whose supply is inelastic. The commodity world price is denoted P_{XT}^{*} .

There is a representative consumer who consumes a traded good, *T*, imported from abroad and a non-traded good of which he received an endowment each period. The utility function is given by:

$$U_t = \sum_{s=t}^{\infty} \beta^{s-t} \left[\frac{c_s^{1-\rho}}{1-\rho} + \frac{\vartheta}{1-\delta} \left(\frac{M_s}{P_s} \right)^{1-\delta} \right], \qquad (6)$$

where

$$C_t = C_{Nt}^{\gamma} C_{Tt}^{1-\gamma} / \gamma^{\gamma} (1-\gamma)^{1-\gamma}, \qquad (7)$$

and M_t/P_t is the real money. β is the discount factor. The budget constraint is written as follows:

$$\begin{aligned} &B_{t+1}P_{Tt} + \tilde{B}_{t+1} + E_t B^*_{t+1} + M_t = \\ &(1+r)B_t P_{Tt} + (1+i\ )\tilde{B}_t + (1+i^*)E_t\tilde{B}^*_t + M_{t-1} \\ &\qquad + P_{Xt} + Y_{Nt}P_{Nt} - C_t P_t - \tau_t P_t \end{aligned} \tag{8}$$

where $P_t = P_{Nt}^{\gamma} P_{Tt}^{1-\gamma}$ is the economy price index. B_t, $\tilde{B}_t$ and $\tilde{B}^*_t$ denote the holdings of a real bond, a domestic nominal bond and a foreign bond. E_t is the nominal exchange rate (price of the foreign currency in terms of the domestic currency), M_{t-1} is the holding of money at the start of period t. The real bond pays a constant rate of return, *r*, and the nominal domestic and foreign bonds pay constant rates of return *I* and i^*. Each period the consumer receives government transfers whose value are $\tau_t P_t$.

It is assumed that there are no restrictions to trade, so that the law of one price holds and we have $P_{Tt} = E_t P^*_t$. The derivation of the nominal exchange rate stems from standard first-order conditions and yields the following equation, in logarithmic form[8]:

$$\begin{aligned} E_t = E_t &\left\{ \frac{i\delta}{1+i\delta} \sum_{j=0}^{\infty} \left(\frac{1}{1+i\delta} \right)^j (M/P)_{t+j} \right\} \\ &-[\gamma(P^*_{Xt} + y_{Nt}) + (1-\gamma)P^*_{Tt}] - \frac{\rho(1-\gamma)}{\delta}(P^*_{Xt} - P^*_{Tt}) - \frac{\gamma\rho}{\delta} y_{Nt} \end{aligned} \tag{9}$$

where $\boldsymbol{E}$ is the expectation operator. The world price of the exported commodity affects the nominal exchange rate through several channels.

Changes in the export price modify the net present value of expected wealth and this affects the nominal exchange rate in several manners. Firstly, the consumer can decide to increase his consumption of traded good, whose price (in local currency) must fall to obtain internal balance. This in turn yields an appreciation of the nominal exchange rate for the law of one price to hold[9]. This effect increases with the share of the imported good in total consumption $(1-\gamma)$ and with the ratio of the intertemporal elasticity of consumption ρ relative to the elasticity of money demand δ. Secondly, a positive wealth effect may induce an increase in the demand for non-tradable goods, thereby implying a rise in the consumer price index. To restore the equilibrium of the real money demand, the nominal exchange rate must appreciate. Thirdly, any positive variation in the export price modifies the future stream of the domestic money supply but the impact on the nominal exchange rate is ambiguous, though one would expect that an expansive monetary policy leads a nominal depreciation. Finally, an increase in the output of the non-traded good leads to a nominal appreciation of the exchange rate.

The above model can also be used to determine the variation of the *real* exchange rate to a variation in the export price. In this case, all the variables in the model are defined in terms

[8] For a detailed proof, see Kearns (2007).

[9] The internal balance is defined by the equality between the supply, $P_{Nt}Y_{Nt} + P_{Tt}T_t$ and the demand $P_t C_t$. An increase in T_t, all things being equal, implies that P_{Tt} must fall for the equality to hold.

of the general level of prices, $\frac{P}{P_t}$. One difference is that the variations in the prices that affect *P* do not only induce adjustments in the nominal exchange rate to restore the equilibria, but also variations in the real exchange rate. In this regard, a rise in the export price of commodities will yield a real depreciation, all things being equal.

In this paper we focus on the real exchange rate and thus use equation (9) with the variables expressed in real terms. This equation is used to compute the fundamental value of the real exchange rate. .

4.2.- The empirical model

We consider the empirical counterpart of equation (9), under the assumption that expectations of the future money stock are equal to its current value. We consider the possible persistence of the real exchange rate by including a lagged term in the regressors. Accordingly, we consider the following equation:

$$log\frac{E_t}{P_t} = \varphi log\frac{E_{t-1}}{P_{t-1}} + \alpha log\left(\frac{M_{t-1}}{P_{t-1}}\right) + \beta log\,(P^*_{Xt-1}) + \gamma log\,(P^*_{Tt-1}) + \delta log\,(y_{Nt-1}) + \varepsilon_t \quad , \qquad (10)$$

where ε_t is a disturbance term. This equation is used to compare the misalignments of the real exchange rate that would have prevailed in the ECOWAS countries under different pegs. We assume a "strict" peg: choosing an anchor foreign currency implies a level relationship between the domestic money stock and inflation and those of the anchor country. This means that money and inflation evolve proportionally to those of the anchor country. The exchange rate is the real effective exchange rate defined as follows. We compute the real effective exchange of the ECOWAS countries under the preceding assumption of convergence of the inflation rates. Therefore, the exchange rate is defined as the weighted average of the relative price indexes of the main trading partners of the ECOWAS countries and the price index of the anchor country.

Define $\omega = (a, \beta, \gamma, \delta)$. Then, the fundamental value of the real exchange rate is obtained by using the vector $\tilde{\omega} = \omega/(1-\varphi)$.

4.3.- Data and econometric methodology

We use monthly data from 1999 to 2008 and consider the following proxies for the variables.

·*Real effective exchange rate*. For each country we construct a time series that is based on *(i)* the nominal effective exchange under a given peg (trade-weighted average of the anchor's country bilateral nominal exchange rate vis-à-vis the ECOWAS countries main trading partners[10]; *(ii)* differentials between the anchor country's consumer price level and the trade-weighted average of the price of the ECOWAS countries' main trading partners. ECOWAS

[10] We choose the major exporting countries accounting for minimum 70% of total exports.

countries' main trading partner series are taken from IMF and COMTRADE trade statistics[11], while the other series comes from the IFS database and national institutes of statistics.

·*Real export price of commodities*. We use the same series as in the preceding section, the main difference being that we consider the real price commodity themselves but not their difference to actual history.

· *Import prices and non-traded production*. The price of exports of the anchor countries serve as a proxy for the ECOWAS countries' import prices. Specifically, we consider the average of the export price of Japan, the Euro area and the United States. The series are taken from the IFS database. As for non-traded production, we did not find any series spanning over a long period of time in the ECOWAS countries. We thus consider that non-traded output accounts for a percentage of total GDP, this percentage being calculated as (1-γ) where γ is the degree of openness of a country (namely the sum of exports and imports to GDP). When only annual data were available, the series were then interpolated to a monthly frequency.

·*Monetary aggregates*. We use the money stock M2 of the anchor country.

The econometric methodology relies on the following steps. Firstly, equation (10) is used to test for a level relationship between the endogenous variable and its explanatory variables, using the Pesaran et al. (2001)'s methodology (thereafter PSS). These authors have proposed a bound testing approach for testing the existence of a long-run relationship between a group of variables when the series have different time series properties (a mixture of stationary, I(0), I(1), I(2), structural breaks, etc). One advantage over the classical Engle-Granger or Johansen-based approaches is that, one does not need to have a cointegration relationship to conclude that a long-run relationship exists. PSS test is therefore less restrictive.

In a second step, if we conclude to the existence of a level relationship, then equation (10) is estimated using a generalized least squares estimator and taking into account structural breaks when they are present in the data. The robustness of the estimation is tested using misspecifications tests on the estimated residuals.

Thirdly, we compute the misalignments of the real exchange rate as the discrepancy between the observed values and the estimated values expressed in percentage of the estimated values. It is noteworthy that, since the mean of the residuals of the estimated model is zero (if correctly estimated), we compute separately the average of the misalignment corresponding to positive (undervaluation) and negative residuals (overvaluation). We do not take all the residuals, but consider only the discrepancies that are "significant enough". To this end, only the residuals that are greater than a benchmark (the latter is chosen as the estimated the standard errors of the residuals).

[11] See Table A.2 in appendix.

4.4.- Interpreting the results

Table 6 contains our results. For each peg, we report the Wald statistics corresponding to the PSS test and compare their value to the two bounds corresponding to the case where the estimated models contain restricted trends and unrestricted intercepts (the lower and upper bounds with four explanatory variables are respectively equal to 3.05 and 3.97. The null of no-level relationship is rejected when the Wald statistic lies above the upper bound, which happens in our case for all the countries. We also report the estimated coefficients and the percentage of under- and overvaluation[12].

Impact of real commodity prices on the real exchange rates

The different magnitudes of the variation of the real effective exchange rate around its mean value can be interpreted by considering what happens in the country dependent model when a given currency prevails as an external anchor, while the invoicing currency is different (according to the structure of the exports of the African countries).

Table A.2 in appendix shows the major export destinations for the ECOWAS countries (average percentage of total exports over 1999 to 2008). The data reveals that, the euro area is an important trading partner, but it does not emerge as the main one for a majority of countries. Only in 7 out of the 14 countries the euro area accounts for around half or more of their total exports (Cape Verde, Côte d'Ivoire, the Gambia, Ghana, Guinea, Niger, and Sierra-Leone). The Asian emerging countries and other developing countries gain important shares of export (notably in Benin, Burkina Faso, Guinea Bissau, Mali, Senegal and Togo) and the United-States accounts for a great share of exports in Nigeria. We accordingly have two invoice currencies, namely the euro and the US dollar (the Asian emerging countries pay the imports in dollar).

The dependent economy model maintains that the nominal exchange rate adjust in order to restore the internal equilibrium after a wealth effect following an increase in the price of real commodities (through a decrease in the price of traded-goods and real money balance effects). For instance, after an export price increase, the internal balance is retrieved through an appreciation of the nominal exchange rate. The strength of this effect conditions the magnitude of variation of the exchange rate during the adjustment process. It depends upon whether the domestic firms sell in the foreign countries in the producers' currency –here the anchor currency – or whether the invoicing price is the foreign countries' currency (because the invoice price affects the net present value of the expected wealth in local currency). These two cases correspond to the so-called "producer-currency pricing (PCP)" and "local currency pricing (LCP)".

We consider here the LCP, which is the most interesting case to comment our results. We can construct a classification of the strength of variation of the nominal exchange rate in different configurations. To this end, let us first consider what the bilateral parities of the

[12] We do not report the results of the misspecification tests on the estimated residuals to avoid an overabundance of tables. The results are available upon request to authors.

anchor currencies were against the euro and the dollar over the period from 1999 to 2008 (Table 6)

Table 6. Variation of bilateral parities over 1999-2008

	Export zone currencies	
	Euro	Dollar
Anchor currencies		
Dollar	Depreciation	-
Euro	-	Appreciation
Yen	Huge depreciation (around 20%)	Small depreciation (5-6%)
Yuan	Depreciation	Small appreciation

Secondly, we can summarize what the magnitude of the wealth effect would be in the dependent economy model following a decrease or an increase in the export prices (see Table 7). In a LCP price-setting, the size of the wealth effect (the variation of the export income in local currency) varies with export destinations, the appreciation or depreciation of the anchor currency vis-à-vis the currency used to invoice the exports, increasing or decreasing world prices of the exported commodities. To take an example, suppose that a country is pegged to euro while invoicing its price in dollar and that the world prices of its exports raise by x%. If the euro appreciates vis-à-vis the dollar, then the additional export income, in euro, from the increase in the world price will increase by less than x% ("weak" wealth effect). Even, in case of a huge appreciation, the world price increase of exports may translate into a decrease in the export revenues in euro! Conversely, a depreciation of the euro leads a more than proportional increase in the export revenues expressed in euro ("strong" wealth effects). The higher the size of the wealth effect, the more important will be the variation of the nominal exchange rate during the adjustment process to equilibrium. The conclusions are symmetric in case of a decrease in the world price of exports.

Although, we observed that the dynamics of the world prices of the commodities exported by the ECOWAS countries have undergone two separate episodes of downward and ascending trends (from 1999 to 2002 and then from 2003 onwards), their dynamics over the entire period shows an upward oriented evolution.

How large an impact do export prices have on the real exchange rate also depends on price effects. In the dependent economy model, an increase in the export price is associate with an increase in the general level of prices (for instance if the consumers buy more non-traded goods). This induces a real appreciation. Therefore, the adjustment of the nominal exchange rate and the variations of the general price level play in the same directions as to their impact on the real exchange rate. If the price effect is strong enough, it can amplify the variations of the real exchange rate compared with its variations involved by the adjustment of the nominal exchange rate.

Table 7. Expected magnitudes of the adjustment of the nominal exchange rate

Case of a decrease in the World price of the exports		
	Exporting area	
Anchor currency	Euro area	Dollar area
Dollar	Weak wealth effects and thus weak amplitude of the nominal exchange rate during the adjustment to a new equilibrium	-
Euro	-	Strong wealth effects and thus ample variations of the nominal exchange rate during the adjustment to a new equilibrium
Yen	Weak wealth effects and thus weak amplitude of the nominal exchange rate during the adjustment to a new equilibrium	Very weak wealth effects and thus very small variations of the nominal exchange rate during the adjustment to a new equilibrium
Yuan	Weak wealth effects and thus weak amplitude of the nominal exchange rate during the adjustment to a new equilibrium	Strong wealth effects and thus ample variations of the nominal exchange rate during the adjustment to a new equilibrium
Case of an increase in the World price of the exports		
	Exporting area	
Anchor currency	Euro area	Dollar area
Dollar	Strong wealth effects and thus ample variations of the nominal exchange rate during the adjustment to a new equilibrium	-
Euro	-	Weak wealth effects and thus weak amplitude of the nominal exchange rate during the adjustment to a new equilibrium
Yen	Strong wealth effects and thus ample variations of the nominal exchange rate during the adjustment to a new equilibrium	Stronger wealth effects and thus ample variations of the nominal exchange rate during the adjustment to a new equilibrium
Yuan	Strong wealth effects and thus ample variations of the nominal exchange rate during the adjustment to a new equilibrium	Weak wealth effects and thus weak amplitude of the nominal exchange rate during the adjustment to a new equilibrium

Table 8. Misalignments of the real exchange rate and estimation of the country-dependent model

Country	Peg	Wald test	% undervaluation (positive residuals)	% overvaluation (negative residuals)	ψ	α	β	δ	γ
Burkina Faso	Dollar	16,53	8,71	10,33	0,77*	-0,35**	-0,02	-0,43*	0,02
	Euro	13,06	6,15	7,64	0,93*	-0,44**	-0,016	-0,57*	0,076
	Yen	17,75	2,76	2,33	0,82*	-0,92*	-0,047**	0,90*	0,141
	Yuan	21,62	5,25	4,99	0,65*	-0,42*	-0,03	-0,25*	0,05
Côte d'Ivoire	Dollar	10,81	23	29,67	0,89*	-0,56*	-0,07*	-0,17*	-0,08
	Euro	6,96	7,80	6,36	0,74*	-0,44*	-0,03*	-0,25*	-0,02
	Yen	6,48	2,67	2,56	0,90*	-0,73*	0,02	-0,15	-0,04
	Yuan	7,78	4,13	4,11	0,91*	-0,58*	-0,05*	-0,24*	-0,03
The Gambia	Dollar	6,90	21,65	27,29	1,00*	-0,65*	-0,03	0,01	-0,33*
	Euro	6,54	4,44	4,22	0,97*	-0,89*	-0,02**	-0,024	-0,03
	Yen	6,79	2,33	2,23	0,98*	-0,85*	-0,08*	0,028	-0,07
	Yuan	7,08	7,86	5,43	0,96*	-0,84*	-0,04	-0,003	-0,07
Ghana	Dollar	11,97	21,90	23,23	0,84*	-0,22*	0,023	-0,51*	-0,11**
	Euro	10,78	6,26	7,63	0,55*	-0,27*	-0,03**	-0,30*	0,014
	Yen	16,93	1,81	1,98	0,70*	-0,06	0,037	-0,67*	0,021
	Yuan	8,91	5,62	3,91	0,89*	-0,22*	0,02	-0,58*	-0,08
Guinea	Dollar	7,52	23,80	21,74	1,02*	-0,64*	-0,169*	-0,30*	-0,07
	Euro	8,07	6,09	5,02	0,97*	-0,89*	-0,04*	-0,66*	0,007
	Yen	6,28	2,31	2,12	0,99*	-0,85*	-0,107*	-0,43*	-0,028
	Yuan	6,58	5,08	4,08	0,96*	-0,84*	-0,156*	-0,48*	-0,01
Guinea Bissau	Dollar	8,90	2,33	3,02	0,98*	-0,73*	-0,09*	-0,180*	-0,06
	Euro	6,06	1,87	2,14	0,95*	-0,724*	-0,02	-0,205*	-0,028
	Yen	7,10	3,91	3,75	0,94*	-0,65*	-0,05*	-0,33*	0,038
	Yuan	11,25	14,97	22,23	0,96*	-0,61*	-0,04	-0,35*	-0,01
Mali	Dollar	11,67	9,00	6,70	0,95*	-1,14*	-0,184*	0,31	-0,12**
	Euro	8,17	2,23	2,89	0,95*	-0,36*	-0,023	-0,59*	0,005
	Yen	8,71	2,55	2,53	0,96*	-0,84*	-0,138*	-0,117	-0,011
	Yuan	13,59	10,65	6,72	0,91*	-0,76*	-0,172*	-0,187	0,03

Note : * and ** means that the coefficients are statistically significant, respectively at the 1% and 5% level.

Table 8 (continued). Misalignments of the real exchange rate and estimation of the country-dependent model

Country	Peg	Wald test	% undervaluation (positive residuals)	% overvaluation (negative residuals)	ψ	α	β	δ	γ
Niger	Dollar	12,75	17,34	20,74	0,71*	-0,31	-0,06	-0,37	-0,03
	Euro	6,11	6,24	5,94	0,99*	-0,50*	-0,0006	-0,48*	-0,005
	Yen	9,10	2,21	2,46	0,96*	-0,59*	-0,02	-0,34*	-0,03
	Yuan	6,93	7,05	5,73	0,73*	-0,46*	-0,06	-0,317*	0,03
Nigeria	Dollar	8,09	10,92	17,60	0,83*	-0,803*	-0,04*	0,009	-0,03
	Euro	14,89	11,48	14,33	0,95*	-0,66*	-0,01	-0,131*	-0,04
	Yen	4,38	1,89	1,89	0,96*	-0,93*	-0,02	0,026	-0,006
	Yuan	7,93	3,72	4,23	0,87*	-0,66*	-0,019	-0,102**	-0,002
Senegal	Dollar	7,25	10,63	8,44	0,95*	-0,36*	-0,026	-0,50*	-0,09
	Euro	21,59	0,82	0,76	0,96*	-0,147*	-0,004	-0,82*	0,005
	Yen	14,07	2,4	2,56	0,89*	-0,59*	-0,06*	-0,29	0,06
	Yuan	7,36	9,44	7,30	0,92*	-0,46*	-0,06*	-0,356*	-0,047
Sierra Leone	Dollar	10,81	176	44,79	0,81*	-1,01*	0,0	0,256	-0,05
	Euro	11,31	10,97	12,21	0,95*	-0,76*	-0,007	-0.198*	0,001
	Yen	6,43	2,12	2,13	0,87*	-1,08*	-0,016	0,25	-0,048
	Yuan	9,08	5,54	4,31	0,72*	-0,71*	0,004	-0,03	0,005
Togo	Dollar	8,20	11,60	17,23	0,83*	-0,67*	-0,018	-0,07	-0,08**
	Euro	4,93	9,82	12,88	0,95*	-1,03*	0,05*	0,13**	-0,06
	Yen	9,09	2,57	2,24	0,96*	-0,85*	-0,07*	-0,09	-0,01
	Yuan	9,37	3,98	3,69	0,87*	-0,67*	-0,057*	-0,162**	-0,038

Note : * and ** means that the coefficients are statistically significant, respectively at the 1% and 5% level.

The computed residuals between the observed and estimated fundamental real exchange rate are reported in Table 8 and some results accord well with the conclusions of Table 7. To take some examples, consider the cases of Cape Verde and Sierra-Leone, two countries whose share of exports towards Europe is particularly high, covering above 70% (respectively 85,73% and 72,70%). Under a peg to the US dollar, we obtain the highest discrepancies as compared with the other countries in the sample. This indicates a sharp appreciation or depreciation of the real exchange rate when the latter evolves under or above its fundamental value to restore the internal and external equilibrium after a shock. Other countries share a similar feature. Indeed, we also find high under- and overvaluations of the exchange rates from their fundamental value for the Gambia, Ghana, Niger, countries whose exports towards the euro area accounts for around half of their total exports. Conversely, under a peg to the euro, countries that would have invoiced their exports in US dollar (those exporting to a dollar zone) would have experienced slow deviations of the exchange rate from its fundamental value, because the magnitude of adjustment of the nominal exchange rate after an export price shock would have been small (due to weak wealth effects caused by an anchor currency that appreciates against the invoice currency). Examples are Burkina Faso, Guinea-Bissau, Mali and Togo.

We also find evidence that a peg to the yen turns out to yield the lowest discrepancies, for all the countries whatever their exporting zone. This suggests that, in addition to the adjustment of the nominal exchange rate, another factor is at play when an economy is hit by a shock in the export prices. Although the dependent economy model dichotomizes the real and money spheres in the steady-state (the nominal exchange moves to restore the real money balances), during the transition path to a new equilibrium, the increase in the general level of prices caused by the higher export incomes alters the purchasing power of money. This translates into a decrease in the demand for non-traded goods and to a downward pressure on the general price level (the so-called Pigou effect). Lower prices result in a real depreciation of the domestic currency. If the real money effect is strong enough, it attenuates the effects of the nominal exchange rate on the real exchange rate.

An interesting question here is the following. Why would such real money effects have been stronger, had the countries been peg to the yen? The answer is that real money effects show asymmetries between inflationary and deflationary environments. A decrease in the purchasing power of money is more heavily felt by the consumers if initial prices were diminishing as compared with a situation where they were already increasing or with a situation where prices are usually at a low level. Over the period from 1999 to 2008, the inflation situation in Japan has differed markedly from the other countries, since this country faced a deflation. In our simulations, the importance of real money effects – playing in an opposite direction with regard to the nominal exchange rate - could explain why we find small deviations between the observed and fundamental real exchange rates.

As to the yuan peg, the countries' situation is a mixture of what happens under the other pegs, with smaller sizes of misalignments as compared with the dollar and euro peg for one country out of two (Burkina Faso, Ghana, Guinea, Côte d'Ivoire, Nigeria, Sierra Leone, Togo.

Explaining the negative impact of monetary stock on the real exchange rate

Another feature from the estimations that deserves some comments is the negative sign of the money variable. On the face of it this result may appear surprising, since we would expect from the theoretical model that the nominal exchange rate needs depreciates when the stock of money increases. It must be kept in mind that the estimations do not tell us what happened indeed, since we are doing a counterfactual exercise. They simply say which sign of the money coefficient we obtain for the simulated series of the real exchange rates to fit in with the dependent economy model. In such a model one obtains negative signs if there are systematic expectation errors about the monetary process. Such errors happen when the monetary stock is highly persistent, but the agents believe that it includes a large transitory component[13].

The misperception as to the persistence of shocks leads the agents to under-estimate the impact of shocks on the future money supply. Accordingly, the markets can expect a depreciation of the nominal exchange rate when an appreciation would in fact occur. So, the exchange rate may initially move in the wrong direction, thereby explaining the occurrence of misalignments. This expectation bias can be viewed as a "peso" problem stemming from a slow adaptation of monetary adaptation. The high persistence of the real money stock used in our simulations are shown in Table 9

Table 9. Unit root tests on the level and first-difference of the real money stocks m (and Δm)

	KPSS			ERS		
	m	Δm	Conclusion	*M*	Δm	Conclusion
USA	0.24*	0.15	I(1)	-2.53*	-3.54	I(1)
Euro area	0.32*	1.03*	I(2)	-0.88*	0.85*	I(2)
Japan	0.30*	0.37	I(1)	-0.94*	-1.11*	I(2)
China	0.31*	0.94*	I(2)	-0.09*	-10.66	I(1)
Critical value (5%)	0.146	0.463	-	-3.01	-1.94	-

*Note: KPSS and ERS refer to the unit root tests proposed by Kwiatkowski et al (1992) and Elliot et al. (1996). The tests include an intercept plus a trend for the series in level and an intercept for the first-difference. In the KPSS tests, the null of a stationary process is rejected whenever the computed statistic lies above the critical value, while the null of a unit root process is accepted when the computed statistic is above the critical value. * means that the null hypothesis is rejected.*

Another interpretation of the negative coefficients of the money variable is that we have two contradictory effects at play. On the one hand, provided that there are no errors expectations, any increase in the nominal stock of money implies a depreciation of the nominal exchange rate. Indeed, this rise implies a higher real money balance that allows the

[13] For a formal proof, we refer the reader to Kearns (2007).

consumer to increase their consumption today without scarifying their consumption tomorrow. In particular, they may choose to increase their consumption of the traded good (substitution effects) and the increased price of this good induces a nominal depreciation (for the law of one price for the law of one price to hold) and thus a real depreciation. On the other hand, the consumers may choose to increase both their consumptions of non-tradables and tradables, causing an increase in the consumer price index and, accordingly, a real appreciation. The total effect thus depends upon the relative strength of both effects. The negative coefficients indicate that the effect of the prices dominates that of the nominal exchange rate.

Which peg as regards external competitiveness?

If minimizing the misalignments of the observed real exchange from its fundamental value is the most important consideration for the ECOWAS countries, then choosing the yen would have been their optimal choice. Some would claim that that there is no gain from retaining an anchor of a foreign country with which the African countries trade very little. So, since the euro area and dollar zones represent a much higher fraction of their respective trade, we can safely ignore the yen peg according to this point of view.

The dollar peg or euro peg are better yardsticks to gauge the optimal choice of the countries. As can be seen from the tables, the dollar peg would have led to stronger misalignments than the euro, with important misalignments in the countries whose fraction of exports to the United States is big. The main reason is the depreciation of the dollar against the euro in a context of rising world commodity prices and inflationary pressures in both the euro area and dollar zones.

An optimally designed anchor policy should evolve across time in regard to the changes affecting the fundamentals that induce changes in the real exchange rate. Of course, one hurdle is that such a policy may not be practical to implement.

As regards the external competitiveness, the countries may disagree on the choice of their anchor exchange rate. This stems from the incidence of invoicing in a currency different from the currency to which they would be pegged. The countries show a great heterogeneity and it may be suggested in this case to choose a basket of currencies.

5.- Conclusion

Our results suggest that the choice of an anchor country as regards the internal and external competitiveness may be a dynamic choice, with varying anchors across time. If, the countries has adopted a peg regime in the past, we have seen that their policy should have differ from 1999-2002 to 2003-08 in terms of export profitability since the international prices of commodities evolved from a downward trending to upward oriented movements. Concerning the external competitiveness, the choice would have depended on the evolution of the fundamentals influencing the real exchange rate. Accordingly, one difficulty here come

from the fact that the countries should not be advised to lock into a given exchange rate peg and stick to it, even when the determinants of the exchange rate change their dynamics in time.

Besides, there seems to be contradictions between the objectives of internal and external competitiveness, as well as between the different goals they pursue under each type of competitiveness. For instance, pegging to a currency that is depreciating (resp. appreciating) when the world price of commodities are rising (resp. decreasing) could be a good choice in terms of the maximization of the export profitability, but as regards external competitiveness this choice could yield strong misalignments of the real exchange rate because of the incidence of the invoicing price. Another example is the call for a peg to export price index formulated by Frankel. This suggestion may have been appropriate for the countries when declining terms of trade were observed. However, this does no longer seem to be the case during periods of rising commodity prices as we have experienced in the recent years. We saw that other anchors would yield higher export income.

What this means is that, for the ECOWAS countries, the choice of an anchor would imply to establish a hierarchy between different goals that are contradictory. The outcome may depend upon the preferences of each state and the manner in which the latter will aggregate. In this sense, the governments are right when they argue that the choice of a currency peg is above all a political decision.

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APPENDIX

Table A.1. De Facto Exchange rate regimes for the member countries in West Africa

Member countries	Exchange rate regime
Benin, Burkina Faso, Côte d'Ivoire, Guinea- Bissau, Mali, Niger, Senegal, Togo	- **Fixed** Exchange rate regime: Conventional fixed peg arrangement (De jure, Exchange arrangement with no separate legal tender) - Currency Union: West African Economic and Monetary Union - Common Currency: **CFA franc** 1948-1998.12.31: pegged to the **French franc** 1994.1.12: 50% devaluation (1 Euro = 50 → 100 CFA F) 1997.5.2: Guinea-Bissau joined this union (1 CFA F = 65 Guinean Peso) 1999.1.1-: pegged to the **Euro** (1 Euro = 655.957 CFA F)
Cape Verde	- **Fixed** Exchange rate regime: Conventional fixed peg arrangement - Currency: **Cape Verde Escudo** 1998.3.30-: pegged to the **Portuguese Escudo** 1999.1.1-: pegged to the **Euro** (1 Euro = 110.265 CV Escudo)
Gambia, The	- **Flexible** Exchange rate regime: Managed floating with no preannounced path for the exchange rate and Cross rates based on a fixed relationship to the Pound Sterling (De jure, Independently Floating) Monetary aggregate target - Currency: **Gambian Dalasi** 2014.6: "West African Monetary Zone", Common Currency "the ECO"
Ghana	- **Flexible** Exchange rate regime: Managed floating with no preannounced path for the exchange rate, pegged to the **US Dollar** (De jure, Independently Floating) Inflation targeting - Currency: **Ghanaian Cedi** 2007.7.3: redenominated (1 new Cedi = 10000 old Cedi) 2014.6: "West African Monetary Zone", Common Currency "the ECO"
Guinea	- **Flexible** Exchange rate regime: Managed floating with no preannounced path for the exchange rate (De jure, Independently Floating) Monetary aggregate target

	- Currency: **Guinean franc** 2014.6: "West African Monetary Zone", Common Currency "the ECO"
Nigeria	- **Flexible** Exchange rate regime: Managed floating with no preannounced path for the exchange rate, pegged to the **US Dollar** Monetary aggregate target - Currency: **Naira** 2014.6: "West African Monetary Zone", Common Currency "the ECO"
Sierra Leone	- **Fixed** Exchange rate regime: Conventional fixed peg arrangement (De jure, Independently Floating) Monetary aggregate target - Currency: **Leone** 1964: Fixed exchange regime (2 Leone = 1 British West African Pound) 1990: Flexible exchange rate regime was adopted But now, De Facto, pegged to the **US Dollar** 2014.6: "West African Monetary Zone", Common Currency "the ECO"

Source: De Facto classification of exchange rate regimes and monetary policy frameworks as of April 31 2008 by International Monetary Fund (IMF). We also refer to De jure classification as of May 31 2001 and Country note 2009 from IMF International Financial Statistics.

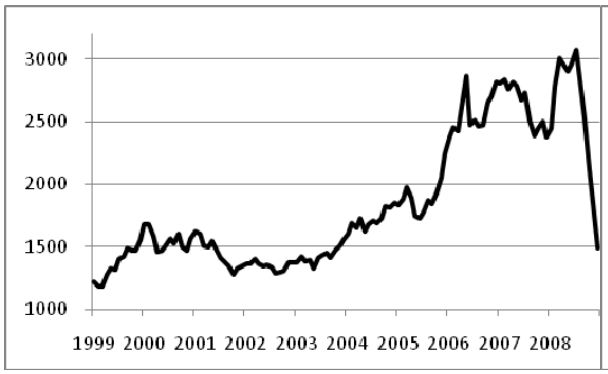
Table A.2. Major exporting countries

Member countries	Main exporting countries and shares
Benin	China 15.5% EU 13.42% India 13.2%
Burkina Faso	EU 22.58% China 15.73% Singapore 12.8%
Cape Verde	EU 84.72% USA 10.72%
Côte d'Ivoire	EU 48.18% (USA 8.93%)
Gambia, The	EU 53.4% India 16.34%
Ghana	EU 51.27% (USA 8.5%)
Guinea	EU 51.13% USA 10.33%
Guinea-Bissau	EU 5.81% Uruguay 14.53% India 57.82% Nigeria 10.25%
Mali	EU 27.3% China 13.84% Thailand 12.75%
Niger	EU 41.76% Nigeria 28.9% Japan 11.49%
Nigeria	USA 41.8% EU 22.03%
Senegal	EU 34.42% India 14.48% Mali 10.58%
Sierra Leone	EU 73.88% (USA 9.29%)
Togo	Ghana 16.79% EU 16.39% Benin 11.1% Burkina Faso10.6%

Source: UN Comtrade database. The exporting country shares are averaged index during the period of 1999-2006. We refer to only the shares more than 10% (in case of USA, the shares more than 8%).

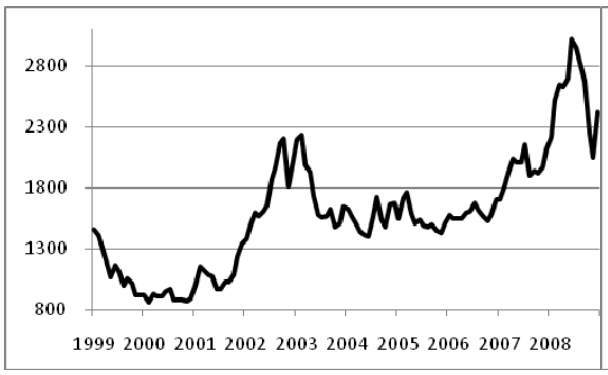
Figure A.1. Movement of the Dollar price of main commodities during the period of 1999-2008

1.1. Aluminum (US Dollar / 1 Tonne)

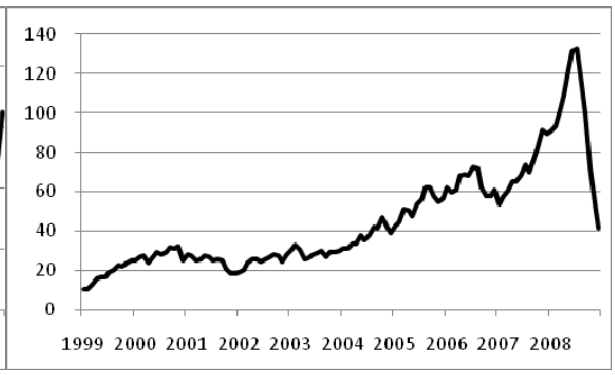


1.4. Gold (US Dollar / 1g)

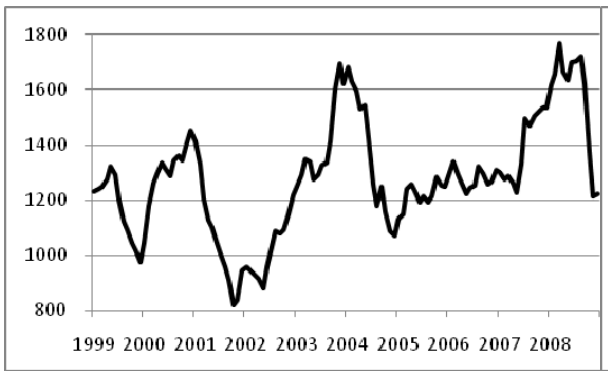
1.2. Cacao (US Dollar / 1 Tonne)



1.5. Oil (US Dollar / 1 Baril)



1.3. Cotton (US Dollar / 1 Tonne)



1.6. Uranium (US Dollar / 1 Pound)

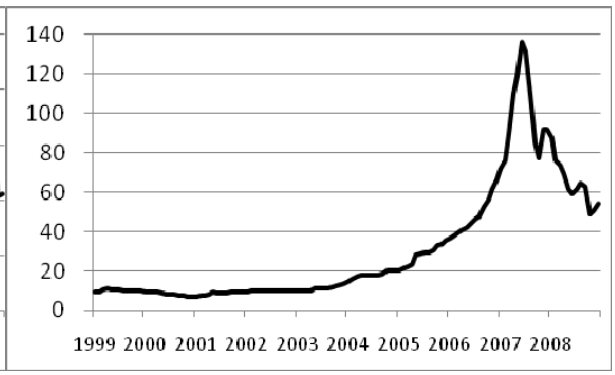
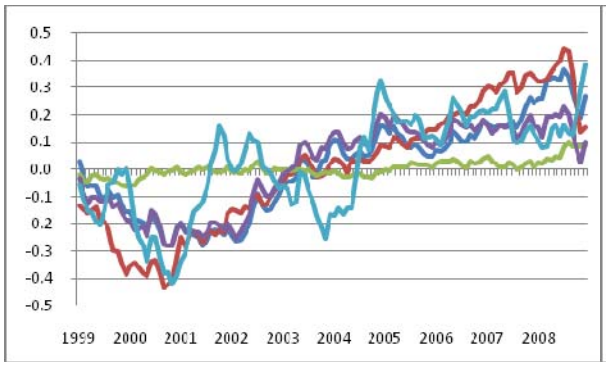


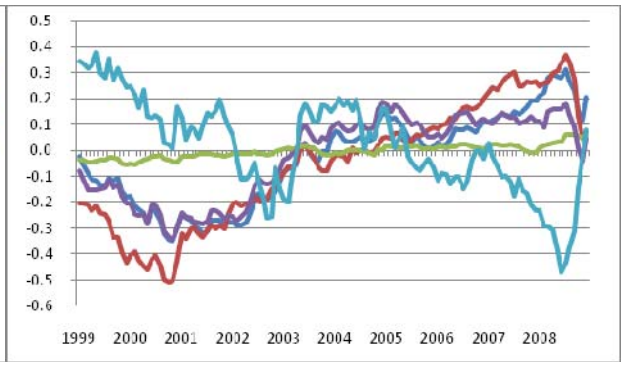
Figure A.2. Deviations of the real prices under a given peg relative to actual regime

Blue line: Dollar peg, Brown: Yen peg, Green: Euro peg, Violet: Yuan peg, and
Light Blue: Commodity peg

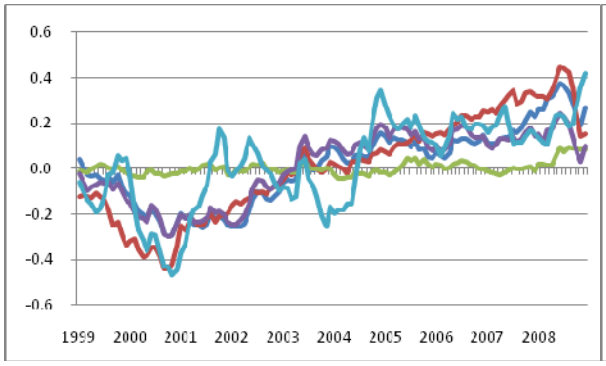
A.2.1. Benin



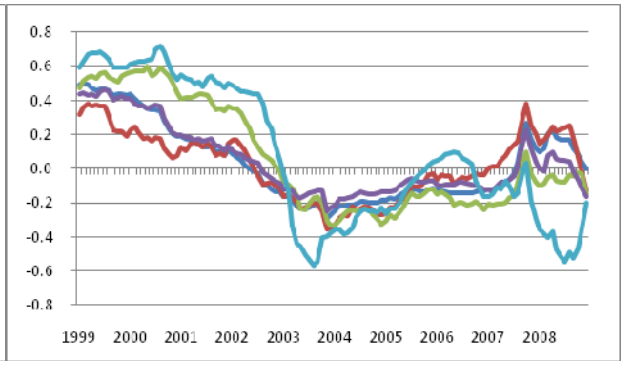
A.2.4. Côte d'Ivoire



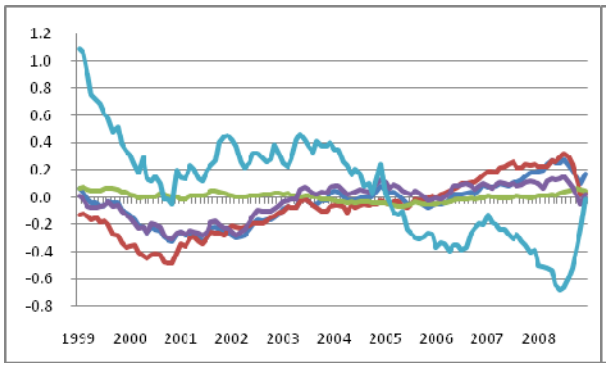
A.2.2. Burkina Faso



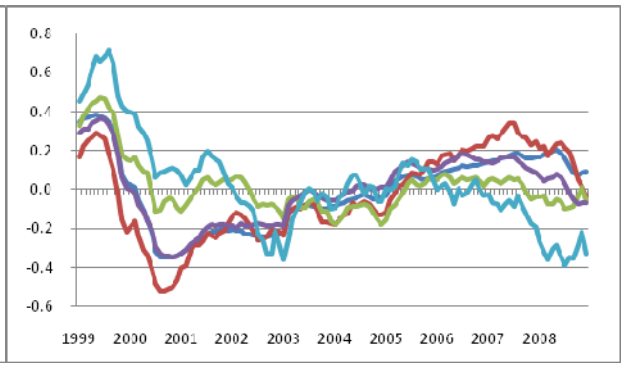
A.2.5. Gambia, The



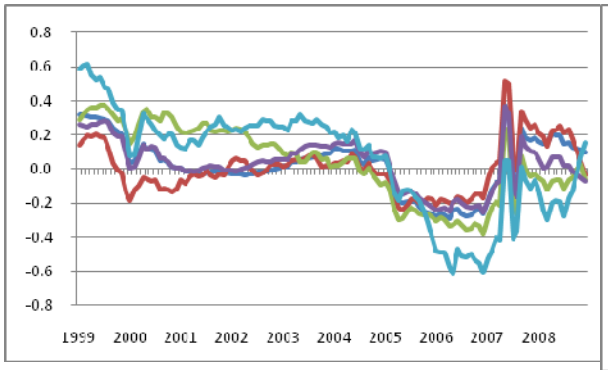
A.2.3. Cape Verde



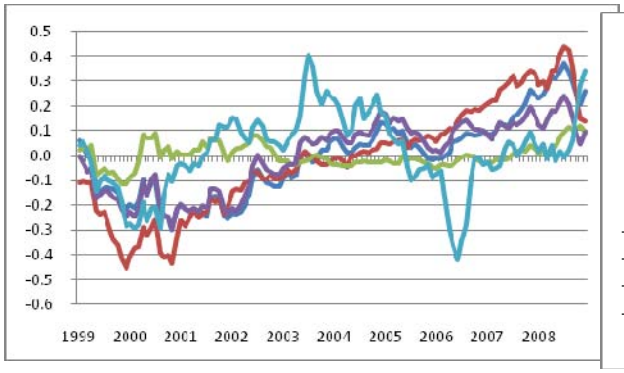
A.2.6. Ghana



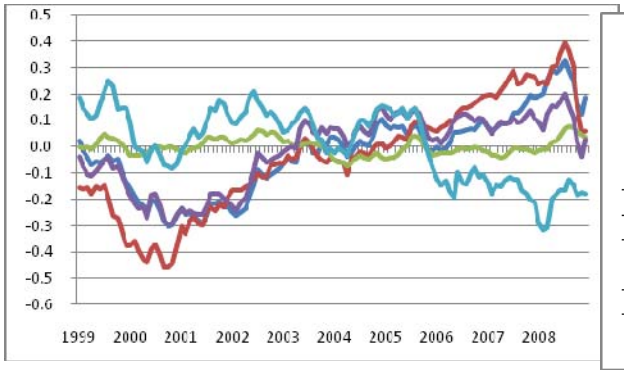
A.2.7. Guinea



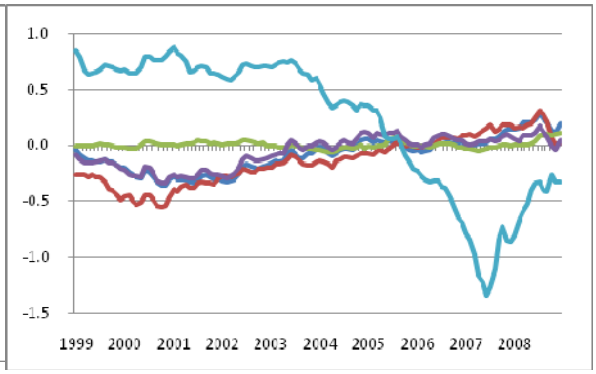
A.2.8. Guinea-Bissau



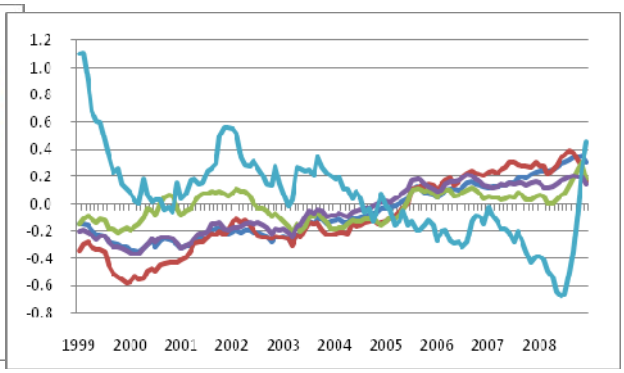
A.2.9. Mali



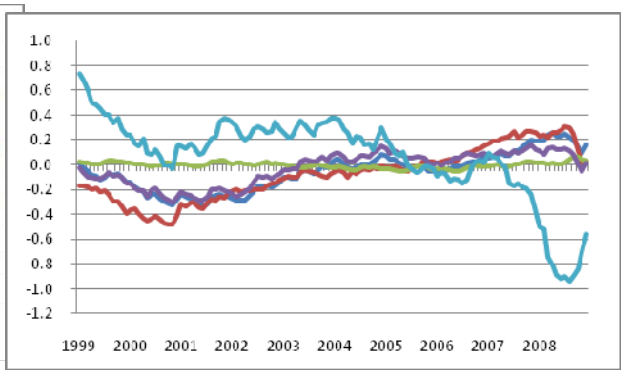
A.2.10. Niger



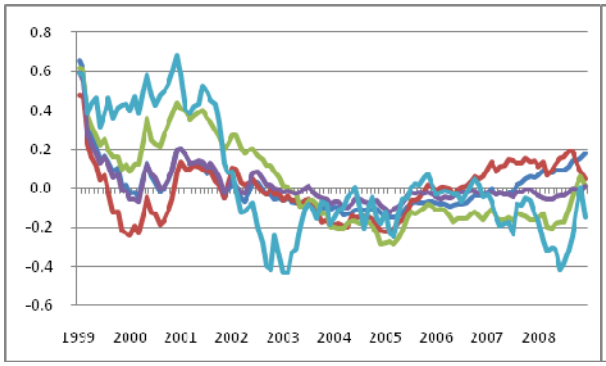
A.2.11. Nigeria



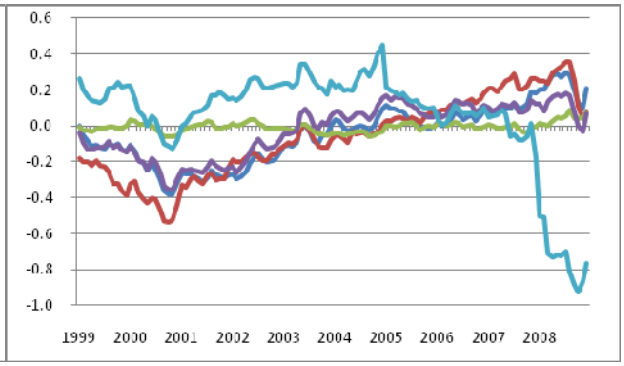
A.2.12. Senegal



A.2.13. Sierra Leone



A.2.14. Togo



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