Eastern Journal of Economics and Finance
Vol. 1, No. 1, 1-31, 2015
e-ISSN: 2305-9095

Re-estimating Effective Equilibrium Exchange Rates in the West African Economic and Monetary Union: New Evidences and Perspectives

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Keywords: Effective exchange rates, misalignments, West African Economic and Monetary Union, Behavioral equilibrium exchange rate, Permanent equilibrium exchange rate.
JEL Classification: F31, F41, O55.

Abstract

This study assesses the long-run dynamics of nominal effective rates in the UEMOA through the post-devaluation era, 1995-2010. The study used two distinct approaches the behavioral equilibrium exchange rate (BEER) and the permanent equilibrium exchange rate (PEER) - to estimate the long-run values for the nominal effective exchange rate (NEER) in each country. Overall, the results indicate that the NEERs of all countries in the union are misaligned with respect to their sustainable levels. It also suggests the need for a revaluation of the CFAF. These findings are innovative in the literature, for they contrast with the conclusions of many past studies and public discourses in the political arena. Furthermore, it is found that misalignments in most countries have accelerated in the post-devaluation era, which may cast doubts about the effectiveness of this policy-action. On the other hand, this research work sends a signal to current decision-makers inviting them to make the appropriate exchange rate corrections in an attempt to reinforce the long-term viability of the CFAF and ensure a balanced economic growth across the union.

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1.0 Introduction

In 1994, the 15 countries in the franc zone underwent a devaluation of their currencies vis-à-vis the French franc[1] (FF), which was the anchor currency. The zone is divided in 3 distinct monetary subregions- namely, the West African Economic and Monetary Union (UEMOA), the Central African Economic and Monetary Community (CEMAC) and the Comoros Islands each one has its respective currency. The extents of these devaluations were 100 percent for both the *Communauté Financière Africaine* franc (CFAF) in the UEMOA and the *Coopération Financière Africaine* franc (CFAF) in the CEMAC, and 50 percent for the *Franc comorien* (FC) in the Comoros Islands. The economic rationale then heralded by monetary authorities to justify this policy-action was the necessity to address the "unsustainable" misalignments in these countries' exchange rates, which had led to severe imbalances in trade balances in particular and current accounts in general.

Eighteen years after this episode, evidence in the UEMOA[2] seems to indicate some unexpected facts. Indeed, trade deficits worsened for all countries except for Côte d'Ivoire where the existing trade surplus improved. Overall, the trade deficit in the union exhibited a sevenfold dip from 1994 to 1999, and a more than tenfold dip from 2000 to 2010 (See Figure 1)[3]. On the average, current accounts deficits in member countries improved by about 25 percent but remained pronounced from 1995 to 1999. However, these deficits worsened from 2000 to 2010 as current account balances plunged by more than 300 percent, on the average (See Figure 2)[4]. These facts indicate at the minimum that the anticipated benefits from the devaluation did not fully materialize.

Monetary authorities and proponents may contend that they correctly pinpointed the existence of misalignments in the union. Yet, current stylized facts suggest that the policy-action taken has not corrected these existing misalignments.It may rather be argued that this

[1] The franc zone is composed of 15 countries divided into 3 monetary regions: i) the West African Economic and Monetary Union (UEMOA) with 8 countries; ii) the Central African Economic and Monetary Community (CEMAC) with 6 countries, and iii) the Comoros Islands, which represents the 15th country.
[2] The treaty establishing the UEMOA came into force on August 1, 1994, with 7 member states. On May 2, 1997, Guinea-Bissau joined the *Union* boosting its total membership to its current level of 8. All countries in the UEMOA share a common currency called the CFAF. The fixed rate is currently 1EUR=655.957 XOF, as of April 2012. XOF is the international currency code for the CFAF.
[3] Figures are computed using data from the UNCTADstat, published by the United Nations Conference on Trade and Development (UNCTAD).
[4] Figures are computed by the author using data from the *African Development Indicators* as published by The World Bank.

policy-action set up a macroeconomic environment that exacerbated these misalignments over time.

It is well documented in the literature that exchange rate misalignments can have profound effects on the economy. These effects are compounded when misalignments are high and persistent. Among other scholars, one recalls Koske (2008) and Giannellis & Papadopoulos (2007) who have investigated this topic. In an increasingly competitive international environment, it has become even more relevant for any country to implement macroeconomic policies that do not exacerbate these misalignments.

Developing countries in the UEMOA in particular should show a great deal of interest in the behavior of their effective exchange rates with respect to their long-run sustainable levels. As a matter of fact, the inexistence of a strong and diversified manufacturing base in these countries makes them exclusively reliant on imports to acquire the bulk of goods- both investment and consumption goods- needed to support their respective economies. Hence, an undervalued currency may increase the costs of these imports and feed inflationary pressures within domestic economies. On the other hand, an overvaluation of the currency may negatively affect these countries' exports, which are mainly composed of raw materials and minerals such as cotton, coffee, cocoa, livestocks and gold, among others.

As a result, conducting an inquiry into the potential existence of misalignments in the UEMOA, through an assessment of the dynamics in effective exchange rates vis-à-vis their long-term sustainable levels becomes a worthy exercise. This paper attempts to achieve this goal in order to provide a platform for decision-makers to better understand exchange rate misalignments and craft their policies accordingly. It will add to the literature where exchange rate misalignments in the franc zone in general have been sparslely examined. It will indeed complement research carried by scholars such as Coleman (2008) and Abdih & Tsangarides (2010) regarding this zone. The former study focuses on 12 countries taken from both the UEMOA and CEMAC, and it finds overall evidence of overvaluations of the real exchange rates in these countries. The latter analyzes the behavior of real exchange rates by considering the UEMOA and the CEMAC as regional blocs. In constrast with Coleman (2008), they find no strong evidence that real exchange rates are overvalued in these two blocs.

The hallmarks that set this paper apart from others are threefold. First, we exclusively devote attention to the 8 member countries in the UEMOA taken individually. The dynamics in the effective nominal rates in each country is hence discussed separately. Second, no study, to the best of our knowledge, has considered the nominal effective exchange rates in these countries. There is a growing pool of studies and scholars along with politicians in the UEMOA that are questioning the current monetary arrangements that date back to the pre-independence era[5]. It thus becomes relevant to explore whether or not there are misalignments in the nominal effective rates by estimating the sustainable levels of these rates for each of these economies. At last, the current paper considers the post-devaluation era, which facilitates and sheds light on the debate about the impacts of that devaluation on these countries' nominal effective rates.

This paper examines the long-run dynamics of nominal effective exchange rates in each of the 8 member countries of the UEMOA to investigate the existence and the extent of potential misalignments. Focusing on the post-devaluation era, we expose that the nominal effective exchange rates of all countries are significantly misaligned with respect to their sustainable levels. The largest country of the union, Côte d'Ivoire, is the only country whose nominal effective exchange rate exhibits signs of convergence towards its long-run rates[6]. Besides, this country has on the average experienced the lowest degree of misalignments throughout the post-devaluation era. This finding signals that except for Côte d'Ivoire the devaluation of January 1994 has not alleviated, but has rather accelerated, misalignments in most countries. One may consequently question the soundness of the economic rationales behind the decision to devalue the CFAF as well as the sustainability of the union in view of the substantial misalignments experienced in most countries.

The remainder of the paper is organized as follows. A brief overview of key estimation techniques of equilibrium exchange rates is discussed in the next section. The methodology is presented in section 3. Data are presented in the fourth section, while results and implications are discussed in section 5. At last, section 6 offers some concluding remarks.

[5] 1945.
[6] In Benin, the PEER points to a low degree of misalignments, while the BEER indicates otherwise- that is, a high degree of misalignments.

2.0 Review of Relevant Literature:

Studies about the determination of equilibrium exchange rates in a given economy have been conducted by a host of scholars in the literature. There exists a variety of estimation methods for these long-run rates, and these methods have been applied to both developing and developed countries. In Africa, very few studies have been completed. Saayman (2007) and MacDonald & Ricci (2004) have analyzed the equilibrium real exchange rate in South Africa. The former article focuses on the real equilibrium exchange rate of the South African rand (SAR) with respect to the United States dollar (USD). The methodological approach used is in accordance with the behavioral equilibrium exchange rate (BEER), which identifies a set of key factors that would determine the movements of the equilibrium exchange rate over time. Three distinct measures of real exchange rates are computed using (i) consumer price indices, (ii) prices of tradable and non-tradable goods and (iii) labor costs. From 1978 to 2005, results indicate the existence of misalignments in the SAR real exchange rate. Specifically, estimations using (ii) and (iii) show that the SAR was overvalued from 1980 to 2005, in general. However, (i) points out that the SAR was undervalued from 1985 to 1987 and from 2000 to 2005, and overvalued the rest of the time. The latter article follows the BEER approach and uses the real effective rate. It discovers that the real exchange rate of South Africa, with respect to its main trading partners, was close to equilibrium in the first half of the 1990s. It exposes on the other hand that the currency experienced a misalignment that was more distinct from 1995 through 2002:Q1.

In Botswana, Iimi (2006) considers a similar approach with a BEER and the real effective exchange rate of the Pula, Botswana's national currency. It was found to be mostly undervalued in the second half of the 1980s and overvalued from around 1996 till the end of the estimation period in 2004.

In the western and central regions of Africa, Abdih & Tsangarides (2010) explore the long-run values of real effective exchange rates in the UEMOA and CEMAC. They use a fundamental equilibrium exchange rate (FEER) model that includes terms of trade, government spending, openness, productivity and investment as fundamentals. With the Johansen cointegration technique and data covering the 1970-2005 period, they find no strong evidence that the currencies in these two monetary regions were overvalued (nor undervalued) at the end of the study period. This suggests that there is currently no significant misalignment of the real effective rate as of 2005.

Coleman (2008), to continue, uses seemingly unrelated regressions equations (SURE) estimation techniques to assess the misalignments of real exchange rates in 12 member countries of the franc zone. Findings reveal that real exchange rates remained overvalued in the three largest economies- Côte d'Ivoire, Cameroon and Senegal- prior to the 1994 devaluation. Only in the largest country of the panel was there equilibrium in 1994. However, further evidence show that the impacts of this devaluation on real exchange rates in the three largest economies were temporary as the rates displayed a tendency to revert to their pre-devaluation overvalued levels. Among other results found, the paper detected that the uniform 1994 devaluation led to a significant undervaluation in the majority of member states. In other words, the uniform devaluation caused a great deal of misalignments in real exchange rates for most countries in the zone.

In Asia, Couharde & Coudert (2004) address the interrogation regarding whether the Chinese renminbi is undervalued. Their assessment uses both level and panel cointegration techniques on the real exchange rate in an FEER framework to uncover that the renminbi's real effective exchange rate was undervalued between 2002 and 2005. On the other hand, they contend that a revaluation of the renminbi in an attempt to correct for the US external deficit will have a limited effect.

In another Asian country, the Malaysian ringgit has been the center of a study conducted by Koske (2007). She comparatively employs both the BEER and the FEER approaches to estimate the equilibrium values for the ringgit in effective terms. Both the BEER and FEER approaches point out that the real effective exchange rate was overvalued- therefore misaligned- before the 1997/1998 Asian crisis. However, evidence show that the rinngit was consistent with its fundamentals by 2001, while a "slight" undervaluation was found to be in order in 2005[7].

Hallett & Richter (2004) use an FEER approach to determine the equilibrium exchange rate for the US dollar and other key currencies, namely the Canadian dollar, the Mexican pesos and some major Asian currencies. They find that the US currency is misaligned and that an adjustment is necessary for the country to correct for its foreign liabilities. However, they warn that for a complete success of this process, other countries such as Canada, Mexico and some Asian countries (Japan, China, Taiwan and Malaysia) would have to concurrently implement adjustments in their respective exchange rates as well.

[7] For further studies about effective exchange rate misalignments in Eastern Europe and EMU countries, see Giannellis & Papadopoulos (2007), Rubaszek & Rawdanowicz (2009) and Dumitrescu & Dedu (2009).

3.0 Survey of estimation techniques for equilibrium exchange rates

A vast collection of studies in the literature discusses estimation techniques for equilibrium exchange rates. It is a testament to the importance of this topic in macroeconomics and international economics. In general, one identifies 4 main methodological approaches in the determination of long-run exchange rates of a country or group of countries. These are the behavioral equilibrium exchange rate (BEER), the permanent equilibrium exchange rate (PEER), the fundamental equilibrium exchange rate (FEER) and the desired equilibrium exchange rate (DEER).[8] Among these approaches, the BEER, PEER and FEER remain the most commonly used.

The BEER framework was first introduced by Clark & MacDonald (1998)[9]. The underlying concept about this framework is to determine the long-run equilbrium relationship between the actual real exchange rate and its determinants. Among other determinants, the authors use the interest rate differential, trade openness, relative price of non-traded to traded goods along with the net foreign assets. It is noteworthy that the introduction of the interest differential in this framework emanates from the uncovered interest rate parity theory, which is the cornerstone of this approach. Scholars such as Baffes et. al. (1997) and Clark & MacDonald (2000) have provided comprehensive studies regarding this method.

Similar to the BEER, the PEER aims to assess the behavior of the exchange rate based on a set of determinants. Once a long-run relationship is established, the dynamics of the exchange rate are broken down into transitory and permanent components. The latter components are then extracted to account for the PEER. The BEER and the FEER are the focus of the present study and further discussions about these approaches are provided in the next section.

The FEER approach is also referred to as the current account approach. It determines the equilibrium exchange rate by setting up a general or partial macroeconomic model. Williamson (1985, 1994) introduced this method which considers the current account target that makes internal and external macroeconomic balances sustainable over the medium to

[8] A fifth approach could be the natural real exchange rate (NATREX). But it is overllooked in this discussion because of its close similarities to the FEER.

[9] A scholar such as Koske (2007) attributes the parternity of the BEER approach to Clark and MacDonald (1998). However, Baffes et. al. had already laid out the groundwork for this method in a study conducted in 1997.

long-run. The exchange rate that ensures such sustainability in internal and external macroeconomic balances is called the equilibrium exchange rate.[10]

With the DEER methodology, a partial macroeconomic equilibrium framework is estimated. Bayoumi et. al. (1994) have conducted an extensive study using this method. The main feature of this approach is that it estimates the exchange rate which is consistent with the "desired" internal and external balances (Saayman, 2007).[11]

4.0 Methodology

To determine the long-run equilibrium levels of effective exchange rates for UEMOA member countries, the methodology considered in this paper follows two distinct approaches: the behavioral equilibrium exchange rate (BEER) and the permanent equilibrium exchange rate (PEER). The literature includes a variety of techniques for the estimations of long-run equilibrium real exchange rates. Each approach presents its set of assumptions along with strengths and weaknesses. We use the nominal effective exchange rate (NEER) of UEMOA members contrary to previous studies that have considered the real effective exchange rate (REER).

The Behavioral Equilibrium Exchange Rate (BEER) and the Permanent Equilibrium Exchange Rate (PEER).

The BEER approach estimates the long-run equilibrium exchange rate by identifying the determinants of the exchange rate in a given economy. A key assumption with that approach is that these determinants, also called fundamentals, mostly or entirely drive the dynamics in the exchange rate both in the short- and long-run. Hence, the robustness of its results hinges on the researcher's ability to appropriatetly single out these fundamentals. Otherwise, spurious results are highly likely. On the other hand, the equilibrium is determined empirically, based upon the set of explanatory variables identified as determinants of the exchange rate (Clark & MacDonald, 1998).

Following in the footsteps of the seminal works by Clark and MacDonald (1998, 2000), we develop a model that uses the interest rate parity theory and accounts for the

[10] Further analysis involving the FEER were undertaken by Isard & Faruqee (1998), Clark & MacDonald (1998), and Wren-Lewis & Driver (1992), among others.
[11] Church (1992) deserves consideration for further discussions about the DEER.

presence of risk by including a risk premium. Accordingly, the baseline model is modified as follows:

$$E_t[\Delta NEER_{t+k}] = -(R_t - R_t^*) + \rho_t \qquad (1)$$

where NEER is the nominal effective exchange rate; R_t is a measure of the nominal interest rate in the domestic economy; R_t^* is a measure of the nominal interest in the world and ρ_t captures the risk premium. E_t and Δ are the conditional expectation and first-difference operators, respectively.

By assuming that ρ_t has a time-varying component and solving for the equilibrium NEER, n_t, Equation (1) becomes[12]:

$$n_t = E_t[n_{t+k}] - k(R_t - R_t^*) + k\rho_t \qquad (2)$$

Equation (2) indicates that the equilibrium NEER is a function of (i) the rational expectations formed by economic agents about the future values of the NEER; (ii) the nominal interest rate differential, and (iii) the risk premium. In other words, the exchange rate at time t depends on both the anticipated values of this exchange rate- that is, $E_t[n_{t+k}]$- and a set of contemporaneous factors (CONT)- namely, interest rate differential and the percieved risk associated with the domestic economy at that point in time. The former represents the long-run equilibrium value (LREV) of the exchange rate which is assumed to be the product of a vector of economic fundamentals. Thus, Equation (2) can be rewritten in the following format:

$$n_t = LREV_t + CONT_t \qquad (3)$$

Based on the structure of economies in UEMOA member countries and previous studies in the literature (See among others Abdih, 2010; Coleman, 2008; Saayman, 2007), we consider a vector of 5 economic fundamentals for LREV:

(i) Terms of trade (TOT). The exchange rate literature touches on the relevance of the international TOT in determining the exchange rate (e.g., Doroodian et. al., 2002). Indeed, changes in relative price of a country's imports and exports affect the supply and demand of domestic currency, which in turn may affect the nominal effective exchange rate. In addition, the TOT captures the effects of potential external imbalances experienced by a country. It hence accounts for the effects of the international trade on the exchange rate. On the other hand, its net impacts on exchange rate remain ambiguous. It will depend on the extent of the substitution and income effects. Any improvement in TOT generates a substitution effect

[12] Equation (2) is in line with Giannelis & Papadopoulos' (2007) findings with the key difference that it does not include a risk premium.

which causes an appreciation in the home currency, while the income effect that follows that appreciation has a tendency to depreciate it.

(ii) Relative price of non-tradable to tradable goods (PNTT). Productivity differences between the tradable and non-tradable sectors of a given economy may result in changes in the exchange rate. This is referred to as the Balassa-Samuelson effect. In his well-known reappraisal of the purchasing power parity doctrine, Balassa (1964) explains that technological progress of a country relative to another will lead to an appreciation in the real exchange rate of the former. This appreciation is the result of an increase in the price level following productivity gains. Many scholars have altered the original form of this theory to expand its application to sectors within a country and between countries. Under this expanded version, PNTT may prove useful in capturing both internal and external asymmetric shocks affecting productivity (Coleman, 2008). Shocks to productivity may ultimately impact a country's LREV of exchange rate in effective terms. This constitutes a departure from the current literature on equilibrium nominal exchange rate which overlooks this fact- e.g., Giannellis & Papadopoulos, 2007. Indeed, an increase in the price level- following a positive productivity shock, for instance- is expected to cause depreciation in the effective nominal exchange rate of a small-open economy as the domestic country loses competitiveness.[13]

(iii) Net foreign assets (NFA). In an open economy, capital movements remain essential in affecting the exchange rate both in the short- and long-run (Clark and MacDonald, 1998; Iimi, 2006; Koske, 2008; among others). To account for this fact, NFA is included rather than (gross) foreign assets holdings[14]. Indeed, this approach has the advantage of capturing the impacts of both the inflows and outflows of capital on the exchange rate. It addresses the relationship between the external position of a country and its exchange rate. Ambiguity rests however on the sign of this determinant as a positive NFA is expected to depreciate the domestic currency, while a negative NFA will cause an appreciation.

(iv) Trade Policy (TPOL). It is included to assess the effects of a country's trade policy on exchange rate. Also, it captures the openness of a country to trade. The common precept is that a restrictive trade policy- for instance, with high tariffs- will place an upward pressure on the value of the domestic currency vis-à-vis its main trading partners. On the

[13] In the present analysis, we assume that each of the UEMOA member countries is a small open-economy.
[14] Giannellis & Papadopoulos (2007) limit their study to domestic holdings of foreign assets, overlooking thereby the potential effects of capital inflows on exchange rate.

contrary, a more open economy with few barriers to entry is expected to experience a depreciation of its currency with respect to its main trading partners. A note of caution is nonetheless warranted regarding these expectations. Indeed, a weak substitution effect, or an absence thereof, following an increase in import tariffs will create the opposite or no effects on the effective exchange rate. That is, ambiguity remains a possibility.[15]

(v) Investment (INV). This analysis considers investment to control for factors driven by the supply-side of the economy. This is meant to capture the intertemporal effect of capital formation on exchange rate (Edwards, 1989b, p. 37). The capital stock at a specific point in time is the result of investment made in the previous period. Investment can impact exchange rate ex-post through a potential increase in productivity. An appreciation of effective exchange rate is to be expected due to likely improvement in competitiveness.[16]

The CONT component in Equation (3) takes into account two variables representing the interest rate differential (IRD), R-R*, and the risk factor (ρ). IRD is instrumental as a determinant of n_t and the theoretical rationale for it is widely discussed in the literature.[17] In an environment with free capital movement any persistent interest rate differential between two partners or trading blocs will provide incentives for arbitrage to make financial gains. These arbitrage activities will in turn drive the (effective) exchange rate towards its equilibrium value. This fact is highlighted in this study by considering the interest rate differential between UEMOA member countries and the group of five main trade partners (M5) for each country. At last, the risk factor is not overlooked as an increased in perceived risk for a given country may hinder the inflow of capital, which may affect the effective exchange rate.

In light of this discussion, Equation (3) becomes:

$$n_t = f(TOT, PNTT, NFA, TPOL, INV, IRD, \rho) \qquad (4)$$

Based on Equation 4, we empirically estimate the equilibrium nominal effective exchange rate using the co-integration procedure as developed by Johansen (1988, 1991) and Johansen & Juselius (1990). The immense appeal of this procedure has made it one the most

[15] See Edwards (1989a, p. 51).
[16] To check for potential interactions bewteen PNTT and INV, an interaction term was included in the empirical model. It is removed in the final draft as it appears insignificant and had only marginal impacts on the explanatory power of the baseline model. Results are available from the author upon request.
[17] See Iimi (2006) and Giannellis & Papadopoulos (2007), among others.

commonly applied technique in modern economic literature, especially in investigations involving the determination of equilibriums given a set of variables.

A reduced-form of Equation (4) is derived using vector autoregression (VAR):

$$Q_t = \Phi_1 + \sum_{i=1}^{k} \Phi_{2i} Q_{t-i} + \varepsilon_t \quad (5)$$

where Q_t is an (8x1) vector of macro-variables such that $Q'_t = [n_t, TOT_t, PNTT_t, NFA_t, TPOL_t, INV_t, IRD_t, \rho_t]$; Φ_1 is an (8x1) vector of constants; k is the lag length; Φ_{2i} is an (8x8) vector of coefficients associated with Q_t at the i-th lag, and ε_t is an (8x1) vector of independent, identically and normally distributed white noise disturbances.

A first-difference specification of Equation (5) is obtained:

$$\Delta Q_t = \tilde{\Phi}_1 + \sum_{i=1}^{k-1} \tilde{\Phi}_{2i} \Delta Q_{t-i} + \Theta Q_{t-1} + \tilde{\varepsilon}_t \quad (6)$$

where Δ is the first difference operator; $\tilde{\Phi}_1$ is an (8x8) matrix of constants; $\tilde{\Phi}_{2i}$ is an (8x8) matrix of coefficients; Θ is defined such that $\Theta = \left[\sum_{i=1}^{k} \Phi_{2i} \right] - I$, and $\tilde{\varepsilon}_t$ is an (8x1) vector representing white noise distubances[18]. I is the (8x8) identity matrix.

At this stage, the rest of the empirical work hinges on the rank (r) of Θ. Indeed, as explained by Johansen & Juselius (1990), no co-integration vector exists for the variables composing Q_t, if r=8 or r=0. That is, there is no long-run relationship between the macro-variables. In such a case, a vector error correction model (VECM) cannot be defined. However, if 0<r=p< 8, then p is the number of cointegrating vectors between the 8 macro-variables, and a VECM can be derived as:

$$\Delta Q_t = \tilde{\Phi}_1 + \sum_{i=1}^{k-1} \tilde{\Phi}_{2i} \Delta Q_{t-i} + \alpha \beta' Q_{t-1} + \tilde{\varepsilon}_t \quad (7)$$

where two (8xp) matrices, α and β, may be derived in such a way that Θ = α x β'. More specifically, α is a matrix that accounts for the different weights associated with each of the p cointegrating vectors. It captures the speed of adjustment towards the long-run equilibrium. On the other hand, the matrix β includes the cointegrating vectors, which denotes the long-run coefficients.

Once the existence of at least one long-run relationship among macro-variables is established, it is possible to break down the dynamics toward this long-run equilibrium into

[18] These disturbances are also independent, identically and normally distributed.

permanent (common trends) and transitory (common cycles) components. Using the matrix β, we compute the BEER and PEER estimates. The former is obtained by extracting the smoothed series of fundamentals, while the latter is derived by using the permanent component of these fundamentals. Finally, BEER and PEER-based estimates are compared with the actual values to figure out the existence or not of any misalignments.

5.0 Data

The dataset is balanced and covers the UEMOA's 8 member countries throughout the post-devaluation era, 1995-2010. Three main sources have been used in the collection of all data. First, the *International Financial Statistics (IFS),* published by *the Internationl Monetary Fund (IMF),* was the source for:

- nominal exchange rates, which are used in calculations for nominal effective exchange rates (NEERs);
- the interest rate differentials (IRDs);
- investments (INVs), measured by gross formation of fixed capital;
- net foreign assets (NFAs);
- consumer price indexes (CPIs), and
- gross domestic products (GDPs)
- relative prices of nontradables to tradables (PNTTs)

Second, the online database *(UNCTADstat)* by the *United Nations Conference on Trade and Development (UNCTAD)* was the main source for:

- the relative trade weights, which are also used in calculations for NEERs;
- terms of trade (TOTs)
- trade policies (TPOLs), proxied by trade openness.

At last, the risk factor is measured by the *corruption perceptions index* (CorrPI), as published by *Transparency International*.

6.0 Results and discussion

The first step toward the estimations of BEER and PEER is to check for the order of integration of all series for each country. Unit roots tests are therefore conducted using both the Augmented-Dickey Fuller (ADF) (1979, 1981) and the Phillip-Perron (PP) (1988) tests. Results are reported in Table 1.

In Burkina Faso, Côte d'Ivoire, Guinea-Bissau, Mali, Niger, Senegal, Togo, all series are found to be I(1). For these 7 countries, both the ADF and PP indicate the presence of unit roots for all series, except for Côte d'Ivoire, Guinea Bissau and Niger where only the ADF

indicates the presence of unit roots. This indication only concerns NFA (in natural logarithms) for both Côte d'Ivoire and Niger, and PNTT (in natural logarithms) for Guinea Bissau. There is only one country, Benin, which stands in contrast to others. There is one series- IRD- where both the ADF and PP tests point out the absence of unit roots, meaning that the series is I(0). However, all other series for this country are I(1). Overall, this single "outsider" hasn't affected in any significant way the estimations results.

After establishing that all series for each country are I(1), with the exception of only one series which is I(0), we proceed to our next step to determine whether the series are co-integrated for each country using the Johansen's Trace and max-eigenvalues tests. Results catalogued in Table 2 suggest that there is at least one co-integration vector in all series for each of the 8 countries in the UEMOA. Countries such as Côte d'Ivoire and Mali display as many as 6 vectors. Other countries, like Benin, Guinea-Bissau and Togo, have as many as 5 co-integrating relationships. These findings clear the way for the determination of the β and α' coefficients as described in Equation (7). The long-run relationship coefficients and the associated speeds of adjustment are summed up in Tables 3 and 4, respectively. Standard errors are listed in brackets.

The terms of trade prove to be statistically significant in all but one country- Guinea-Bissau. Results denote that an improvement in the terms of trade precludes an appreciation in nominal effective exchange rates (NEERs) for all but two countries- Côte d'Ivoire and Burkina Faso. Comparable results were found in other parts of Africa such as Botswana (Iimi, 2006), UEMOA (Abdih & Tsangarides, 2010), and Eastern and Central Europe (Giannellis & Papadopoulos, 2007). This finding reveals that the substitution effect dominates the income effect in these economies. However, in Côte d'Ivoire and Burkina Faso, any improvement in the terms of trade leads to depreciation in the NEERs as the income effect appears dominant. The appreciation in NEER is respectively 0.56, 0.24, 0.06, 0.12, 0.29 and 0.17 percent for Benin, Guinea Bissau, Mali, Niger, Senegal and Togo, following an increase in the terms of trade by one percent. Additionally, the depreciation is about 0.16 and 1.19 percent for Burkina Faso and Côte d'Ivoire, respectively, as a result of a

unit percent increase in the terms of trade. Saayman (2007) found similar results as in the case of the SAR vis-à-vis the USD[19].

As expected, an increase in the price of nontradables to tradables leads to depreciation in the NEER. This result applies to all countries excepting Guinea Bissau where an appreciation takes place. The variable meant to capture the Balassa effect remains significant in all countries. As far as net foreign assets are concerned, only three countries are signed in accordance with economic theory. These three countries- namely Benin, Guinea Bissau and Niger- experience a depreciation in the NEER when net foreign assets increase. To the contrary, an appreciation in the NEER is noticed in the other five countries- Burkina Faso, Côte d'Ivoire, Mali, Senegal and Togo. Considering the fact that the impacts of net foreign assets is negligible at best, we re-assessed the baseline model without it and our findings were unaltered in a significant way as all other signs remained the same and estimates were overall unchanged, throughout the third decimal place.

Trade openness is significant in all but two countries- Burkina Faso and Togo. In five countries, an economy with a more open trade policy experiences a depreciation in its NEER as contended by economic theory. However, in three countries- Mali, Senegal and Togo- estimates do not corroborate the theory.

The interest rate differential carries the appropriate negative sign in Mali, Niger, Senegal and Togo. As a matter of fact, the higher the domestic interest rate relative to the foreign interest rate, the higher the inflow of capital. Hence, an appreciation in the NEER is expected. This finding is consistent with Saayman (2007) and Iimi (2006) who found similar results for South Africa and Botswana, respectively.

A positive sign is detected in Benin, Burkina Faso, Côte d'Ivoire and Guinea- Bissau which implies that a depreciation takes place as domestic interest rate increases, ceteris paribus. A more likely rationale behind this depreciation may be derived from the fact that economic agents' decisions remain unaffected by higher domestic interest rate due to lack of confidence or increased uncertainty in the domestic economic environment. Indeed, Burkina Faso and Benin, for instance, are close economic partners to Côte d'Ivoire. This country went

[19] It is noteworthy that although that Iimi (2006), Abdih & Tsangarides (2010), Saayman (2007) actually considered the real effective exchange rate (REER), the underlying rationales do apply to changes in the NEER as well.

through a near decade-long political crisis, 2002 to 2011, which negatively affected the economies of these countries.

The corruption perceptions index is significant in four countries- Benin, Mali, Senegal and Togo. Of these four countries, it is correctly signed with the exception of Togo. Indeed, a country with a high corruption perceptions index is seen as a "clean" country. This fact provides in turn a safe environment for foreign investment. An inflow of capital puts an upward pressure on the currency creating thereby an appreciation.

An analysis of data reported in Table 4 brings valuable insights about the speeds of adjustment of NEERs toward their equilibrium levels when deviations occur. In Benin, Burkina Faso, Côte d'Ivoire, Guinea-Bissau and Niger, estimates respectively indicate that on average 37, 10, 5, 4 and 35 percent of gaps are eliminated quarterly. It appears that the adjustment is the fastest in Benin and Niger and the slowest in Côte d'Ivoire and Guinea-Bissau. For other countries- Mali, Senegal and Togo- estimates suggest that the actual NEERs will diverge from their equilibrium values on average by 11, 13 and 16 percent in a quarter, respectively.

Equilibrium Effective Exchange Rates

In the final step of our discussion, we focus our attention on the BEERs and PEERs in UEMOA member countries. BEERs are derived using the coefficients obtained in Table 3 along with the smoothed series of each fundamental. PEERs are constructed by considering the permanent components of series of fundamentals only. In the latter approach, the decomposition of these series into permanent and transitory components is completed with the Christiano-Fitzgerald random walk band pass filter.[20] An attractive feature of this method is the random walk specification that represents an improvement on the Hodrick–Prescott (1997) filter when applied to quarterly data (Christiano & Fitzgerald, 2003). In addition, there is no loss of data as with the Baxter-King (1999) method[21]. Once the BEERs and PEERs are extracted, misalignments are calculated by taking the deviation of actual NEERs from the sustainable levels of NEERs as derived through the BEER approach (BEER-based) or PEER

[20] In the econometrics literature, one generally denotes 4 main filtering methods: the Hodrick–Prescott (1997) filter, the Baxter–King filter, the Christiano-Fitzgerald (2003) random walk band pass filter and the Butterworth (1930) square wave high pass filter. For the latter, extensive work has recently been conducted by Pollock (2000).

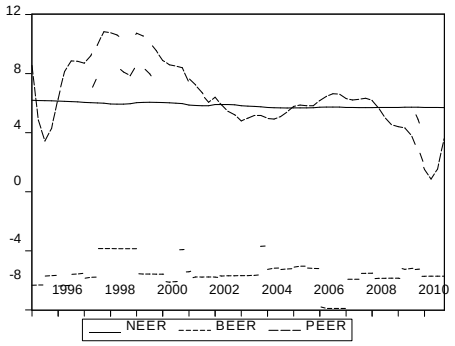
[21] See Baum (2006) for extended discussions about these filters, their weaknesses and strengths.

approach (PEER-based). Thus, a negative (positive) value will imply an undervaluation (overvaluation) of the CFAF.

Benin

Figure 1

Effective Exchange Rate



Misalignment

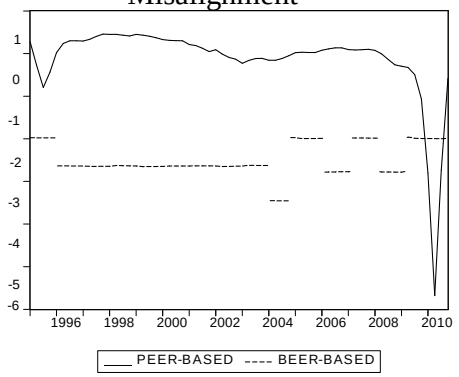


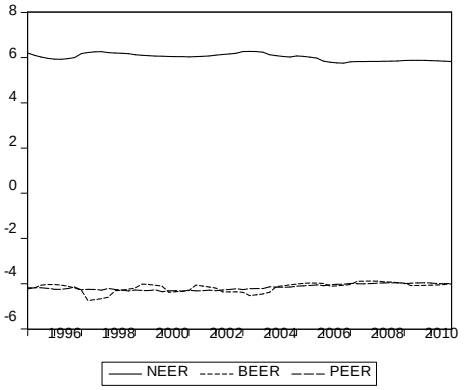
Figure 1 reveals that, in the year following the 1994 devaluation, the CFAF remained undervalued according to the PEER-based measurement. This finding indicates that the 100 percent devaluation had little impacts, if any, on bringing the effective rates to par with the sustainable PEER level. It appears as well that the CFAF was overvalued from 1996 to 2002 followed by a brief period of undervaluation from 2002 to 2005. However, a sharp decline (undervaluation) is observed starting around the second quarter of 2008. On the other hand, the BEER-based measurement consistently suggests that the CFAF has been an undervalued currency over the post-devaluation era.

Overall, evidence suggests that the CFAF has been an undervalued currency since 1995. The extent of this undervaluation averages 200 percent according to the BEER, while the PEER signals a modest 12 percent for Benin. A close look at this country's trade balance highlights the fact that it is largely a net importer of manufactured goods- investment and consumption goods- suggesting that an appreciation in the long run effective rate would be warranted in an attempt to make imports relatively cheaper (See Tables 5 and 6).

Burkina Faso

Figure 2

Effective Exchange Rate



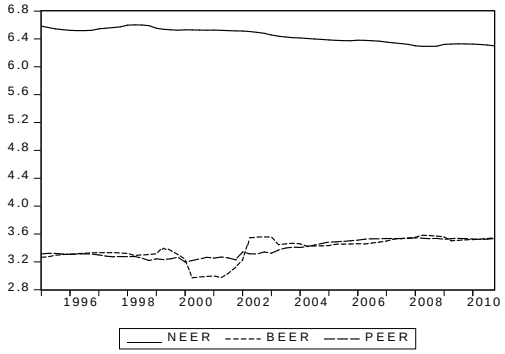
Misalignment

Figure 2 points out the existence of a persistent and high undervaluation for the CFAF in Burkina Faso. Both the BEER and PEER indicate that a realignment of the exchange rate of Burkina Faso through an appreciation is necessary. An examination of the trade balance for this country is eloquent in two ways. First, it has run a trade deficit averaging in the neighborhood US$600 million since 1990. This figure is even higher, roughly US$669 million, over the post-devaluation period, 1995-2010, compared to about $379 million in the (few) years preceding the 1994 devaluation (See Table 5). Second, this deficit topped 16 percent of GDP in the post-devaluation era (See Table 6). The importance of this share provides the economic rationale to justify the need for an appreciation as found in this study. On the surface, this finding may seem at odds with conventional discourses on exchange rates in the UEMOA. However, when one considers the facts that the country (i) has a very small manufacturing base, (ii) primarily exports raw materials (cotton, for instance) and livestocks, and (iii) has no control on commodity prices, it becomes apparent why an appreciation would be in order for the nation.

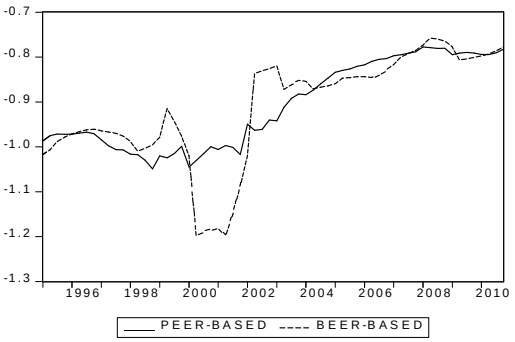
Côte d'Ivoire

Figure 3

Effective Exchange Rate



Misalignment

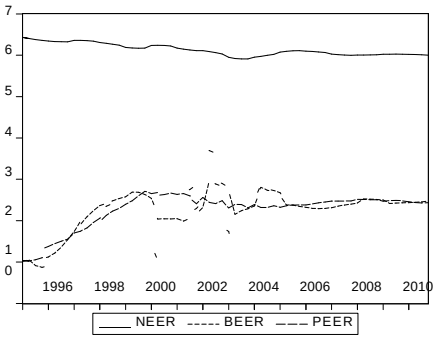


In the largest economy of the UEMOA, results denote an undervaluation of the currency, but the observed trend hints at a convergence towards the sustainable level of the exchange rate, according to the BEER and BEER,. This is the only country in the UEMOA that has had a trade balance with a surplus over the period of study (See Table 5). On the average, the average misalignment in this country is not as marked as in the previous two countries. Contrary to other countries in the union, it is the only one that presents a positive current account balance over the period of study (See Figure 2).

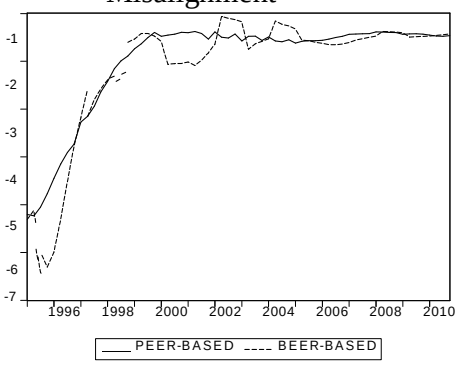
Guinea-Bissau

Figure 4

Effective Exchange Rate



Misalignment



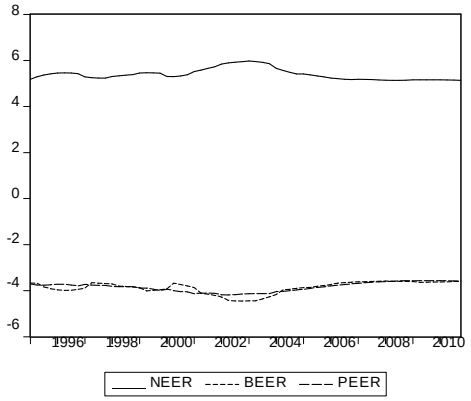
A misalignment of the CFAF does exist for Guinea-Bissau. A convergence toward the long-run equilibrium level is observed from 1995 to 2000 where it appears to stagnate afterwards. An explanation of this observation could be derived from an analysis of the patterns of trade balances for this country (See Figure 1). As a matter of fact, its trade deficit dipped by 41 percent in the year following the devaluation of the CFAF. Then, the trade balance started to improve with a shrinking deficit that remained relatively low until 2006.

Moreover, the current account showed comparable movements with a deficit that worsened by 25 percent before starting a recovery that collapsed in the 2000s. These episodes are globally captured by both the BEER and PEER as they indicate a convergence at first followed by a plateau.

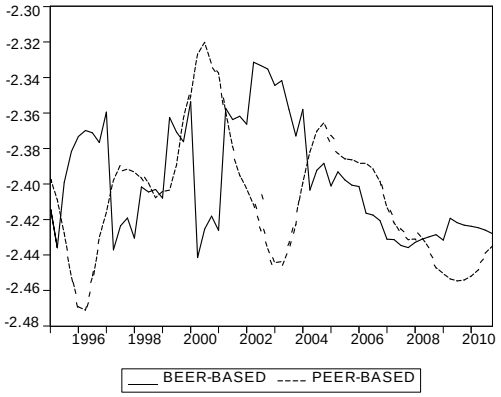
Mali

Figure 5

Effective Exchange Rate



Misalignment

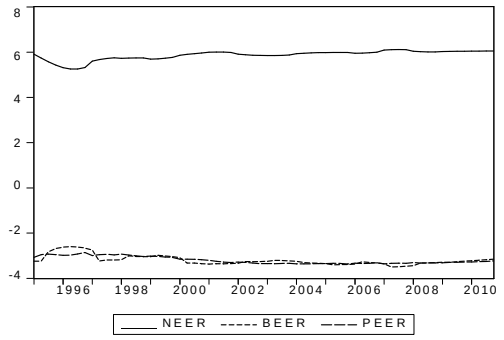


The nominal exchange rate is undervalued and the long-run trend indicates a movement away from the equilibrium effective exchange rate. In other terms, Mali is expected to experience a worsening of misalignments in its effective exchange rate. Another revealing finding is that on the average the trade balance deteriorates with ever larger deficits (See Figure 1). Both the BEER and PEER are sending the same signals to decision-makers calling for a reassessment of the effective exchange rate to address these persistent misalignments.

Niger

Figure 6

Effective Exchange Rate



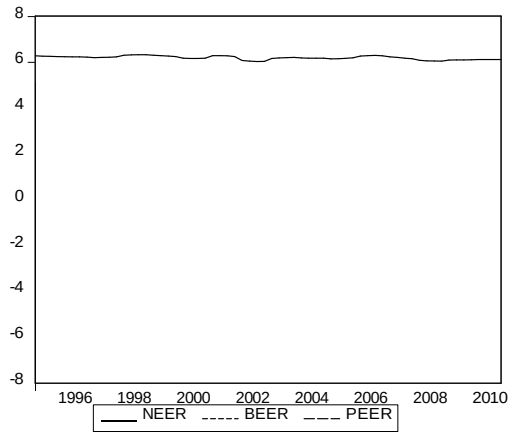
Misalignment

Figure 6 exposes the fact that there has been a lasting undervaluation of the effective exchange rate in Niger. From 1995 to 2007, the BEER presents evidence of an aggravating misalignment, while the PEER shows an improvement toward the equilibrium rate. Around 1997 until 2006, both the BEER and PEER illustrate a slight convergence toward the long-run equilibrium rate. However, this trend is sharply reversed starting in 2008. This trend is also mirrored through the trade balance that experiences a sharp drop as well. In this country the trade deficit has averaged 17 percent of GDP in the post-devaluation era.

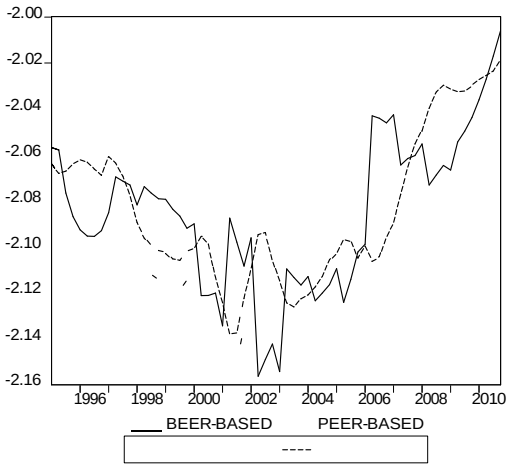
Senegal

Figure 7

Effective Exchange Rate



Misalignment

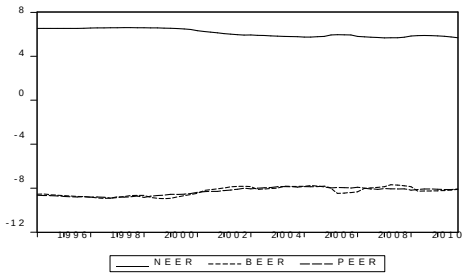


The misalignment is on the average less severe comparatively to Guinea Bissau, Mali and Niger. The undervaluation is accentuated from 1995 to 2001 as evidenced by both the BEER and PEER. From that year onward, the effective exchange rate has been steadily converging toward its equilibrium rate notwithstanding the fact that it has remained highly undervalued. It can be argued that the 1994 devaluation precipitated the misalignment in this country instead of correcting it as heralded by monetary and political authorities of the union. Additionally, it is noteworthy that the trade deficit averaged $1.5 billion over the period of study. This figure represents about 22 percent of the Senegalese economy- that is, the second largest share in the UEMOA (See Table 6). An appreciation in the exchange rate would therefore constitute a route to explore as it will help alleviate the burden of imports and improve the current account balance.

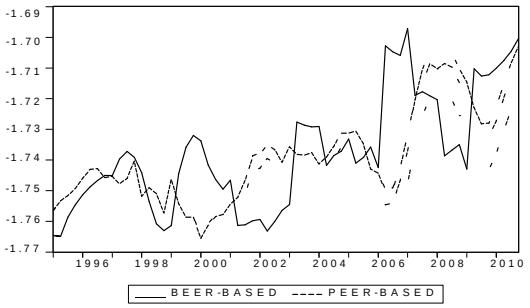
Togo

Figure 8

Effective Exchange Rate



Misalignment



The undervaluation is much less considerable in Togo compared to all other countries except for Côte d'Ivoire. One observes an upward trend towards the long-run effective rate starting in 1995. Togo exhibits the second lowest trade deficit in volume among all countries at about $384 million but ties Senegal with the highest share as a percentage of its economy at roughly 22 percent (See Table 5).

7.0 Conclusions

The present paper has investigated the nominal effective exchange rates of UEMOA member countries using the BEER approach followed by the PEER approach for a robustness check of our findings. Overall, it has underlined three main findings regarding nominal effective exchange rates in the union. First, the evidence consistently reveals that the CFAF is undervalued in every country, and the magnitude of this undervaluation has an average that tops 85 percent. This finding hints at the need for a reassessment of the value of this currency by monetary authorities- toward a revaluation- to correct for this persistent undervaluation. Attention should be drawn as well to the fact that the debt service for each country represents a massive burden on public finances, and a highly undervalued currency does nothing but compounds the matter because all debts are denominated in foreign currencies- namely, the US dollar or the Euro. Second, this study has provided elements of proof to cast doubt on both the success of the 1994 devaluation and the soundness of the premises that led to that policy-action in the first place. Indeed, trade balances in all countries but Côte d'Ivoire have rather worsened, not improved, in the post-devaluation era. Moreover, current accounts have experienced the same fate, with once more the notable exception of Côte d'Ivoire, the largest

country of the union. Third, on the sole basis of rationales used by authorities to justify this devaluation, it could be argued that the union has been split into two camps. On the one hand, we may single out a "winner"-Côte d'Ivoire- and on the other, there have been seven "losers"- Benin, Burkina Faso, Guinea-Bissau, Mali, Niger, Senegal and Togo- in the aftermath of this devaluation.

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Figure 1. Trade Balances of UEMOA member countries, 1995-2010 (in millions, current USD).

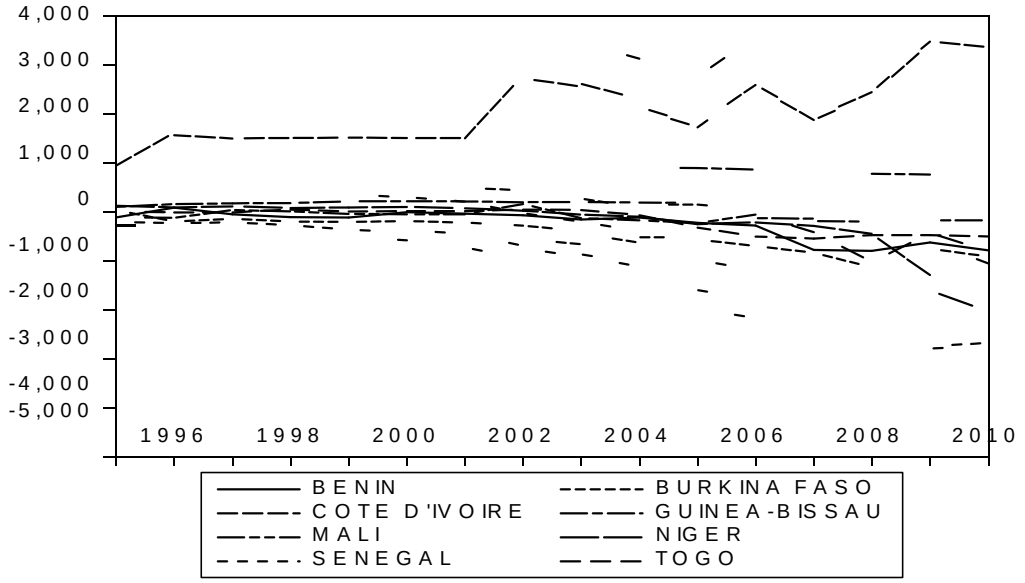
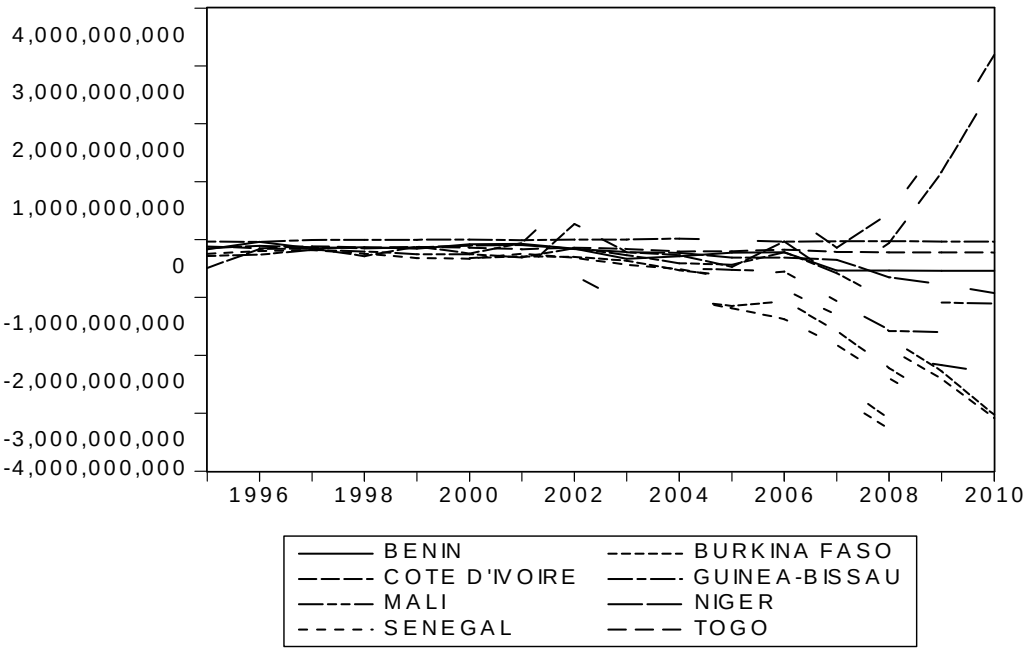


Figure 2. Current Account Balances of UEMOA member countries, 1995-2010 (current USD)[22].



[22] For Burkina Faso data were available from 2000 to 2010 only.

Table 1- Unit Root Tests

Benin	Level		First Difference	
Variable	ADF	PP	ADF	PP
NEER	-1.886	-1.910	-8.077***	-8.082***
TOT	-1.528	-3.409	-3.026**	-3.964***
PNTT	-1.700	-1.850	-3.467**	-3.543**
NFA	1.511	2.606	-3.600**	-3.658**
TPOL	-1.933	-1.933	-6.201***	-6.428***
INV	-1.088	-0.974	-6.422***	-6.111***
IRD	- 0.828**	-4.362***	…	…
CorrPI	-2.672	-2.852	-7.687***	-7.687***

Burkina Faso	LEVEL		First Difference	
Variable	ADF	PP	ADF	PP
NEER	-1.221	-1.840	-3.575***	-4.441***
TOT	-1.764	-1.804	-3.635***	-3.727***
PNTT	-0.798	-0.947	-3.020**	-4.072***
NFA	-2.131	-2.845	-2.879*	-5.115***
TPOL	-2.416	-2.529	-2.904*	-4.319***
INV	-1.452	-0.922	-2.654*	-4.619***
IRD	-2.051	-2.587	-2.547**	-5.138***
CorrPI	-0.612	-2.024	-3.070**	-4.670***

Côte d'Ivoire	LEVEL		First Difference	
Variable	ADF	PP	ADF	PP
NEER	-0.41417	-0.6807	-4.075***	-4.123***
TOT	-1.2101	-1.64729	-2.593*	-3.901***
PNTT	-1.57655	-1.50081	-2.642*	-3.911***
NFA	-2.5141	-4.140***	-4.766***	…
TPOL	-1.63001	-1.51523	-3.332**	-3.443**
INV	-2.7037	-1.06419	-2.039	-4.147***
IRD	-0.98546	-0.86102	-4.108***	-7.404***
CorrPI	-1.08105	-1.44544	-3.121**	-5.357***

Guinea-Bissau	LEVEL		First Difference	
Variable	ADF	PP	ADF	PP
NEER	-1.910	-1.48031	-3.745**	-6.615***
TOT	-0.816	-1.33394	-2.187*	-3.970***
PNTT	-0.424	-5.185***	-6.043***	…
NFA	-1.980	-1.41464	-3.181**	-4.318***
TPOL	-1.719	-1.54243	-2.389	-5.361***
INV	1.108	-2.5143	-9.353***	-4.722***
IRD	-3.695**	-2.31977	…	-4.860***
CorrPI	-0.343	-2.31858	-2.607*	-5.200***

Mali	LEVEL		First Difference	
Variable	ADF	PP	ADF	PP
NEER	-2.006	-1.657	-3.510***	-3.576***
TOT	0.332	-1.459	-2.421**	-3.225**
PNTT	-1.197	-1.127	-3.334***	-3.926***
NFA	-1.741	0.063	-3.947**	-4.292***
TPOL	-1.329	-1.826	-3.615***	-4.296***
INV	-1.38	-1.013	-3.237**	-3.284**
IRD	-0.807	-2.329	-1.606*	-5.045***
CorrPI	-2.211	-2.871	-7.323***	-4.783***

Niger	LEVEL		First Difference	
Variable	ADF	PP	ADF	PP
NEER	-2.24146	-1.507	-2.848*	-4.694***
TOT	-0.10002	-0.641	-3.336**	-4.149***
PNTT	-0.83377	-1.885	-4.404***	-4.720***
NFA	2.08368	6.817***	4.655***	…
TPOL	-0.57561	-1.591	-5.177***	-5.227***
INV	0.86805	1.241	-2.221**	-4.862**
IRD	-0.15241	-1.588	-2.851*	-4.917***
CorrPI	0.59419	-0.300	-2.013**	-4.308***

Senegal	LEVEL		First Difference	
Variable	ADF	PP	ADF	PP
NEER	-0.080	-2.509	-5.051***	-5.181***
TOT	-2.553	-1.448	-1.402	-0.825***
PNTT	-0.231	-1.323	-4.909***	-5.056***
NFA	0.993	0.874	-4.782***	-4.930***
TPOL	-1.951	-0.764	-4.001***	-4.457***
INV	-1.569	-2.084	-4.164***	-5.096***
IRD	-1.389	-2.326	-4.978***	-5.110***
CorrPI	-1.744	-2.539	-3.236**	-4.073***

Togo	**LEVEL**		**First Difference**	
Variable	ADF	PP	ADF	PP
NEER	-0.814	-0.747	-3.090**	-3.154**
TOT	-1.280	-1.764	-2.164*	-3.213***
PNTT	-1.638	-0.082	-3.450**	-4.197***
NFA	0.385	-1.005	1.609*	-1.437
TPOL	-0.629	-1.302	-2.934**	-4.335***
INV	-0.437	-0.758	-5.278***	-5.324***
IRD	-1.500	-1.564	-2.922**	-3.692***
CorrPI	-0.810	-1.291	-3.190**	-4.029***

Table 2- Cointegration Tests- Number of Cointegration vector(s)

	Trace	Max-Eigenvalue	Lag(s)
Benin	5	2	2
Burkina Faso	4	4	2
Côte d'Ivoire	6	6	2
Guinea-Bissau	5	5	2
Mali	6	1	2
Niger	2	1	1
Senegal	3	1	1
Togo	5	4	2

Table 3- Cointegration Estimates

	Benin	Burkina Faso	Côte d'Ivoire	Guinea-Bissau	Mali	Niger	Senegal	Togo
LnTOT	-0.560***	0.168*	1.196***	-0.248	-0.065***	-0.125***	-0.297***	-0.175***
	[-7.511]	[1.828]	[9.842]	[-1.425]	[-3.493]	[-5.492]	[-3.865]	[-3.965]
LnPNTT	1.178***	1.548***	0.671***	-0.729***	0.946***	0.604***	1.161***	1.694***
	[21.648]	[13.4036]	[5.27327]	[-5.302]	[126.828]	[29.307]	[9.72486]	[8.892]
NFA	0.001***	-0.001***	-0.001	0.007*	-0.001***	0.0001**	-0.0001***	-0.001*
	[6.802]	[-7.475]	[-1.276]	[1.80632]	[-14.155]	[2.609]	[-5.928]	[-1.947]
LnTPOL	0.043***	0.27539	0.485***	0.526***	-0.514***	0.673***	-1.062***	-0.3659
	[2.928]	[1.25]	[3.581]	[4.202]	[-32.193]	[7.241]	[-3.845]	[-1.404]
LnINV	-0.541***	-0.882***	0.065	0.349	0.355***	-0.193***	0.215*	1.306***
	[-4.631]	[-7.825]	[1.156]	[1.537]	[31.134]	[-5.898]	[1.862]	[9.965]
IRD	0.036***	0.185***	0.035**	0.662***	-0.024***	-0.029***	-0.069***	-0.020**
	[9.444]	[9.042]	[2.146]	[6.862]	[-11.383]	[-5.450]	[-8.054]	[-2.111]
CorrPI	-0.159***	-0.041	0.047	0.27	-0.030**	0.023	-0.120***	0.475**
	[-7.634]	[-0.751]	[1.156]	[0.782]	[-2.60294]	[0.58923]	[-3.309]	[2.602]
C	0.0732	-1.7186	-9.832	-8.349	-1.52594	-2.6675	-0.58195	2.1783

Table 4- Alpha Adjustment Matrix

	Benin	Burkina Faso	Côte d'Ivoire	Guinea-Bissau	Mali	Niger	Senegal	Togo
Ln(NEER)	-0.373**	-0.099	-0.051*	-0.04*	0.110	-0.350**	0.132	0.166**
	[-2.033]	[-0.819]	[-1.195]	[-1.962]	[0.731]	[-2.094]	[0.900]	[2.242]
Ln(TOT)	0.489***	-0.0915	-0.403***	-0.017	-1.098*	0.015	-0.052	-0.363
	[3.354]	[-1.256]	[-4.354]	[-0.416]	[-1.690]	[0.065]	[-0.481]	[-1.713]
Ln(PNTT)	-0.1415	-0.059	-0.039	0.246***	-0.609	0.113	-0.113	-0.161
	[-0.944]	[-0.638]	[-0.470]	[4.098]	[-0.621]	[0.381]	[-0.959]	[-1.794]
NFA	-134.67	1895.322***	-64.9	4.218	185.921**	283.118	-182.697	-0.429
	[-1.570]	[3.746]	[-0.628]	[1.368]	[2.194]	[0.700]	[-0.243]	[-0.097]
Ln(TPOL)	-0.8796	-0.036	-0.016	-0.149**	0.406	-0.145	0.059	-0.246
	[-0.892]	[-0.566]	[-0.215]	[-2.121]	[0.884]	[-0.840]	[1.411]	[-4.368]
Ln(INV)	-0.179***	0.232**	-0.111	0.0001	-0.268	-0.056	-0.107	-0.574
	[-2.709]	[2.379]	[-0.909]	[0.012]	[-0.667]	[-0.173]	[-1.319]	[-4.1829]
IRD	-4.228*	0.707	-1.1329	-0.551***	11.372*	-2.589	1.804	3.332
	[-1.948]	[0.740]	[-0.883]	[-3.307]	[1.66889]	[-1.241]	[1.495]	[6.561]
CorrPI	-1.450***	0.191	-0.716	-0.007	4.163***	0.133	-0.358	0.056
	[-3.044]	[0.856]	[-1.444]	[-0.120]	[3.54876]	[0.687]	[-1.180]	[0.701]

Note: *, ** and *** represent levels of significance at 10, 5 and 1 percent, respectively.

Table 5- Averages of Trade Balances (in millions of current USD)

	Benin	Burkina Faso	Côte d'Ivoire	Guinea-Bissau	Mali	Niger	Senegal	Togo
1990-2010	-378.0	-600.0	1714.9	-54.0	-377.3	-360.7	-1235.3	-319.7
1995-2010	-474.1	-669.1	2037.7	-50.7	-428.5	-442.8	-1502.5	-384.6
1990-1994	-70.4	-378.9	681.9	-64.5	-213.4	-98.1	-380.4	-112.1

Table 6- Trade Balances (+/-) as a percentage of GDP, 1995-2010

Country	Percentage (%)
Benin Burkina	-14.2
Faso Côte	-16.8
d'Ivoire	+15.6
Guinea-Bissau	-20.1
Mali	-10.3
Niger	-17.5
Senegal	-22.5
Togo	-22.9