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Impact of exchange rate on trade competitiveness in the CFA zone

Abdoul Naze
abdoulkadernaze@gmail.com

Impact of Exchange Rate on Trade Competitiveness in the CFA Zone

by

Abdoul Kader Naze

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Nimantha Manamperi
Lynn A. Collen

Abstract

Created out of the need to integrate France with its former colonies, the CFA Franc was launched in 1945 and pegged to the French Franc until the arrival of the euro when the peg was changed to 655.957 CFA per euro. While a fixed-exchange-rate, *a priori*, helps mitigate exchange rate risks and thus, promotes trade and investment, economic growth in the region remains sluggish and uneven, at least partly due to a lack of autonomous, country-specific monetary policy confronting the asynchronous business cycles among the member nations. Also, currency devaluation is not a policy option that could help correct the chronic trade deficits in the zone. Moreover, not only the EU's share in the region's total trade has declined, there is a potential currency misalignment where the real exchange rate based on the current peg deviates from where it would be, based on a country's economic fundamentals, the *Equilibrium Exchange Rate*. Whether such misalignment might have contributed to the trade deficits in the CFA zone is an empirical question that this panel study investigates using two different trade balance equations, one using the real effective exchange rate (REER) and the other using the equilibrium real effective exchange rate (EREER) on annual data over 1985-2015. We find that REER does not carry the theoretically postulated sign in the estimated trade balance equation but the equilibrium one (EREER) does. Moreover, when the EREER is used, trade balance seems to be more elastic, especially during the post devaluation era (1995-2015), when we are able to recover the expected sign for REER. Considering the misalignment between REER and EREER, it appears that being anchored to a foreign currency, CFA franc likely has not helped the CFA countries improve their trade competitiveness. Having their own currency, and control over monetary and exchange rate policy, would enable them to deal better with country specific shocks and boost trade competitiveness. However, this would have to be preceded by the strengthening of the political institutions, enforcement of stricter fiscal discipline and independent monetary policy.

JEL classification: F14; F44; O24; O55

Keywords: CFA franc, Real effective exchange rate, Trade balance , Competitiveness.

Tables of Contents

List of Tables

Chapter I: Introduction

From a taboo subject raised only by a very few African intellectuals and politicians such as Kako Nubukpo, Sanou MBaye, Carlos Lopez etc., the CFA franc debate is starting to take some new dimensions and to enter the day-to-day conversation attracting on its way more activists. For example, President Idriss Deby emphasized that "we must have the courage to say there is a cord preventing development in Africa that must be severed." The "cord" he was referring to is the CFA franc which is now over 71 years old.

The CFA Franc which stands for Communauté Financière Africaine (African Financial Community) was officially created on December 26th, 1945 by a decree signed by the General De Gaulle. It is a colonial currency created of France's need to foster economic integration among his colonies and thus control their resources, economic structures, and political systems. After the independence (1960), the CFA franc was affiliated to two monetary unions with their own currency referred to the CFA franc. Firstly, the West African Economic and Monetary Union (WAEMU) composed of eight countries: Benin, Burkina Faso, Cote d'Ivoire, Guinea-Bissau, Mali, Niger, Senegal, and Togo. Secondly, the Central African Economic and Monetary Community (CAEMC) regrouped in six countries: Cameroon, Central African Republic, Republic of Congo, Gabon, Equatorial Guinea, and Chad.

The two currencies initially pegged to the French Franc, have been pegged to the euro at the same parity of 655.957 CFA per euro since the launch of the European currency. However, they are not interchangeable meaning that the CFA franc used in the WAEMU cannot be used in the CAEMC without being converted, although the two central banks said they are working on a

complete integrated system that will allow the two versions of the CFA franc to circulate freely within the zone as a single currency.

As established by the monetary accords between African nations and France, the CFA franc has four main pillars. Firstly, there is a fixed rate of exchange with the euro (and previously with the French Franc) set at 1 euro = 655.957 CFA franc. Secondly, a French guarantee of unlimited convertibility of CFA francs into euros. Thirdly, a centralization of foreign exchange reserves. In fact, since 2005, the two central banks: The Central Bank of West African States (BCEAO) and the Bank of Central African States (BEAC) have been required to deposit 50% of their foreign exchange reserves in a special French Treasury "operating account". This arrangement is a quid pro quo for the French guarantee of convertibility. The final pillar stipulates the principle of free capital transfer within the franc zone meaning that countries of the Franc zone can freely transfer capital within each sub-region and between each sub-region. There is no need of exchange controls within the CFA zone. Also, we can note that people still have some difficulties to move freely within the Franc zone. Although some efforts have been made in the case of the WAEMU where people move freely, it is still not the case in the CAEMC where people have problems entering some countries such as Gabon and Equatorial Guinea.

Being pegged to the euro (previously to the French franc) helps maintain macroeconomic stability and keeping inflation under control within the two monetary unions. Therefore, the monetary authorities of these two unions have implemented some reforms that enable the central banks to adopt new statutes stipulating that the main goal was to ensure a stable price. Also, the CFA franc countries benefit from lower inflation and better fiscal discipline compared to other developing countries particularly the other Sub-Saharan African countries. In fact, in the non-

CFA countries, the instability of the exchange rate can impair their ability to attract foreign investors. Indeed, the microeconomic gains from having a stable currency can be quite significant.[1] It boosts their trade with European Monetary Union (EMU) countries and also inflows of Foreign Direct Investment (FDI) to the CFA zone. In fact, the higher the stability of the euro (relative to the US dollar), the more popular the euro as the vehicle of international transactions, and hence, the larger the benefits for CFA zone (Hadjimichael & Galy, 1997).

On the other hand, although the peg of the CFA franc to euro has some positive effects for the two monetary unions, like any other monetary union, they lose control of their own monetary and exchange rate policies as an adjustment instrument in the case of asymmetric shock. The CFA franc countries are bound by the monetary policies implemented by the EMU, even when they face unique regional or country-specific shocks. Although CFA countries have access to fiscal policy, they need to have a strong fiscal discipline - a necessary condition for the peg to the euro. Thus, they basically have very little control when it comes to macroeconomic stability. Moreover, being pegged to the euro could have some adverse impacts on the business cycle of the CFA franc countries. Hadjimichael and Galy (1997), and Zafar (2005) claimed that one of the major concerns for the CFA franc countries would be a strong euro after they switch the peg from the French franc to the euro. Indeed, an overvaluation of the euro against the US dollar thus leads to an overvaluation of CFA franc (i.e., an appreciation higher than that consistent with the evolution of macroeconomics fundamentals), leading to a loss of

[1] This is akin to having a common currency that lowers transactions costs and boosts trade and investment within a monetary union. Although the CFA franc used in WAEMU and the same in CAEMU are not interchangeable yet, its convertibility among member nations within each union might have contributed to larger volumes of intra-union trade and investment.

competitiveness for the CFA franc zone members and therefore to a deterioration of their current accounts and their growth rates. Moreover, being pegged to the euro, currency devaluation is not an option for them.[2] While they may have access to fiscal policy, as mentioned already, they are required to exercise fiscal restraint, a necessary condition for the peg. Thus, they have no control over their monetary and exchange rate policies, and hardly any fiscal autonomy. These macroeconomic losses might outweigh the microeconomic gains in terms of increased trade and investment and hamper economic growth in the CFA countries.

Section 1: Motivation

My motivation about how good the fixed exchange rate of the CFA franc is for its members comes from the fact that I am personally affected by it since I am coming from one of the country members which is Burkina Faso. Despite the stable macroeconomic environment, the low inflation rate and the ability to attract foreign investment created by the fixed exchange rate in the CFA franc zone, its members still lag behind other countries in the global competitive rankings. Countries of the CFA franc zone are struggling to achieve a sustained economic growth - the relatively sound macroeconomic performance has not translated into substantial growth in per capita income or lower the unemployment rates. Therefore, some economists and commentators argue that fixed exchange regimes are uncompetitive and in the case of the CFA franc the lack of competitiveness compared to other African countries has been attributed to the fixed exchange rate in place (Amin, 2000 & Nubukpo, 2012). Kako Nubukpo (2012) pleaded that the anchorage of the CFA franc with a strong euro has some negative effects on the CFA countries since it reduces their competitiveness and in contrast, he favors imports from countries

[2] This is important considering the potential misalignment of the CFA Franc - the real exchange rate (RER) is out of line with its economic fundamentals for a specific period.

with weak currencies like China. Coulibaly (2017) emphasized that "the anchoring of the CFA franc to the euro no longer have the same meaning, nor does it serve the same interests as it did when the system was established". Indeed, the benefits in terms of exchange rate stability with the euro seem less significant because there is less trade between the two areas. While, CFA franc countries' main trading partners were the euro countries at the beginning, during the last couple of decades their trade with emerging countries has risen steadily. According to the bank of France trade between CFA countries and the BRICS countries (Brazil, Russia, India, China, and South Africa) grew sevenfold between 2002 and 2008 from 2.6 billion to 18.7 billion of dollars. The peg of the CFA franc to the euro tends to hurt the overall economic performance of the CFA countries because an overvaluation of the euro against the US dollar, leads also to an overvaluation of the CFA franc hurting their competitiveness since their exports are becoming more expensive compared to their trading partners. Ehrhart and Jacolin (2012) indicated that the share of the euro area in exports from the CFA zone has declined from 50% to 25% in the last 20 years in favors of countries like China, Nigeria, Thailand, and India.

Section 2: Statement of the Problem

Improvements in unit labor cost (ULC) relative to the rest of the world leads to an increase in the volume of trade in international markets, and low real effective exchange rate (REER) attracts foreign demand leading to an increase in country's share of world market. However, being pegged to the euro, the CFA franc comoves with the euro, and the member countries lose control over monetary and exchange rate policies and thus may lose competitiveness. Moreover, the fiscal discipline that the peg calls for, leaves the member nations with scant fiscal autonomy. While there are microeconomic gains from increased trade and

investment, it is possible that lack of the aforementioned macroeconomic policy tools might have impaired economic growth and stability of the CFA zone.[3] Would they have performed better if they had their own currency, and hence all the policy tools at their disposal? Would the member nations have performed better without the peg? Given the microeconomic gains from having a stable (and common) currency, it remains a theoretically ambiguous and empirically open question.

This paper looks into how the fixed exchange rate of the CFA franc might have impacted the trade competitiveness of its member countries. In particular, we look into how the prevailing exchange rate affects the trade balance of CFA member countries.

Section 3: Purpose of the Study

The purpose of this study is to investigate if the CFA Franc is hurting the competitiveness of its members. Edwards (1989) showed that the real exchange rate (RER) and the real effective exchange rate (REER) can be used to measure price competitiveness. A large body of literature has shown that the CFA Franc zone is characterized by a currency misalignment meaning that the RER is out of line with its economic fundamentals for a specific period. Hence, following a currency appreciation/depreciation, a country may lose/gain in competitiveness. Following this idea, we will assess the relationship between the RER and trade balance by respectively estimating the impact of the *actual real effective exchange rate* (REER); *equilibrium real effective exchange rate* (EREER) on the trade balance of the CFA countries. By doing so, we are expecting to observe whether the CFA countries are more competitive using the CFA franc or

[3] While being pegged to the euro contributes to price and exchange rate stability in the CFA zone, there is no a priori reason to believe that the CFA zone is subject to the same or similar business cycles as the EMU. In fact, within the EMU itself, the member nations have their own unique macroeconomic challenges calling for different country-specific policies.

not. This paper contributes to the debate by bringing some new evidence about the impact of the fixed exchange rate on the CFA countries trade competitiveness. Also, there is a gap in literature when it comes to Africa and to my knowledge, no one has looked at this issue with two different exchange rates (REER and EREER).

The rest of the paper is organized as follows: Chapter II reviews the literature related to the relationship between exchange rate and trade balance. Chapter III discusses the Model and Methodology used to examine the effect of exchange rate on the trade balance. Chapter IV shows the Empirical Results of all regressions and Chapter V concludes.

Chapter II: Literature Review

Understanding the impact of exchange rates on trade balance helps countries to improve their trade balances with other countries (Tsen, 2011). Therefore, it is important to understand the response or/ behavior of trade balance to exchange movements to implement and coordinate effective trade and exchange rate policies (Yol & Baharumshah, 2005). In fact, a persistent deficit of the trade balance may precipitate a financial crisis and undermine economic performance for concerned countries. Most empirical studies emphasize that a depreciation of the real exchange rate improves the trade balance in the long- run while worsening it in the short-run. Krugman and Obstfeld (2009); Hacker and Abdulnasser (2003) argued that a change of the exchange rates has two main effects on the trade balance which are: price and volume effects. The price effect works on the short-run making imports more expensive for foreigners thereby domestic exports products are cheaper for buyers. Also, in the short-run, trade balance can experience some deterioration following a domestic currency depreciation since imports and exports do not adjust immediately.

In the literature three different approaches are used to explain the effect of exchange rate depreciation on trade balance: 1) the elasticity approach, 2) the absorption approach and 3) the monetary approach. The elasticity approach is based on the Marshall-Lerner (ML) condition and state that if the sum of the elasticities (absolute values) of demand of country's exports and imports is greater than one, depreciation of the exchange rate will improve the trade balance. However, when the sum is less than one, depreciation worsens trade balance.

Many authors have studied the link between a change in the exchange rate and trade balance using aggregate trade data to estimate the export and import demand of elasticities. Most

of them were using aggregate trade data to determine these elasticities of demand, and there was an issue since a significant price elasticity with one trading partner could be more than offset by an insignificant elasticity with another partner producing an insignificant trade elasticity. To correct this problem called "aggregate bias", the estimation of trade elasticity needs to be done using bilateral trade data. Therefore, some authors such as Eaton (1994) estimated the bilateral trade elasticities between the US and one or more of her trading partners. Most of them concluded that the real exchange rate is a significant determinant of the US trade balance flows. Bahmani-Oskooee and Goswani (2003) assessed the impact of the real exchange rate on Japan's trade flow with nine of her main trading partners. In their study, they assessed the long -run relationship between Japan's export/import and real exchange rate using the autoregressive distributed lag (ARDL) model. They concluded that when trade flows are measured in terms of foreign currency or reserve currency, Japan’s exports are not sensitive to the real exchange rate, while the opposite occurs for its imports.

The absorption approach developed by Sydney Alexander (1952), was established as an alternative approach due to the limitation of the elasticity approach. It states that the effect of a devaluation on the trade balance depends on the resultant change in the income of the devaluing country, the unabsorbed portion of its income (that is, exports) and the absorbed income (imports). It also suggests that during a certain period, in a country total resources available for use or “absorption” is the sum of its income Y and imports M. The absorption approach analyzes the economy from the point of view of aggregate expenditure, analyzing the direct effects of exchange rate changes on relative prices, income, absorption, and trade balance. Hernan (1999), emphasized that this approach assumes devaluation to have two directs effects which are the

substitution and income effects. Indeed, devaluation may change the relative price of imports and exports (or terms of trade) and therefore contribute to a substitution effect. Similarly, devaluation may have an impact on the income of the devaluing country causing a change in its absorption, the extent of which depends upon its propensity to absorb. If the expected result of the devaluation is to improve the trade balance, the propensity to absorb of the country issuing the devaluation should be less than one and its additional consumption and investment would have to be less than the increase in its production.

Finally, the monetary approach assumes that the trade balance is a monetary phenomenon. The fluctuations (surplus and deficit) within the trade balance are considered as monetary flows arising from the disequilibrium in the money market. For the monetarist, the effect of exchange rate on trade balance should be transitory only when authorities do not simultaneously engage in expanding money supply through open market operations. However, if the monetary authorities increase the money supply through open market operations, aggregate demand and domestic prices will rise undermining the effect of exchange rate depreciation on the trade balance.

There have been numerous studies investigating the link between exchange rate and trade balance, Aziz (2008) analyzed both short-run and long-run effects of the real effective exchange rate (REER) on Bangladesh's trade balance using Engle-Granger and Johansen cointegration techniques. His findings showed a positive relationship between REER and trade balance and that REER had some effects on the trade balance in both the short- and long-run. Similarly, Zhe (2007) examined the relationship between REER and trade surplus between China and its trading partners between 1997 and 2006. The results indicated that REER depreciation improves trade

surplus but the effects of the REER depreciation on domestic and trading partners' GDP were less than its influence on trade surplus.

In contrast, some studies have found that depreciation did not have a long-run positive effect on the trade balance. Indeed, Boyd et al. (2001) examined the effects of the real exchange rate on trade balance for 8 OECD countries. Using a vector autoregressive distributed lag (VARDL) structure and cointegration, they concluded the existence of the J-curve (effect of real exchange rate depreciation on the trade balance in the short-term) and a negative effect in the short-run as well as a Marshall-Lerner condition of positive effect in the long -run. Also, Miles (1979) studied 14 countries that had 16 depreciation experiences in the 1960s and found no evidence of a positive relationship between RER depreciation and improvement of the trade balance. Although, some authors find currency depreciation to adversely impact the trade balance many studies find the opposite.

Hence, Bahmani-Oskooee and Alse (1994) have re-examined the relationship between currency depreciation and trade balance for 19 developed countries and 22 developing countries. After applying a cointegration method, they found that out of 20 countries, only 6 could be applied a cointegration. The other countries indicated a negative relationship between currency depreciation and trade balance on the long-run. Also, Bahmani-Oskooee and Ratha (2004) extended the previous work of Bahmani-Oskooee and Brooks (1999) to investigate the relationship between the dollar depreciation and the bilateral trade balance of the US in the short and long-run using 18 major trading partners. They found no evidence of a J-curve pattern in the short-run but in the long-run, dollar depreciation has some favorable effects on the US trade in most cases.

Gomez and Paz (2005), assessed the relationship between exchange rate and trade balance in Brazil using the Vector Error Correction Model (VECM) to analyze whether the ML condition and the J-curve hold in Brazil. Their results were conclusive for both after a depreciation of the domestic currency. More recently, Ratha (2010) investigated on the rupee's devaluation to find what impact it has on India's economy. Using the latest data and the bounds-testing cointegration approach and error-correction modeling, he found out that the rupee's devaluation is expansionary in India. His findings also concluded that nominal devaluation of the rupee leads to its real devaluation and that the trade balance starts to improve right away after the rupee's devaluation without any presence of the J-curve pattern.

Taking the case of Africa, there are only a few studies looking into the relationship between exchange rate and trade balance. For example, Bhattarai and Armah (2005) found evidence of reduction on the trade balance in the short-run but positive impact on the long-run for Ghana. Yol and Baharumshah (2007) showed a positive effect of real exchange rate depreciation on trade balance using 10 African countries. However, Tanzania's trade balance worsened after RER depreciation and no effect was found for Senegal, Ghana, and Morocco in the long-run. Musila and Newark (2003), utilized an IS-LM model and found that devaluation reduced import growth and improved export performance in the long-run in Malawi. Chipili (2013), using Johansen cointegration method examined exchange rate volatility and trade flows in Zambia and found that a stable exchange rate boosts trade and mobilizes resources for the non-tradable sector.

Furthermore, studies such as Ogbonna (2009 and 2011), Oladipupo and Ogheneovo (2011) showed that the ML condition holds in Nigeria implying that exchange rate depreciation

has a positive effect on the trade balance, while others refute the claim. For instance, using the Ordinary Least Squares (OLS) method, Loto (2011) found that the ML condition does not hold in Nigeria, while Igue and Ogunleye (2014) found evidence that the Marshall-Lerner condition holds in Nigeria by using the Johansen method of cointegration and VECM when investigating the relationship between real exchange rate and trade balance in Nigeria. Alege and Osabuohein (2015) studied the interaction between trade and exchange rate in 40 SSA countries using panel cointegration analysis. They developed two equations for import and export in which exchange rate, GDP, the stock of capital and technology are used as independent variables. Their results indicated that import and export are inelastic to changes in exchange rate. They concluded that currency depreciation may not have the expected results in the region looking at the structure of the economies and export compositions. Also, the depreciation of the exchange rate will not reduce imports, but the opposite will happen to aggravate the balance of payments.

Finally, empirical studies on the franc zone have focused their interest on three strands. Studies in the first strand of the literature focus on the relationship between exchange rate and competitiveness by emphasizing the impact of uncompetitive (unrealistic) exchange rates on sectoral economic performance such as the agricultural sector performance in CFA countries. To illustrate that, Amin (1996) pointed out the relationship between an over-valuation of the real exchange rate and the lack of competitiveness in Cameroon's agricultural sector. However, Ouattara and Strobol (2004) approached the subject indirectly by looking at the impact of aid flows on the competitiveness of CFA countries and find no evidence of the Dutch disease associated with into CFA zone. The second strand of literature focuses on the effects of the 1994 devaluation of the CFA franc. Bogetic et al. (2007) examined data in Cote d'Ivoire after the

devaluation and find that prices of cocoa have a substantial impact in the overvaluation of the REER in Cote d'Ivoire. Zafar (2005) also found that the CFA franc is misaligned following its peg to the euro in 1999. However, Abdih and Tsangarides (2010), later found no evidence of any significant misalignment of the CFA franc from its long-run equilibrium. They suggested that any over-valuation of the CFA franc (and consequent loss in competitiveness) observed, later on, might not be caused by the peg of the CFA franc to the euro. The third strand of literature focuses on the institutions of the fixed exchange regime suggesting that the fixed exchange rate is not a problem itself but rather, the arrangements associated with it are the problem. Amin (2000) compared the economic performance of CFA zone to others SSA countries from 1980-1997 and concluded that the franc zone economies are performing less relative to non-franc zone economies and this is mainly caused by institutional rigidities associated with the monetary and exchange rate arrangements under the fixed exchange regime.

Chapter III: Model and Methodology

Section 1: Model

The focus of this empirical analysis is to examine the effects of the exchange rate (actual REER & equilibrium REER) on the trade balance. To this end, we estimate a variant of the method used by Ndlela and Ndlela (2002). This method consists of using a partial equilibrium approach to evaluate the effect of the REER and EREER on exports and imports and therefore on the trade balance.

In our proposed model, a depreciation of the REER is expected to increase trade balance by raising exports and make it cheaper for the trading partners. Following Alege and Osabuohein (2015), we will assume that real gross domestic product (RDGP) in the exporting country will have a direct impact on the level of export a country has to offer. Therefore, we are also adding some other variables such as political stability and stock of capital to reflect specific conditions common to SSA countries and in our case the CFA franc countries. The inclusion of capital in the proposed model is crucial for production activities particularly for the domestic firms that face rude competition in the international market. Hence the proxy for capital stock, gross fixed capital formation (GFC), positively affects exports. In fact, GFC can have a positive impact on exports because when the investment increases, so does a country's productive capacity and hence exports. Finally, we are adding a measure of political stability in the model to investigate its role in the performance of the export sector. Very few studies have explored the relationship between political stability and bilateral trade. According to Srivastava and Green (1986), more stable nations exports more while the instability of importing countries does not affect

significantly the bilateral trade. In our study, Polity2 (POL) is used as a proxy of political stability and it ranges from -10 (hereditary monarchy) to +10 (consolidated democracy).[4]

The main hypothesis in this study based on the underlying literature is that a depreciation of the real effective exchange rate (REER) should increase the trade balance of the countries using the CFA franc leading to an increase of their competitiveness. Here, the novelty of the present study is to estimate two equations, one with REER and the other with EREER.[5] Below is the following model proposed to test the aforementioned hypothesis:

Equation (1) : $TB_{it} = \beta_0 + \beta_1 REER_{it} + \beta_2\, RGDP_{it} + \beta_3 GFC_{it} + \beta_4\, POL_{it} + u_{it} + \varepsilon_{it}$

Equation (2) : $TB_{it} = \gamma_0 + \gamma_1 EREER_{it} + \gamma_2\, RGDP_{it} + \gamma_3 GFC_{it} + \gamma_4\, POL_{it} + u_{it} + \varepsilon_{it}$

Where β_0, γ_0 are the constant terms and β_1, γ_1 are respectively the coefficients for real effective exchange rate (REER), equilibrium real effective exchange rate (EREER). β_2, β_3, β_4 in (1) and γ_2, γ_3, γ_4 in (2) are the slope parameters for real gross domestic product (RGDP), gross fixed of capital formation (GFC) and polity2 (POL), respectively. All variables will be expressed in natural logarithm except the political stability variable (POL). The term u_{it} represents country time-invariant specific effect while ε_{it} (idiosyncratic error) is the unobserved factors that change over time and affect the dependent variable.

The trade balance here is defined as the ratio of exports to imports such that an increase implies an improvement of the same. Also, considering an increase in REER implies an appreciation of the domestic currency (i.e., loss of trade competitiveness), the coefficient of actual real effective exchange rate (REER) and equilibrium real effective exchange rate

[4] See, for example, https://competitivite.ferdi.fr/en/indicators/polity2-polity-iv.

[5] Since these two may not be the same, considering the pegging up of the CFA franc to the euro.

(EREER) are both expected to be negative because a depreciation (decrease) is supposed to increase the trade balance. Also, the coefficient of polity2 (POL) is expected to be positive because democracy and political stability are considered good for the domestic economy and likely contribute more to a country's exports than imports, improving her trade balance. In addition, the coefficients of real gross domestic product (RGDP) and gross fixed capital formation (GFC) are expected to be positive although GFC may have a lagged effect. Also, developing countries imports tend to be capital-intensive (to build plants, factories, and infrastructure) and if GFC has a large import-content, in addition to having a lagged effect, the coefficient can be negative.

Section 2: Panel Data and Functional Form

To analyze the impact of exchange rate on the trade balance in the CFA zone from 1985 to 2015, ordinary least squares will be used to estimate the linear model specification based on a panel data. Also known as longitudinal or cross-sectional time-series data, panel data is a dataset in which the behavior of entities (states, individuals, countries, etc.) are observed across time. According to Baltagi (1995), one of the advantages of using a panel data is that by combining times series of cross-section observations, panel data gives " more informative data, more variability, less collinearity among variables, more degree of freedom and more efficiency".

We will be using the Pooled, Fixed and Random effect estimator to estimate our model. The Fixed Effect is used whenever our main interest is to analyze the impact of variables that change over time. As stated by Gujarati (1978) the term "Fixed effects" reflects that although the intercept is changing across individuals, each individual's intercept is time-invariant (does not vary over time). It assumes that something within the individual may impact or bias the predictor

or outcome variables and we need to control for this (Torres-Reyna, 2007). Since the Fixed Effect model controls for all time-invariant differences between the individuals, the estimated coefficients cannot be biased because of omitted time-invariant characteristics such as culture, gender, race, etc. In contrast, the Random Effect model assumes that the variation across entities is random and uncorrelated with the independent variables. An advantage of using the Random Effects model is that time-invariant variables such as gender, race can be included (Torres-Reyna, 2007). The crucial distinction between the Fixed and Random effects is whether the unobserved individual specific effect embodies elements that are correlated with the regressors in the model, not whether these effects are stochastic or not (Green, 2008).

Furthermore, if we have some reason to believe that disparities across entities have some influence on our dependent variable, then Random Effect models should be used. A formal test was developed by Haussmann (1978) to help us choose between the Fixed and Random effects. This test basically tests whether the unique errors (u_i) are correlated with the independent variables, the null hypothesis is they are not. Hence, the null hypothesis of the Haussmann test implies that the preferred model is random effects while the alternative hypothesis is the fixed effects. After running the Haussmann test, if the p-value is less than the critical value at 5% significance level, therefore we reject the null hypothesis and conclude that fixed effect is the appropriate model. The Hypothesis testing is:

- If Corr(X,A) = 0, then Random Effect is Efficient.
- If Corr(X,A) ≠ 0, then Fixed effect is consistent. (with "A" the cross -sectional differences).

Section 3: Data Description

To analyze the impact of exchange rate on the trade balance in the CFA zone from 1985-2015, we mainly focus on 13 African countries that are using that currency. Let's note that the CFA zone is originally composed of 14 countries but following previous studies we excluded Guinea Bissau from our sample because it enters the zone later in 1997. The CFA zone is divided into two monetary unions: WAEMU composed of Benin, Burkina Faso, Cote d'Ivoire, Mali, Niger, Senegal and Togo and CAEMC composed of Cameroon, Central African Republic, Republic of Congo, Gabon, Equatorial Guinea, and Chad. Data frequency is annual, and the sources are World Development Indicators (WDI), EQCHANGE from the Centre d'Etudes Prospectives et d'Inspection Internationale (CEPII) which is a French institute for research and expertise on the world economy. The WDI database is the primary World Bank collection of development indicators and it is assumed to be the most accurate and current global development data available. EQCHANGE is a global database of annual indicators on effective exchange rates divided into two sub-databases providing information on (i) nominal and real effective exchange rates and (ii) equilibrium real effective exchange rates and corresponding currency misalignments for advanced, emerging and developing countries.

The variables used in this study and extracted from the WDI database covered the years 1985 to 2015 and include the variable real GDP, exports of goods and services, imports of goods and services, gross fixed of capital formation all in constant 2010 US$. On the other hand, the variables extracted from the EQCHANGE database are the real effective exchange rate and the equilibrium real effective exchange rate in constant 2010 US$ from 1985 to 2015. The political

stability proxied variable Polity2 is extracted from the Integrated Network for Societal Conflict Research (INSCR) database from 1985 to 2015.

Section 4: Variables

Dependent variables.

- Trade balance (TB): is defined as the ratio of exports to imports, such that an increase implies an improvement of the trade balance. The trade balance variable here is used to measure trade competitiveness, therefore an increase in trade balance means an improvement of the competitiveness of a specific country I compared to its trading partners. Such specification allows running the model in logarithm form. Moreover, it is both real and nominal trade balance. It is calculated in constant 2010 US$.
- Exports of goods and services (XPT): is defined as the value of all goods and other market services provided to the rest of the world. Exports include the value of merchandise, freight, insurance, transport etc and exclude compensation of employees, investment income and transfer payments. It is measured in constant 2010 US$.
- Import of goods and services (IMPT): is defined as the value of all goods and other market services received from the rest of the world. They include the value of merchandise, freight, insurance, transport, travel, royalties, license fees, etc exclude compensation of employees, investment income and transfer payments. This is also in constant 2010 US$.

Independent variables.

- Real Gross Domestic Product (RGDP) is defined as the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. It is calculated in constant 2010 US$.
- Gross Fixed Capital Formation (GFC) consists of land improvements (fences, ditches, drains, and so on); plant, machinery, and equipment purchases; and the construction of roads, railways, and the like, including schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings. GFC is measured in constant 2010 US$.
- Real Effective Exchange Rate (REER) of the country *i* in period *t* is calculated as an index of the weighted average of real bilateral exchange rates against each of its N trading partners. A real appreciation of the domestic currency is recorded as an increase in the real effective exchange rate index. A depreciation of the domestic currency is recorded as a decrease in the real effective exchange rate. The base year is 2010.
- Equilibrium Real Effective Exchange Rate (EREER) of the country *i* in period *t* is derived from the fitted value of the real effective exchange rate given by the estimated equilibrium relationship. According to Couharde et al. (2017) the equilibrium real effective exchange rate is assessed based on the Behavioral equilibrium exchange rate (BEER) approach since it does not require to estimate or to

make assumptions on the long-run values of the economic fundamentals as in the macroeconomic balance approach. According to the literature, those following variables were included in their regressions as fundamentals of the real exchange rate : (i) a measure of sectoral productivity relative to trading partners to account for the Balassa-Samuelson effect, (ii*)* the economy's net foreign asset position, and (iii) the economy's terms of trade. However, instead of computing directly all three fundamentals in the same equation with the real effective exchange rate as the dependent variable, a sequential approach was adopted by including only one variable and then by adding successively the other fundamentals in the regression model. Furthermore, this approach is simple and easy to implement and requires few data. This point is crucial given the lack of reliable data in several developing and emerging economies. A real appreciation of the domestic currency is recorded as an increase in the equilibrium real effective exchange rate index. A depreciation of the domestic currency is recorded as a decrease in the equilibrium real effective exchange rate.

- Polity2 (POL) is a measure of the level of democracy or autocracy of a regime in a country. It ranges between +10 (full democracy) and -10 (full autocracy).

Chapter IV: Empirical Results

Section 1: Descriptive Analysis

The table below shows the descriptive statistics for the sample used in the present study on the CFA franc and trade competitiveness in 13 African countries from 1985 to 2015. The sample size is 403 observations for this panel study.

Table 1. Descriptive Statistics

Variables		West	Central	All
TB	Mean	0.71	1.83	1.23
	Std.Dev	0.27	1.61	1.25
(X-M)	Mean	-530.41	1916.59	599.0
	Std.Dev	1259.20	2779.80	2428.96
Xpt	Mean	2592.24	4730.57	3579.16
	Std.Dev	3098.17	3837.32	3615.68
Impt	Mean	3122.64	2813.98	2980.20
	Std.Dev	2569.35	2431.11	2508.14
Rgdp	Mean	8007.48	9510.95	8701.40
	Std.Dev	6542.71	7317.46	6943.00
Gfc	Mean	1523.95	2380.48	1919.27
	Std.Dev	1218.42	2115.19	1743.38
Reer	Mean	98.62	100.86	99.65
	Std.Dev	27.60	24.36	26.15
Ereer	Mean	86.40	101.43	93.34
	Std.Dev	15.98	15.04	17.25
Pol	Mean	0.61	-3.61	-1.34
	Std.Dev	5.47	3.59	5.14
Countries (id)		7	6	13
Period (T)		31	31	31
Obs. (N)		217	186	403

The summary statistics gives us a general overview of the datasets used in this study. It reports the overall mean and standard deviation values for the all the variables in the model by regions as well as for all the regions combined.

The mean of the trade balance variable is calculated at US$1.23 million for all regions combined. Between the two regions, the Central part has the highest average trade balance with US$1.83 million while the western part only has US$0.71 million at 2010 constant prices. Let's recall that trade balance is calculated as the ratio of exports and imports.

When using the general formula of trade balance represented by (X-M), the average value of trade balance for all regions combined is 599 million of US Dollar. It could be seen that the mean of the Central region is US$ 1,916.59 million which is the highest in the whole region, while a mean of US$ - 530.41 million is observed for the western region. The negative sign is implying that countries in the western region are on average importing more products from their trading partners than they are exporting leading to a deficit in their trade balance. Most countries in the CFA zone have a chronic trade deficit.

The mean of the export variable for all regions combined is US$ 3579.16 million. As expected, the Central region has the highest mean for exported products with US$ 4,730.57 million while the Western region observed only US$ 2,592.24 million. This difference in exports between the two regions is reflected by the nature of the exported products within each region. In fact, countries in the western part are predominantly exporting agricultural products while most of the countries in the Central region are oil exporters.

The average value for import within the CFA zone is US$ 2,980.20 million with countries in the WEAMU importing on average US$ 3,122.64 while countries in the CAEMC

only import US$ 2,813.98 million on average. The average real GDP in all regions combined is US$ 8,701.40 million. Between the two regions, the Central part has the highest real GDP with US$ 9,510.95 million while the Western part only registered US$ 8007.48 million.

Let's note that the country with the lowest exports as well as the lowest imports and real GDP is Central African Republic with respectively 285.13, 435.98 and 1567.95 in millions of US Dollars. While, Ivory Coast is the country that records the highest exports, imports and real GDP within the CFA zone with respectively $ 9,619.43; $7,929.82 and $21,831.68 millions of Dollars. According to the World Bank, during the past decades, the economy of Cote d'Ivoire has grown tremendously leading to a reduction in poverty. Also, Cote d'Ivoire is known as one of the world's leading cocoa and cashew nut producer and oil exporter with a major manufacturing sector.

The average value for GFC in all regions is US$1919.27 million. The mean value for GFC in the Central region is US$ 2,380.48 million while in the Western region it is US$ 1,523.95 million. In the CFA zone, the minimum value for GFC is $58.05 and the maximum is $8,821.87 with an average recorded at $1,919.27. In the sample, the country with the lowest GFC is still Central African Republic with $194.44, while Cameroon has the highest value with $4,703.45.

The average value for the REER and EREER in all regions combined are respectively 99.65 and 93.34. We can see that the CFA countries have on average an actual REER above the equilibrium REER which is the one they were supposed to have if they weren't using the CFA franc. Furthermore, the correlation between REER and EREER within each country is pretty

low, even negative at times, implying that the two exchange rates are quite divergent.[6]
In the sample, Equatorial Guinea has the lowest REER (80.76) and Burkina Faso has the lowest EREER (65.09) while Gabon is the country with the highest REER and EREER with respectively 116.77 and 119.86.

The mean for Polity2 is negative 1.34 in all regions combined. In the central part, the The average value for polity2 is -3.61 while the western region observed 0.61 on average. In the sample, Equatorial Guinea has the lowest measure of political instability with a negative value of - 6.16 while Benin has the highest score with 4.03 on average.
According to the World Bank, Equatorial Guinea has been one the fastest growing economies in Africa in the last decades. The country is largely dependent on oil after the discovery of large reserves of oil in the 1990s and is the third-largest oil producer in Sub-Saharan Africa.
However, on the political plan until now the country has been governed by the same president for more than 30 years. According to Transparency International, Equatorial Guinea is ranked on the top 12 of its lists of most corrupt states.

Section 2: Regression Analysis

The regression results below attempt to answer the research questions that were set out in this study. The OLS estimated model for the first model (containing actual REER) using the Pooled OLS, Fixed Effects, and Random Effects are shown in table 2 below. The results of the Haussmann test are reported in table 2.1 to compare the results obtained in the Random and Fixed Effects models. On the other hand, Table 3 shows the results for the second model (containing the equilibrium REER) using the Pooled OLS, Fixed Effects, and Random Effects.

[6] For example, the correlation coefficients between REER and EREER in Burkina Faso, Cote d'Ivoire are respectively – 0.12 and – 0.06.

Table 2. Results for Pooled, Fixed, Random and Fixed Effect Adjusted for Autocorrelation of Equation (1), 1985-2015

Dependent Variable: LTB

Variables	Pooled OLS	Fixed Effects	Random Effects	Fixed Effects Adjusted for Autocorrelation
Constant	-3.96*** (0.46)	-3.25*** (0.30)	-3.27*** (0.34)	-2.84*** (0.60)
LRGDP	0.34*** (0.07)	0.59*** (0.05)	0.59*** (0.05)	0.77*** (0.08)
LGFC	-0.002 (0.06)	-0.35*** (0.04)	-0.34*** (0.04)	-0.54*** (0.04)
LREER	0.19* (0.09)	0.10* (0.04)	0.10* (0.04)	-0.04 (0.04)
POL	-0.03*** (0.006)	-0.001 (0.004)	-0.001 (0.004)	-0.0008*** (0.004)
AR(1)	—	—	—	0.81*** (0.03)
R-squared	0.28	0.85	0.29	0.95
Adjusted R-squared	0.27	0.84	0.28	0.94
Durbin Watson	0.14	0.41	0.39	2.10

Note: The quantities in parentheses below the estimates are the standard errors.
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Table 2 shows the results of the estimated model results of equation (1) using the pooled OLS, fixed effects, random effects and fixed effects adjusted to autocorrelation.

Pooled OLS regression disregards the space and the time dimensions of the pooled data and just estimate the usual OLS regression. Sometimes, it can be very useful in evaluating the impact of a certain policy and event. The R-squared value of 28% indicates a low relationship between the explanatory variables (LRGDP, LGFC, LREER, and POL) and the

dependent variable trade balance. The estimated coefficient for RGDP (real GDP) has the expected sign in the model and an increase in the real Gross domestic product leads to an increase in the trade balance. However, the estimated coefficients for GFC (Gross fixed capital formation), POL and REER (actual real effective exchange rate) do not have the expected sign. As gross fixed capital formation increase, the trade balance is decreasing. An appreciation (increase) of the actual REER and an increase of the political stability lead to a decrease in the trade balance. The coefficient LRGDP ($4.62 > t_{stat}$) and POL ($5.83 > t_{stat}$) are statistically significant at 1% , 5% or 10% (t_{stat} 5% = 1.96, t_{stat} 1% = 2.57, t_{stat} 10% = 1.64) level of significance for a two-tail test. The coefficient LREER ($2.20 > t_{stat}$) is only statistically significant at 5% and 10% and the coefficient GFC ($0.04 < t_{stat}$) is not statistically significant at 1%, 5% or 10% significance level. The result of the pooled OLS regression can be interpreted as follow: A one percent increase of GFC and REER leads to a decrease of the trade balance respectively by 0.002% and 0.19 %, while 1% increase in RGDP is associated with an increase of the trade balance by about 0.34%. However, a unit increase of POL leads to a decrease in trade balance by about 3%. We cannot rely entirely on this prediction because of the presence of serial correlation in the errors (very low Durbin Watson statistics $0.13 < d_L$).

Fixed effects regression results: The fixed effect allows to better explore the relationship between predictor and outcome variables within an entity (country, person, company, etc.). In the fixed effects regression, we assume that the individual specific effect is correlated with the independent variables. Fixed effects remove the effect of those time-invariant

characteristics allowing us to assess the net effect of the independent variables on the dependent variable. Table 2 shows the result of the fixed effects regression in our sample. The R-squared is 0.85 (85%), a really high fit of the data in. In fact, 85% of the variation in the dependent variable (LTB) is explained by the explanatory variables (LRGDP, LGFC, LREER, and POL). Only 15% of the variation in the dependent variable remains unexplained.

Although the Fixed effects model shows that there is a strong relationship between the dependent variable and the independent variables, the statistic of the Durbin Watson ($0.41 < d_L$) confirms the presence of positive serial correlation in the errors causing standard errors and test statistics to no longer be valid. In this regression, the coefficient POL ($0.36 < t_{stat}$) is the only variable that is not statistically significant at 1%, 5% or 10% significance level. The estimated coefficients for LRGDP ($11.67 > t_{stat}$), LGFC ($8.66 < t_{stat}$) and LREER ($2.39 > t_{stat}$) are all statistically significant. However, the variable of interest LREER is only significant at 5% and 10%. Also, in this regression, the estimated coefficient for GFC, POL, and REER do not have the expected sign in the model. A one percent increase in GFC and REER decrease the trade balance respectively by 0.35% and 0.10%. On the other hand, the estimated coefficients for RGDP has the expected sign. Hence, an increase of one percent in the RGDP leads to an increase in the trade balance by 0.59%. The partial effect of POL in the trade balance is really low and negligible since it's not significant.

Random effects regression: Unlike the fixed effects model, the random effect regression assumes that the individual specific effects are uncorrelated with the independent variables included in the model. Table 2 above also shows the results of the random-effects model. Unfortunately, like in the previous two models, the problem of serial correlation of the

errors still exist (Durbin Watson statistic $0.39 < d_L$). The R^2 value of 0.29 shows that only 29% of the variations in trade balance are explained by the independent variables (RGDP, GFC, REER and POL). Approximately 71% of the trade balance is not explained by the explanatory variables. Likewise, in this regression, only POL is not statistically significant ($0.51 < t_{stat}$) at 1%, 5% or 10%. On the other hand, the variables RGDP ($11.68 > t_{stat}$), GFC ($8.57 > t_{stat}$) are statistically significant at 1%, 5% or 10% significance level. The variable REER ($2.41 > t_{stat}$) is only significant at 5% and 10%. While the estimated coefficients for RGDP has the expected sign in this model the coefficients of REER, POL, and GFC do not. The results of the random effects model can be interpreted as follow: an increase of one percent in RGDP increase the trade balance by 0.59%. An increase of the REER and GFC lead to a decrease in the trade balance respectively by 0.10% and 0.34%. A unit increase in the POL (strengthening of democracy) lowers the trade balance by 0.1% and this effect is negligible since it is not significant. We observe that the results in the Fixed and Random model are qualitatively similar. Therefore, to compare those two models and see which model can be appropriate in our study, we perform a Haussmann test between our Random and Fixed model results. The Haussmann test can be used to test whether the unique errors (u_i) are correlated with the independent variables. The null hypothesis specifies that the unique errors are not correlated and implies that the preferred model is the random effect against the alternative hypothesis which is the fixed effect.

Table 2.1. Estimated Model Results of the Haussmann Test

Test Summary	Chi-Sq. Statistic	Chi-Sq. df	Probability
Cross-section random	5.48	4	0.24

Table 2.1 shows the statistical probability of the Haussmann test comparing the random and fixed effects model of the equation (1). According to our probability result (0.24 > 0.05) implying that the Random effect regression is preferred than the Fixed effects regression at 5% level of significance for a two-tailed test.

Furthermore, in order to reduce the autocorrelation problem, we also run the AR models.[7] When the error term in time t is positively correlated with the past error terms, we have evidence of (positive first-order) autocorrelation. In the case of serial correlation, the OLS estimators are still unbiased and consistent, but no longer BLUE (Best Linear Unbiased Estimator). More importantly, the usual standard errors and the test statistics are no longer valid, even asymptotically.

Fixed effect adjusted for autocorrelation regression results: Table 2 shows, in addition, the AR model regression results of the Fixed effects models. The results are showing a Durbin Watson statistic approximately close to 2 (DW = 2.10) meaning that we now have unbiased estimators with no correlation of the errors. Also, the goodness of fit measures by the R^2 in this specific model is pretty high (0.95) implying that the independents variables explain the trade balance variations at 95%. Only 5% of the trade balance is unexplained. This high R^2 seems unrealistic but it can be explained by the fact that Fixed effect regressions have the

[7] AR in this case stands for the Autoregressive model of the errors. Example : AR(1) is the Autoregressive model of order (1)

tendency of using a lot of degree of freedom, thus producing high R^2. However, this regression differs from all previous regressions above.

Actual REER ($0.94 < t_{stat}$), POL ($0.18 < t_{stat}$) are insignificant at 1%, 5% or 10% but RGDP ($9.79 > t_{stat}$), GFC ($13.47 > t_{stat}$) and AR(1) ($27.93 > t_{stat}$) are all significant at 1%, 5% or 10% significance level for a two-tailed test. In this regression, the coefficients of GFC and POL that have the opposite sign, while the coefficients for REER, RGDP have the expected sign that we hypothesized. Therefore, an increase of one percent in RGDP increases the trade balance by 0.77%. A depreciation of the actual REER has a low effect on the trade balance (only an increase of 0.04%) and this is not even significant in our model. The political stability variable has a statistically insignificant effect on trade balance (one unit increase in POL decreases the trade balance by 0.08%). Also, an increase of one percent in Gross Fixed capital Formation leads to a decrease in the trade balance by 0.54%.

Contrary to the fixed and random models, where we observe an appreciation of the actual real effective exchange rate (REER) leading to a negative impact on the trade balance, when we correct for autocorrelation we observe a depreciation of the REER associated with an increase of the trade balance but the effect is insignificant.

Barring the last model, the key variable of our model, actual REER does not carry the expected negative sign in all cases. Also, while it carries the negative sign in the last model, the coefficient estimate is insignificant. We suspect that it might be due to exchange rate misalignments. Thus, we replace the actual REER with the equilibrium REER and rerun the above model. Table 3 below shows the results of the Pooled, Fixed, Random and the Fixed effect

model adjusted for Autocorrelation of the trade balance model after including EREER as the variable of interest.

Table.3. Results for Pooled, Fixed, Random and Fixed Effect Adjusted for Autocorrelation of Equation (2), 1985-2015

Dependent Variable: LTB

Variables	Pooled OLS	Fixed Effects	Random Effects	Fixed Effects Adjusted for Autocorrelation
Constant	-6.09*** (0.68)	1.76 (1.10)	1.05 (1.07)	-4.34*** (1.26)
LRGDP	0.25** (0.08)	0.68*** (0.05)	0.66*** (0.05)	0.74*** (0.08)
LGFC	0.06 (0.06)	-0.36*** (0.04)	-0.35*** (0.04)	-0.53*** (0.04)
LEREER	0.76*** (0.16)	-1.16*** (0.27)	-0.98*** (0.26)	0.34 (0.30)
POL	-0.03*** (0.01)	0.0001 (0.0035)	-0.0005 (0.0036)	-0.0007 (0.0043)
AR (1)	___	___	___	0.81*** (0.03)
R-squared	0.31	0.85	0.30	0.95
Adjusted R-squared	0.30	0.84	0.29	0.94
Durbin Watson	0.14	0.44	0.41	2.10

Note: The quantities in parentheses below the estimates are the standard errors.
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Table 3 shows the estimated results of the equation (2) cited above using the pooled, fixed, random and the AR model. These specific regressions allow analyzing the impact of the Equilibrium Real Effective Exchange Rate on the trade balance in the CFA zone.

Looking at the real GDP, we observe that RGDP is significant in the pooled ($3.24 > t_{stat}$), the fixed ($12.58 > t_{stat}$), the random ($12.43 > t_{stat}$) and the AR model ($8.90 > t_{stat}$) and it is generally positively correlated with the trade balance in all regressions. A percentage point increase of RGDP leads to 0.25, 0.68, 0.66 and 0.74 percentage points increase of trade balance, respectively, in the pooled, fixed, random and the AR models' estimation. The fixed and the Random models which are the most common models used in panel data show a positive correlation of the real GDP with the trade balance in our sample. When we compare the elasticities of trade balance with respect to the real GDP obtained when using the REER in equation (1) and EREER in equation (2), we observe that the elasticities are higher when the equilibrium real effective exchange rate is used. As we will expect, an increase of the real GDP will have a positive effect on the countries of the CFA zone leading to an increase in their trade balances.

The coefficient of GFC is significant in the fixed ($8.99 > t_{stat}$), the random ($8.86 > t_{stat}$) and the AR model ($13.09 > t_{stat}$) at 1%, 5% or 10% significance level in a two-tail test. Gross Fixed Capital Formation is negatively correlated with trade balance in the fixed, random and AR models, but positively correlated and insignificant in the pooled regression. The negative sign of the GFC can be reflected by a heavy importation of capital goods (machines, plants, etc.) that are expensive and can, therefore, have an impact on the trade balance. The time-lag will also play a role because the payoffs of those investments will be overtime. A percentage point increase in GFC is associated with 0.36, 0.35 and 0.53 percentage points decrease in trade balance respectively in the fixed, random and AR models. On the other hand, a one percent increase of

GFC increases trade balance by 0.06% in the pooled regression. in the fixed and random models, the estimated coefficients are pretty similar in amplitude too.

Moreover, our variable of interest EREER is significant in the pooled ($4.70 > t_{stat}$), the fixed ($4.26 > .t_{stat}$) and the random model ($3.79 > t_{stat}$) but not significant in the AR model ($1.14 < t_{stat}$) at the 1%, 5% or 10% significance level for a two-tailed test. The equilibrium REER has the expected sign that we hypothesized and implies that a depreciation of the exchange rate is associated with an increase of the trade balance. This can be seen in the fixed and random effects models where trade balance is more elastic when the equilibrium REER is used compared to the actual REER (1.16 and 0.98 respectively). This result is showing that if the countries of the CFA zone happen to have their own currency, they might be able to increase their trade balance and therefore be more competitive on the international markets. Moreover, they might be able to devalue their respective currencies and correct chronic trade balances. However, in the pooled and the AR model, the equilibrium REER doesn't have the expected sign.[8]

In this study, the proxy variable for political stability (POL) is only significant in the pooled model ($5.2 > t_{stat}$), but insignificant in the fixed, random and AR model. The estimated coefficient of POL displays the opposite sign in all above models except in the fixed effects regression. An increase in political stability leads to a decrease in the trade balance of 3%, 0.05%, and 0.02% respectively in the pooled, random and AR model. In the fixed model, political stability has a low positive effect (0.01%) with trade balance but is statistically insignificant at 1%, 5% or 10% significance level. Political stability is assumed to affect international trade directly through its impact on income and prices or indirectly through its

[8] In the pooled and AR models, EREER is appreciating and therefore decreasing the trade balance

impact on investment in physical capital. For example, political stability can affect the level of the exports of a country by influencing domestic production and increasing the level of political and economic certainty. Since exports are affected, this can lead to an increase in the trade balance.

Furthermore, we are also comparing the results of the random and fixed effects by using the Haussmann test. As specified above, the Haussmann test is used to test whether the unique errors (u_i) are correlated with the independent variables.

Table 3.1. Estimated Model Results of the Haussmann Test

Test Summary	Chi-Sq. Statistic	Chi-Sq. df	Probability
Cross-section random	10.47	4	0.03

The above table shows the statistical probability of the Haussmann test comparing the fixed effect and the Random effect model of the equation (2).

According to our probability result, ($0.03 < 0.05$) the Fixed effect regression is consistent and preferred to the random effect at 5% significance level. The result of the Haussmann test in equation (2) is different from the one in equation (1). If the fixed effect is the preferred model, therefore, we are assuming that the individual specific effect within countries might be correlated with the independent variables. The CFA zone is divided into two unions: WAEMU and CAEMC. The majority of countries in the WAEMU are exporting mainly agricultural products, while most of the countries in the CAEMC are oil exporters. Therefore, we might assume that the type of commodities exported by each country can be correlated with the real GDP. In fact, we are expecting oil exporters to have a higher real GDP than countries relying on only agricultural exported products.

Based on the new results, EREER has the expected sign in both FE and RE models. Therefore, a depreciation of the currency will be associated with an increase in the trade balance leading CFA countries to be more competitive. Thus, it appears that the CFA countries could be better off abandoning the peg to the euro and having their own currency their own currency. The political stability variable (POL) is insignificant in all the above models except the pooled OLS.

Section 3: Further Analysis

When the economic performance of the CFA countries started to decline in the mid-1980s, the CFA franc was devalued by 50% in January 1994. To learn if such a major devaluation changed the exchange-rate trade balance relation in the region, we looked into the post-devaluation era. As before, we estimate the equations (1) and (2) on data over the sub-sample 1995-2015 and report the results in Table 4. Interestingly, actual REER in equation (1) carries the expected negative sign in all scenarios: pooled, fixed, random and fixed effect adjusted for autocorrelation.

Table 4. Results for Pooled, Fixed, Random and Fixed Effects Adjusted for Autocorrelation of Equation (1), 1995-2015

Dependent Variable: LTB

Variables	Pooled OLS	Fixed Effects	Random Effects	Fixed Effects Adjusted for Autocorrelation
Constant	3.71** (1.32)	0.33 (0.64)	0.41 (0.66)	-2.65** (1.22)
LRGDP	0.63*** (0.09)	0.86*** (0.06)	0.86*** (0.06)	1.11*** (0.11)
LGFC	-0.20** (0.07)	-0.50*** (0.04)	-0.49*** (0.04)	-0.62*** (0.05)
LREER	-1.75*** (0.31)	-0.97*** (0.17)	-0.99*** (0.17)	-0.62*** (0.18)
POL	-0.03*** (0.007)	-0.003 (0.005)	-0.004 (0.005)	-0.006 (0.005)
AR (1)	___	___	___	0.75*** (0.04)
R-squared	0.38	0.89	0.44	0.95
Adjusted R-squared	0.37	0.89	0.43	0.95
Durbin Watson	0.12	0.51	0.49	2.05

Note: The quantities in parentheses below the estimates are the standard errors.
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

The coefficient of the real GDP is significant in all regressions and appears to have the expected positive sign that we hypothesized. A percentage point increase of RGDP leads to 0.63, 0.86, 0.86 and 1.11 percentage points increase in the trade balance respectively in the pooled, fixed, random and AR model.

The coefficients of GFC and REER are also statistically significant at in most of the above regressions. While the estimated coefficient for the actual REER carries the expected sign

in all regression, the coefficient of GFC does not. As mentioned above, the negative sign displayed by the Gross Fixed Capital Formation can be reflected by heavy importation of capital goods and also by the time-lag effect. Therefore, a one percentage point increase in GFC is associated with a decrease of the trade balance of 0.20, 0.50, 0.49 and 0.62 respectively in the pooled, fixed, random and AR model estimations. However, the negative sign in the REER coefficient suggests a depreciation of the actual REER actually increases the trade balance. A percentage increase in actual REER increases trade balance by about 1.75, 0.97, 0.99 and 0.62 respectively in the pooled, fixed, random and AR model.

However, the coefficient of political stability does not carry the expected sign and is insignificant in all regressions except the pooled model. A one unit increase in political stability is associated with a decrease in the trade balance of 3%, 0.3%, 0.4 and 0.5% respectively in the pooled, fixed, random and AR model.

Furthermore, a comparison between the random and fixed effect models using the Haussmann test shows that the random model is the preferred model since the probability (0.45) is greater than 0.05 at the 5% significance level.

Thus, the actual REER has the expected sign in all regressions in the post-devaluation era - a depreciation of the CFA franc improves competitiveness of the CFA countries, and boosts their net-exports. To see if the same can be said of the equilibrium REER, we estimate equation (2), where actual REER is replaced by the equilibrium REER and report the results in Table 5.

Table 5. Results for Pooled, Fixed, Random and Fixed Effects Adjusted for Autocorrelation of Equation (2), 1995-2015

Dependent variable: LTB

Variables	Pooled OLS	Fixed Effects	Random Effects	Fixed Effects Adjusted for Autocorrelation
Constant	-10.47*** (1.10)	-2.91** (1.09)	-3.58*** (1.06)	-16.40*** (2.79)
LRGDP	0.38*** (0.09)	0.85*** (0.06)	0.82*** (0.06)	1.15*** (0.13)
LGFC	-0.06 (0.07)	-0.50*** (0.04)	-0.49*** (0.04)	-0.63*** (0.05)
LEREER	0.68*** (0.18)	-1.29*** (0.31)	-1.06*** (0.29)	0.75* (0.36)
POL	-0.04*** (0.007)	0.0003 (0.006)	-0.002 (0.006)	-0.007 (0.005)
AR (1)	___	___	___	0.80*** (0.03)
R-squared	0.34	0.89	0.40	0.95
Adjusted R-squared	0.32	0.88	0.39	0.95
`Durbin Watson	0.14	0.57	0.51	2.10

Note: The quantities in parentheses below the estimates are the standard errors.
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Interestingly, the results for EREER are now mixed. While it does carry the expected negative sign in the fixed and random model, the coefficient is positive in the pooled and the AR model (supposed best). A percentage point increase of the EREER leads to an increase of the trade balance of 1.29, 1.06 percentage points respectively in the fixed and random models while the trade balance decreases of 0.75 in the AR model. This is puzzling and could be attributable to the estimation of EREER which was based on the whole sample 1985-2015, instead of just the

post-devaluation era, 1995-2015. Nevertheless, we note that the coefficient estimate for EREER is larger (in absolute value) than it was for REER under both FE and RE estimations, i.e., trade balance is more elastic with respect to EREER (than with respect to REER).

As before, the coefficient of the real GDP is significant in all regressions and appears to have the expected positive sign that we hypothesized. A percentage point increase of RGDP leads to 0.38, 0.85, 0.82 and 1.15 percentage points increase in the trade balance respectively in the pooled, fixed, random and AR model.

The coefficient of GFC is significant in the fixed ($12.5 > t_{stat}$), the random ($12.25 > t_{stat}$) and the FE adjusted model ($12.6 > t_{stat}$) at 1%, 5% or 10% significance level in a two-tail test. Gross Fixed Capital Formation is negatively correlated with trade balance in the fixed, random and AR models, and insignificant in the pooled regression. A percentage point increase in GFC leads to a decrease in trade balance of 0.06, 0.5, 0.49 and 0.63 percentage points respectively in the pooled, fixed, random and dynamic panel model.

The coefficient for the political variable (POL) is insignificant in all the regressions except the pooled. Besides the fixed effect model that displays the expected sign but insignificant, POL carries a negative in all the remaining models. A unit increase in POL leads to a decrease of the trade balance of 3%, 0.2% and 0.7% in the pooled, random and AR model.

In addition, a comparison between the random and fixed effect models using the Haussmann test shows that the fixed model is consistent and preferred to the random effect at 5% significance level according to our probability results ($0.02 < 0.05$).

Based on those new results when the sample is reduced from 1995-2015, REER has the expected sign while EREER does not. Therefore, a depreciation of the actual REER would be

associated with an increase in the trade balance leading CFA countries to be more competitive. However, the elasticities of trade balance are still higher when the EREER is used compared to the REER. While it is encouraging to see that currency devaluation would improve trade balances in the countries zone especially in the post-devaluation era, being tied to the euro, currency devaluation is not an option for an individual country facing chronic trade deficits. It has to be CFA wide and involves multiple parties. 1994 was the last time it was devalued. Individual countries just don't have the autonomy framing monetary and exchange rate policy tailored to their unique needs: idiosyncratic shocks or business cycles departing from the euro zone.

Chapter V: Conclusion

The purpose of this study is to examine the impact of the fixed exchange rate on the trade competitiveness of the CFA countries. A depreciation of the exchange rate is often associated with an increase in trade balance leading to a rise of exports competitiveness. Despite its policy importance in the CFA zone, it appears that this key issue has not received much empirical attention. The present study attempts to fill in this gap by estimating and comparing the impact of two different exchange rates, viz., the *actual real effective exchange rate* (REER), and the *equilibrium real effective exchange rate* (EREER) on the trade balance. To this end, it uses a modified model and annual data over 1985-2015 – a period that saw the launch of the euro that the CFA franc was now pegged to (instead of the French franc that ceased to exist). However, the region's trade with the euro area has seen a declining trend and also the loss of monetary and exchange rate policy and limited fiscal policy options, might have contributed to the zone's economic instability and hurt their trade competitiveness. Indeed, the results indicate that the CFA countries might be better off abandoning the anchor and having their own currency.

Our findings by and large show at first that the actual real effective exchange rate (REER) does not have the theoretically postulated sign in the estimated trade balance equation but the equilibrium one (EREER) does when we used the following sample 1985-2015. However, when we reduced our sample to 1995-2015 (the post-devaluation era), we were able to recover the expected sign for actual REER meaning currency devaluation would improve trade balances in the CFA countries. However, the currency is pegged to the euro, and currency devaluation is not an option open to individual countries – it has to be for the entire zone, involving multiple parties - the last devaluation was in 1994, and hence the interest in the sub-

sample, 1995-2015. Interestingly, coefficient estimate of EREER had the expected negative sign only in the fixed and random effects models. While this could be due to using estimates of EREER data based on the whole-sample (1985-2015) rather than just the post-devaluation era (1985-2015), under both models, trade balance is found to be more elastic with respect to EREER than with respect to REER.

To sum up, REER had a statistically insignificant effect on trade balance over 1985-2015. It becomes significant in the post-devaluation era (1995-2015) but currency devaluation is not an option available to individual member countries. Interestingly, EREER has the expected signs and significance in most cases and, for the sub-sample, its coefficient-estimates are larger than those of REER.[9]

Thus, it appears that the CFA countries could benefit from having their own currencies allowing them greater autonomy over their monetary, and exchange rate policies to deal with country-specific shocks, including chronic trade deficits for many of them. However, moving to individual currencies would also hurt trade and FDI due to higher transactions costs and exchange rate risks. This would call for greater responsibilities and discipline exercising monetary and exchange rate policies. Political institutions should be strengthened, including democracy and separation of fiscal and monetary policy.[10] Hence, before launching their own currency, CFA countries should carefully implement and build solid economic and political

[9] In the AR model, the equilibrium REER does not have the expected sign but the coefficient is statistically insignificant.

[10] The empirical results show that political stability variable was either negative or insignificant in most cases, it might be due to the microeconomics gains (lower transactions, greater exchange rate certainty, and the related gains in trade and FDI) stemming from the peg to the euro.

institutions that will assure a stable macroeconomic environment and independent monetary policy to attract foreign investors.

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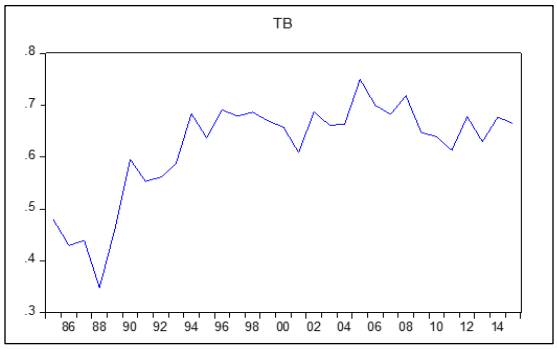
Appendix

Table 6. Correlation between REER and EREER within each country

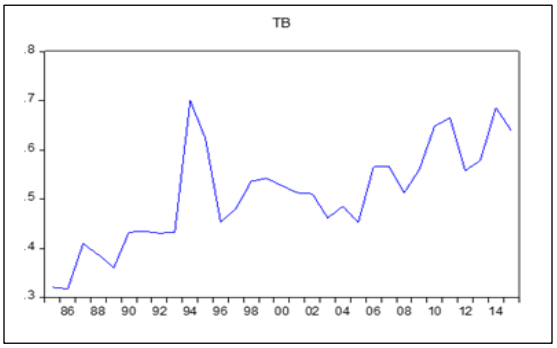
Countries	Correlation Coefficient
Benin	0.73
Burkina Faso	-0.12
Cameroon	0.22
Chad	0.54
Central African Republic	0.58
Congo Republic	0.58
Cote d'Ivoire	-0.06
Gabon	-0.46
Equatorial Guinea	0.65
Mali	0.17
Niger	0.23
Senegal	0.05
Togo	0.19

Figure 1. Trade balances for each country

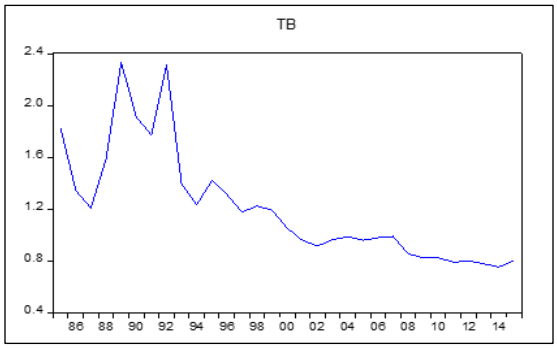
Benin



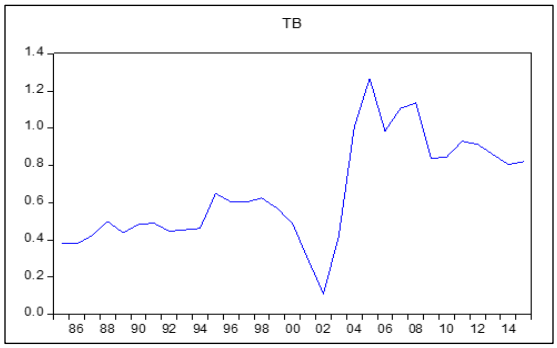
Burkina Faso



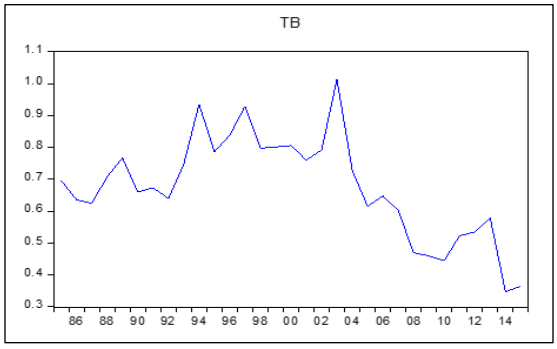
Cameroon



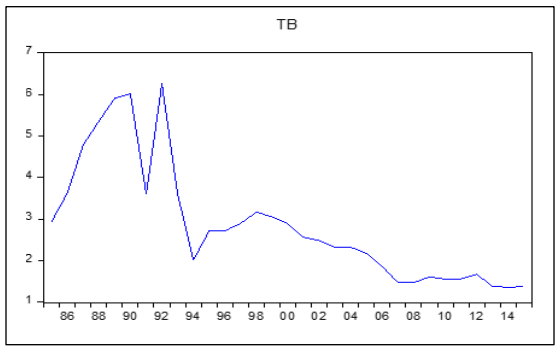
Chad



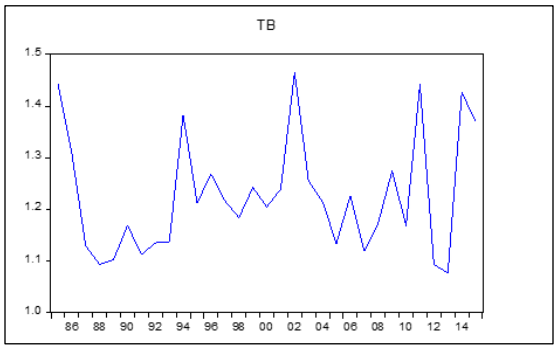
Central African Republic



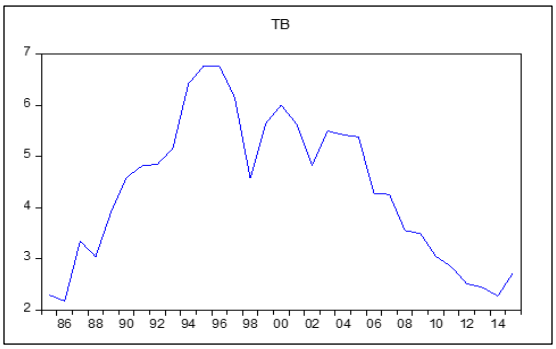
Congo Republic



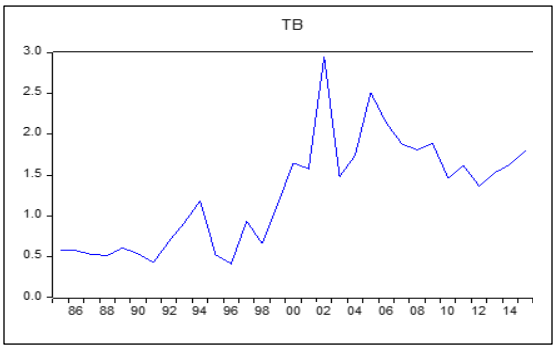
Cote d'Ivoire



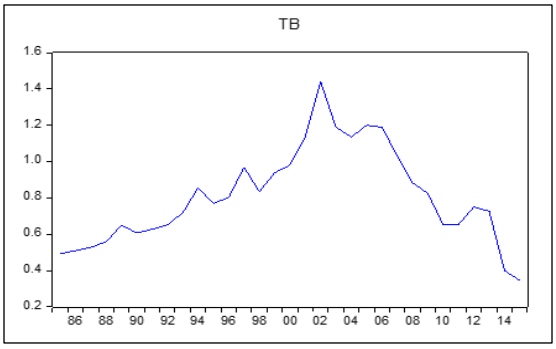
Gabon



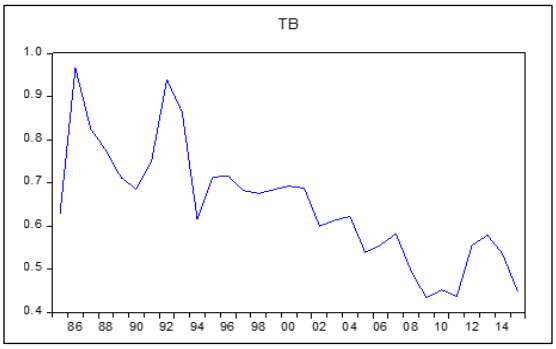
Equatorial Guinea



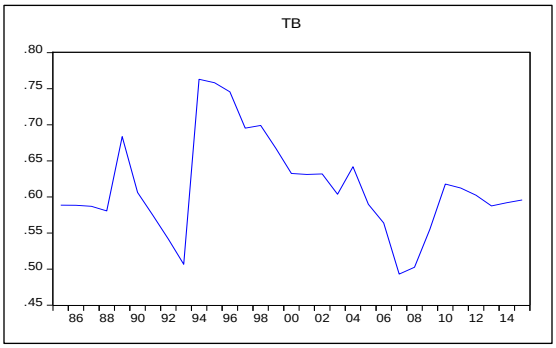
Mali



Niger



Senegal



Togo

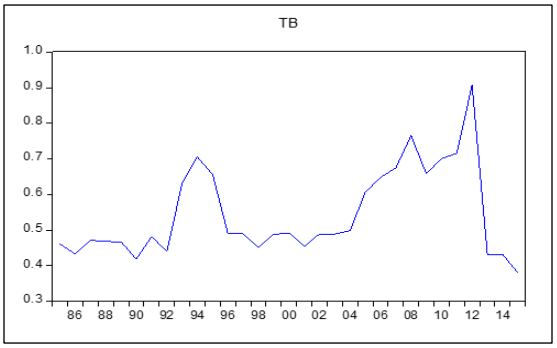
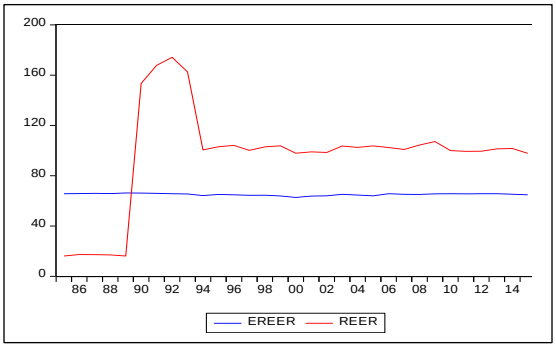


Figure 2. REER and EREER for each country

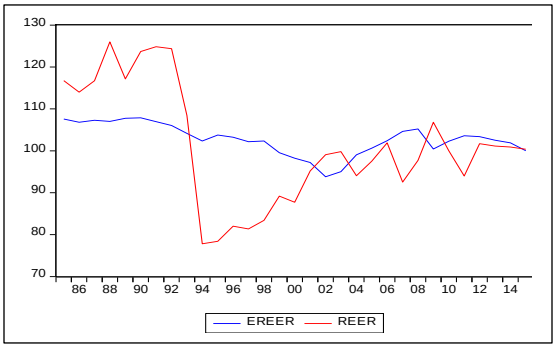
Benin

Burkina Faso

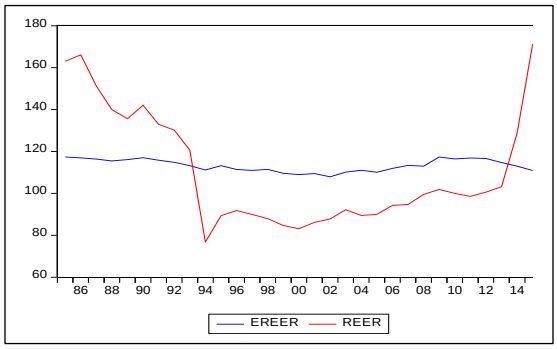


Cameroon

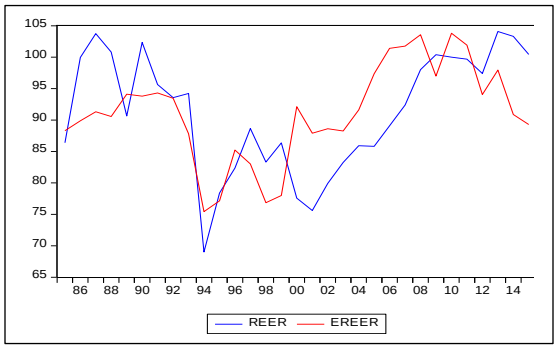
Chad



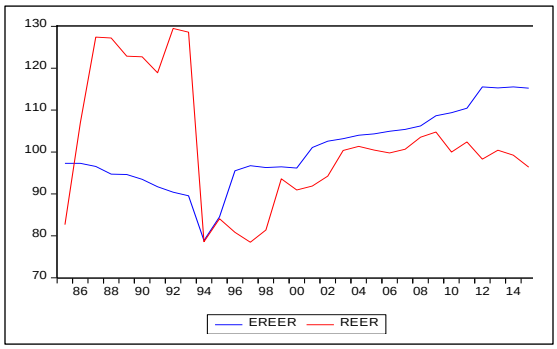
Central African Republic



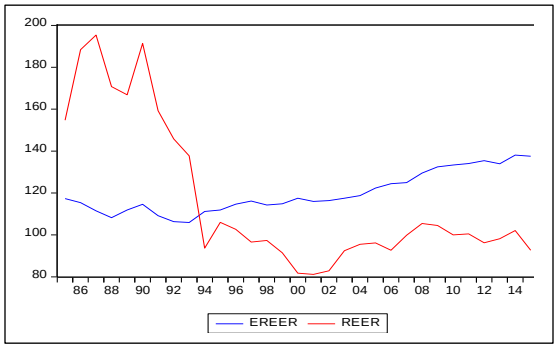
Congo Republic



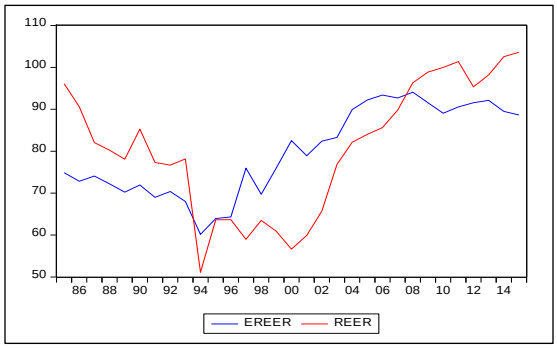
Cote d'Ivoire



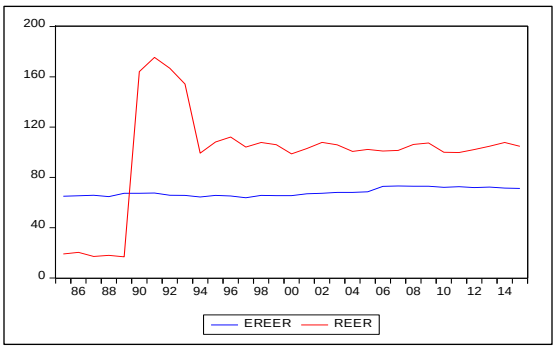
Gabon



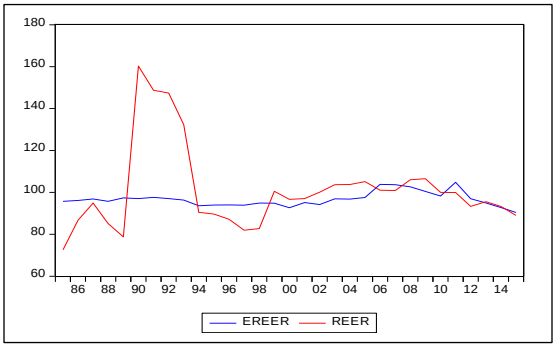
Equatorial Guinea



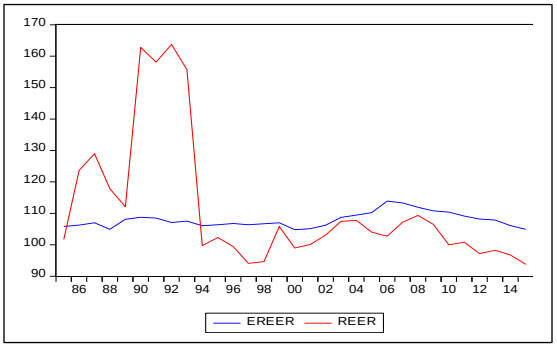
Mali



Niger



Senegal



Togo