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Abstract :

In cfa franc zone, the exchange rate was devalued, in January 1994, in order to deal with the major macroeconomic imbalances that have affected the members during the 1980 decade. Thus, the aim of this paper is to assess the degree of over/undervaluation (namely real exchange rate misalignment) of the currency in the cfa franc zone since the cfa franc devaluation of January 1994.

JEL Classification : C33, F31

Keywords : equilibrium real exchange rate, cfa franc zone, cointegration, panel

Résumé :

En zone franc, la monnaie a été dévaluée en 1994 face aux difficultés rencontrées par ses membres dès le début de la décennie 1980. Ceci dit, si on admet aujourd'hui l'idée d'un franc cfa surévalué avant la dévaluation de 1994 et, ainsi, du bienfait dudit ajustement, n'est-il pas raisonnable aujourd'hui d'avoir une idée de l'ampleur de la sur/sous-évaluation (encore appelé mésalignement) du franc cfa depuis la dévaluation de janvier 1994. Tel est l'objectif de cette étude.

JEL Classification : C33, F31

Mots-clés : taux de change reel d'équilibre, zone franc, cointegration, panel

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1. Introduction

The cfa franc zone is a monetary area which includes fourteen countries in Sub – Saharan Africa having signed, in 1972 and 1973, agreements on monetary cooperation with France ; eight, of these members countries, are in West Africa : Benin, Burkina Faso, Côte d'Ivoire, Guinea – Bissau, Mali, Niger, Senegal, Togo ; six, of them, in Central Africa : Cameroon, Central African Republic, Chad, Congo, Equatorial Guinea, Gabon.

The area has a common currency, the cfa franc, defines as *franc de la coopération financière* in Central Africa and *franc de la communauté financière africaine* in West Africa, issued by the BCEAO (Banque Centrale des Etats de l'Afrique de l'Ouest) in West Africa and the BEAC (Banque des Etats de l'Afrique Centrale) in Central Africa ; the fifteenth member of the cfa franc zone, the Islamic Republic of Comoros, has its own currency (the Comorian franc) and its own central bank (Banque Centrale des Comores).

On january 1994, the cfa franc was devalued against the french franc by 50%. Since the advent of the European Monetary Union (EMU), the cfa franc is now pegged to the euro at a fixed rate of 655.957 cfa franc to 1 euro.

In this paper, our aim is to assess the real exchange rate misalignment in the cfa franc zone since the cfa franc devaluation of January 1994.

Following Edwards (1989), MacDonald (1997), Clark and MacDonald (1998), it is now well admitted that the dynamism of the real exchange rate arises from movements over time of the macroeconomic variables called "fundamentals" :

$$RER(t) = G\{F(t)\}$$

where RER is the real exchange rate, F a vector of "fundamentals", G a specific functional form.

When these "fundamentals" have reached their *sustainable* level (broadly defined as value of "fundamentals" that is consistent with the chosen nominal exchange rate regime), the real exchange rate is therefore at the long – run equilibrium level :

$$RER^* = G\left(F^*\right) \quad (1),$$

where RER^* is the equilibrium real exchange rate, F^* is the *sustainable* level of "fundamentals".

Sustained deviations of the actual real exchange rate from its long – run equilibruim level represents real exchange rate misalignment :

$$RER(t) - RER^* = RER(t) - G\left(F^*\right) \quad (2)$$

This study will be organized following Baffes, Elbadawi and O'Connel (1999)'s steps for estimating the degree of real exchange rate misalignment : in a first step, we will present an analytical model designed to identify the "fundamentals" of the real exchange rate in a representative emerging economy (section 2), in a second step, we will estimate the elasticity coefficient, called long – run parameters, between the real exchange rate and its "fundamentals" (section 3), thus, the third step estimates the real exchange rate misalignment (section 4), finally, in conclusion, we will present a summary of the main results (section 5).

2. The "fundamentals" of the real exchange rate : Montiel (1999)

We consider a small open economy in which the domestic production structure consists of traded and nontraded goods sectors. The unique factor of production in each sector is a perfectly

mobile labor. In this framework the real exchange rate is defined in *internal* term as the domestic relative price of nontradable goods to tradable goods :

$$e = IRER = P_N / P_T \tag{3}$$

where P_N is the price of nontradable goods, P_T the price of tradable goods.

In order to identify the "fundamentals" of the real exchange rate, Montiel (1999) follows an approach now standard in the economic litterature. The idea is to define the equilibrium real exchange rate like Nurkse (1945), as the value of the real exchange rate that is consistent with the two objectives of internal and external balance, for specified *sustainable* values of variables that may influence these objectives.

Internal balance holds when the markets of labor and nontraded goods clear :

$$y_N(e,\xi) = c_N + g_N = \theta c + g_N \,,\ \partial y_N / \partial e > 0 \,,\ \partial y_N / \partial \xi < 0 \,, \tag{4},$$

where y_N represents the supply of nontraded goods under full employment, c is total private spending measured in nontraded goods, θ is the share of spending devoted to nontraded goods, g_N is government spending on nontraded goods, ξ is a differential productivity shock.

External balance : The *external* balance has been defined in various ways in the literature. Montiel (1999) focuses on *stock* rather than *flow* equilibruim approach in wchich, the *external* balance holds when the country's net external assets in world's financial markets have reached a steady – state equilibrium in other words when the country's external liabilities or claims remain the same at each period of time. Since the current account balance helps to appreciate the evolution of the international investment position (equation (1)), the external balance then holds when the current account balance at each period of time is nul :

$$tb + rf^* = y_T(e,\xi) - g_T - (1-\theta)ec + rf^* = 0 \quad (5),$$

where tb is the trade balance defined as the difference between domestic production of traded goods y_T and the sum of government g_T and private spending c on these goods, f^* is steady state value of total net external asset.

(4) and (5) give the following expression for the long – run real exchange rate :

$$e = (\theta/1-\theta)\left\{\frac{y_T(e,\xi) - g_T + rf^*}{y_N(e,\xi) - g_N}\right\} \quad (6)$$

Partial derivatives with respect to the various exogenous variables included in the model give the following expression :

$$e = G\underset{+}{(}g_N, \underset{-}{g_T}, \underset{-}{tb}, \underset{+}{\xi}) \text{ with } tb = -rF^* \quad (7)$$

where the sign + (respectively –) expresses real exchange rate appreciation (respectively real exchange rate depreciation), G a specific functional form.

We can split up total traded goods output into output of exportables y_X and importables y_M . However in this case external balance condition has to be modified as follows :

$$toty_X(e,tot) + y_M(e,tot) - g_M - (1-\theta)ec + rf^* = 0 \text{ with } tot = P_X^W / P_M^W \text{ and } e = P_N / P_M^W \quad (8),$$

where g_M is government spending on importable goods, tot the external terms of trade, P_M^W is the world price of importable goods, P_X^W is the world price of exportable goods.

With this specification on hand, the external term of trade therefore collapses within the list of "fundamentals". Indeed variations in external term of trade affect both internal and external balance. An improvement in the terms of trade causes labor to be transferred from the

importables and nontraded sectors to the expanding exportables sector. Thus, it induces a demand excess in the nontraded goods market ($\partial y_N / \partial tot < 0$) and a supply excess in the traded good sector ($\partial(toty_X + y_M)/\partial tot > 0$).

Since the equilibrium real exchange rate was defined as the rate that prevails when the economy is in internal and external balance, an improvement in the terms of trade requires a real appreciation in order to maintain both internal and external balance[24].

Nevertheless on the grounds of trade policy, the domestic price of exportable goods (P_X) and that of importable goods (P_M) may differ from world prices. This can be the case if we assume that the government applies taxes on imported products at a rate t_m and subsidizes exports to the rate t_x. Under this assumption we can express internal terms of trade (P_X / P_M) as a combination of external terms of trade (tot) and tariff measures ($\eta = 1 + t_m / 1 - t_x$) :

$$P_X / P_M = tot / \eta$$

Since the stance of trade policy affects the internal terms of trade, he collapses within the set of "fundamentals". In order to illustrate our purpose we can for example consider a tightening trade policy modelled as an increase in export subsidies. This measure causes labor to be transferred from the importables and nontraded sectors to the expanding exportables sector. So the previous analysis about the effects of the external terms of trade on the equilibrium real exchange rate can be repeated. Therefore a tightening trade policy appreciates the real exchange rate.

[2] But this effect of the external term of trade on the real exchange rate can be overcome by substitution effect (a supply excess in the nontraded goods market ($\partial y_N / \partial tot > 0$) and a demand excess in the traded good sector ($\partial(toty_X + y_M)/\partial tot < 0$)), leading to an depreciation of the real exchange rate (Baffes, J., Elbadawi, I. and O'Connel, S. (1999)).

The long – run relationship between the real exchange rate and its "fundamentals" (equation (7)) then becomes :

$$e = G\left(\underset{+}{g_N}, \underset{-}{g_T}, \underset{-}{tb}, \underset{+}{\xi}, \underset{+}{\eta}, \underset{+/-}{tot} \right) \quad (9)$$

3. Estimating the long – run parameters

The purpose of this paragraph is to retrieve for the cfa franc zone the long – run parameters in (9) between its real exchange rate and its "fundamentals".

Before proceeding to estimate the long – run parameters, we recall the definition of the real exchange rate and its "fundamentals".

3.1. Definition of the real exchange rate and fundamentals

Constructing the series of the real exchange rate is quite problematic. Indeed, in practice the price indices of tradable and non – tradable goods are not readily available. If the price index of non – tradable goods is generally approached by the domestic consumer price, debates however are more intense for the prices of tradable goods. As part of this study we propose to use the consumer price index of foreign countries and to approach the series of internal real exchange rate by the external real exchange rate. The relevance of this approach is developed quite easily (see box 1 below).

Box 1 : external real exchange rate and internal real exchange rate

Let $BERER$ be the bilateral external real exchange rate between the home country and the foreign partner j :

$$BERER = E^j P / P^j \quad (10),$$

where E^j represents the bilateral nominal exchange rate between the home country and the foreign partner j, P the domestic price level, P^j the foreign partner j's price level.

We can break down consumer prices as a weighted average of traded and non – traded goods prices :

$$P = (P_N)^{\alpha} \cdot (P_T)^{1-\alpha} \text{ and } P^j = \left(P_N^j\right)^{\alpha} \cdot \left(P_T^j\right)^{1-\alpha} \text{ with } 0 < \alpha < 1 \quad (11),$$

where P_N represents the price of non – traded goods, P_T the price of traded goods, α the share of non – tradables goods (assumed to be the same for the home and the foreign country).

(11) and (12) give :

$$BERER = \frac{(P_N / P_T)^{\alpha}}{\left(P_N^j / P_T^j\right)^{\alpha}} \cdot \frac{E^j P_T}{P_T^j} \quad (12),$$

In the long – run, we can assume that the law of one price applies to tradables :

$$E^j P = P^j$$

The ratio P_N / P_T (respectively P_N^j / P_T^j) represents the internal real exchange rate for the home country (respectively for the foreign partener j) :

$$BERER = (IRERD)^{\alpha} / (IRERF)^{\alpha} \text{ with } IRERD = P_N / P_T \text{ and } IRERF = P_N^j / P_T^j \quad (13)$$

Taking the logarithms of both sides and then differentiating equation (14) gives for small changes :

$$\frac{\Delta BERER}{BERER} = \alpha\left(\frac{\Delta IRERD}{IRERD}\right) - \alpha\left(\frac{\Delta IRERF}{IRERF}\right) \quad (14)$$

where Δ represents the absolute change.

In the long run, we can assume that the relative change in the foreign country's internal real exchange rate is proportional to the relative change in the home country's internal real exchange rate :

$$\frac{\Delta IRERF}{IRERF} = k\frac{\Delta IRERD}{IRERD} \text{ with } 0 < k < 1$$

So we obtain :

$$\frac{\Delta BERER}{BERER} = \alpha(1-k)\left(\frac{\Delta IRERD}{IRERD}\right)$$

Therefore, under some assumptions, the relative change in the home country's external real exchange rate is proportional to the relative change in its internal real exchange rate, and, thus, there is a link between the fundamentals and the external real exchange rate.

We use the following fundamentals, those, who, following (10), have the expected effect on the real exchange rate :

Government spending on non – traded goods : measured as the share of government consumption in GDP.

Government spending on traded goods : measured as the share of GFCF in GDP.

Stance of trade policy : like it is common in the literature (Edwards (1989), Baffes, Elbadawi and O'Connel (1999)) we assume that other things being equals, a more liberal trade regime means higher trade volumes. Therefore, we use ratios of trade (export plus import) to GDP as a measure of the *stance of trade policy*.

Trade balance to GDP ratio.

External terms of trade : measured as the ratio of export price index to import price index.

The frequency of data is annual and covers 9 of the 15 countries of the cfa franc zone (Benin, Cameroon, Côte d'Ivoire, Congo, Mali, Niger, Senegal, Tchad and Togo) observed between 1980 – 2010. They were taken from various sources, Penn World Table for the real exchange rate and UNCTAD database for the other.

3.2. Determining the order of integration

For the three tests (Harris and Tzavalis (1999), Levin, Lin and Chu(2002), Im, Pesaran and Shin (2003)) that we use, the null is unit root. The results of these tests were grouped in the following table :

Table 1 : unit root tests

		Harris and Tzavalis			Levin, Lin and Chu		Im, Pesaran and Shin	
		none	*constant*	*trend*	*constant*	*trend*	*constant*	*Trend*
lreer	(1)	0.1	0.2	0.1	0.1	2.3	1.1	1.1
	(2)	-59.3*	-26.2*	-15.1*	-6.1*	-2.1*	-11.1*	-9.4*
lgn	(1)	-0.1	-5*	-4*	4.4	2.6	-1.7**	-2.1*
	(2)	-69*	-30.4*	-18.1*	-4.5*	1.9	-14.6*	-13.1*
lgt	(1)	-0.7	-9	-6*	-1.1	-0.4	-4.3*	-3.4*
	(2)	-76.3*	-33.5*	-20.3*	-14.2*	-9.5*	-18.2*	-17.2*
b	(1)	-12.3*	-10.6*	-6.54*	0.65	4	-3*	-3.4*
	(2)	-75.8*	-33.1*	-19.8*	-8*	-4.7*	-17.3*	16.5*
lopen	(1)	-3.4*	-5*	-4.3*	-1.5***	0.9	-2.6*	-2.2*
	(2)	-75.2*	-32.8*	19.4*	-13.6*	-9.3*	-17*	-15.9*
ltot	(1)	-0.0	0.0	0.1	0.9	3.5	0.3	0.4
	(2)	-70.5*	-31.2*	-18.6*	-7.8*	5.2	-15.7*	-14.4*

Notes : * (**, ***) the null hypothesis is rejected at 1% (5%, 10%) level. (1) : level, (2) : first difference. *lreer* = log real exchange rate, *lgn* = log government consumption (percentage of GDP), *lgt* = log GFCF (percentage of GDP, *b* = trade balance ratio (percentage of GDP), *lopen* = log openness (exportation+importation in percentage of GDP), *ltot* = log external terms of trade.

So if $I(d)$ represents the order of integration, with these results we concluded in favor of $I(1)$ for all series. Thus, conditions for the existence of cointegrating relationships are already satisfied.

3.3. Cointegration test

We use the pooled within dimension tests (*panel v-stat*, *panel rho-stat*, *panel pp-stat*, *panel adf-stat*) and the group between dimension tests (*group rho-stat*, *group pp-stat*, *group adf-stat*) of Pedroni (1995, 1999). All of these statistics are distributed N(0,1) under the null of unit root.

For the *panel v-stat* the right tail of the normal distribution is used to rejected the null hypothesis and, for this statistic, large positive value imply that the null of no cointegration is rejected, concerning the other six statistics, it is the left tail of the normal distribution who is used to rejected the null hypothesis, and, for these other six statistics, large negative value imply that the null of no cointegration is rejected. In this study we have made the choice to conduct these tests with a constant term in the cointegrating vector. The results of these tests were grouped in the following table :

Table 2 : Pedroni's cointegration tests

	Statistics
Pooled within dimension tests	
Panelv-stat	-0.81
panel rho-stat	1.33
panel pp-stat	-0.47
panel adf-stat	6.98*
Group mean between dimension tests	
group rho-stat	2.42
group pp-stat	-0.04
group adf-stat	7.64

Notes : * (**, ***) the null hypothesis is rejected at 1% (5%, 10%) level.

On the basis of this result we choose to work with the hypothesis of cointegration between real exchange rate and its fundamentals.

3.4. The long – run parameters

Table 3 below presents FMOLS estimates of the long – run relationship (equation (9)). We assume this (equation (9)) linear in logarithm :

Table 3 : Cointegrating relation – FMOLS regression

lreer	Coefficients	t – student
lgn	0.2711	15.2657*
lgt	-0.0579	-37406*
b	-0.4788	-9.5663*
lopen	-0.3362	-25.6867*
ltot	-0.1054	-6.4947*
Constant	-4.7955	-50.4047*

Notes : * (**, ***) the null hypothesis is rejected at 1% (5%, 10%) level. *lreer* = log real exchange rate, *lgn* = log government consumption (percentage of GDP), *lgt* = log GFCF (percentage of GDP, *b* = trade balance ratio (percentage of GDP), *lopen* = log openness (exportation+importation in percentage of GDP), *ltot* = log external terms of trade.

As pointed out by the theoretical model an increase in the *government spending on non – traded goods* appreciate the real exchange rate. An increase in the government spending on traded goods, an improvement in the *trade balance ratio to GDP*, trade – liberalizing reforms (an increase of *openness*), as well an improvement in the *external terms of trade* depreciate the real exchange rate. Thus, all the parameters have the right sign.

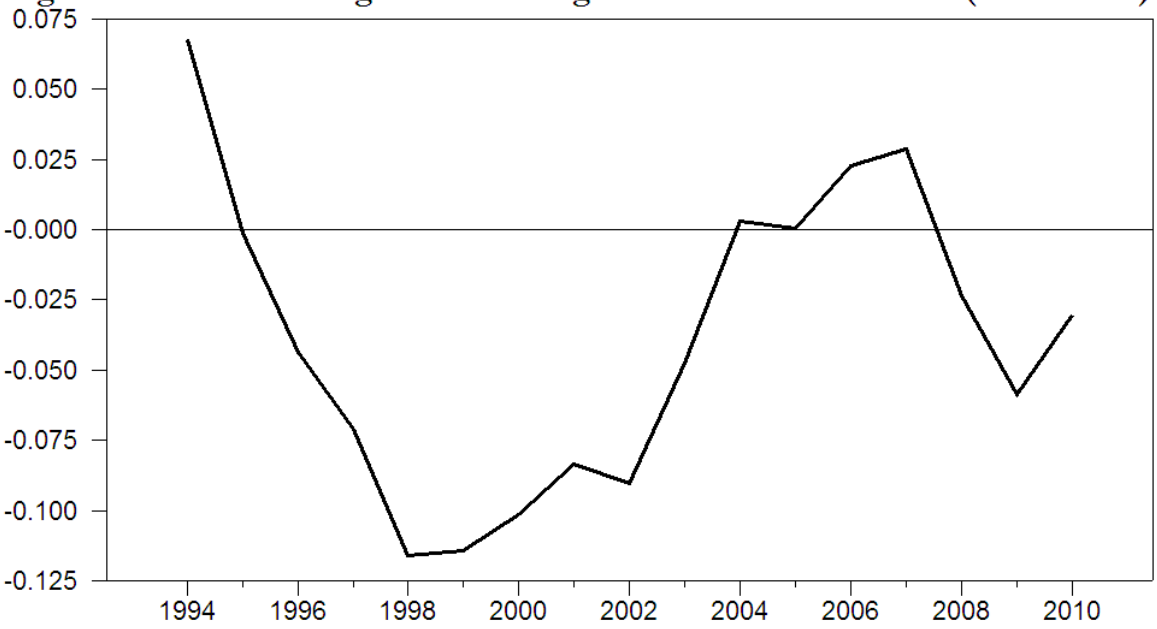
4. Estimating the degree of misalignment

We have defined the real exchange misalignment as the difference between the real exchange rate and its equilibrium value (equation (2)). Following Baffes, Elbadawi and O'Connel (1999) we can decompose the real exchange rate misalignment as follow : $RER(t) - RER^* = RER(t) - G(F) - G(F^* - F)$. The term $RER(t) - G(F)$ is called short-run misalignment (the misalignment calculated using the actual rather than sustainable values of fundamentals) and here we have choosed to computed only this.

We use the long – run parameters reported in table 3 to compute $G(F)$ and the degree of real exchange rate misalignment between 1980 and 2010 and we will stand that the real exchange rate is overvalued (respectively, is undervalued) if *Misalignment* >0 (respectively, if *Misalignment* < 0).

The figure 1 below represents the degree of exchange rate misalignment in cfa franc zone after the cfa franc devaluation of January 1994 (between 1994 and 2010).

Figure 1 : Real Exchange Rate Misalignment in cfa franc zone (1994 - 2010)



As depicted in the figure after the cfa franc devaluation of january 1994, the real exchange rate in cfa franc zone fell sharply until 2003 and rises during four years between 2004 and 2007.

5. Conclusion

The aim of this study was to assess the degree of over/undervaluation of the currency in cfa franc zone after the cfa franc devaluation of January 1994. Because, following our calculations, during the whole period after the devaluation considered here (1995 – 2010), the cfa franc's real exchange rate was undervalued by -4.5% on average, we conclude that the cfa franc devaluation, of January 1994 was benefit.

References

Baffes, J., Elbadawi, I. and O'Connel, S. (1999) 'Single equation estimation of the equilibrium real exchange rate', in *Exchange rate misalignment* : c*oncepts and measurement for developing countries*, L. Hinkle et P. Montiel (eds), World Bank Research Publication.

Clark, P. and MacDonald, R. (1998) 'Exchange rate and economic fundamentals – A methodological comparison of BEERs and FEERs', *IMF Working Papers*, No. 98/67, International Monetary Fund.

Edwards, S. (1989) *Real exchange rate*s, *Devaluation and adjustment* : *Exchange rate policy in developing countries*, MIT Press, Cambridge, Massachussetts.

Harris and Tzavalis (1999) 'Inference for unit roots in dynamic panels where the time dimension is fixed'. Journal of Econometrics, vol 91, pp 201–226.

Im, Pesaran and Shin (2003) 'Testing for Unit Roots in Heterogeneous Panels', *Journal of Econometrics*, , vol 115, pp 53-74.

Levin, Lin and Chu (2002), 'Unit root tests in panel data : Asymptotic and finite-sample properties', *Journal of Econometrics*, vol 108, pp 1–24.

MacDonald, R. (1997) 'What determines real exchange rates ? The long and short of it', *IMF Working Paper*, No. 97/21, International Monetary Fund.

Montiel, P.J. (1999) 'Determinants of the long – run equilibrium real exchange rate : An analytical model' in *Exchange rate misalignment* :*Concepts ad measurement for developing countries*, L. Hinkle and P. Montiel (eds), World Bank Research Publication.

Nurkse, R. (1945) 'Conditions of international monetary equilibrium' in *Essays in International Finance* 4, Princeton University Press, International Finance Section, New Jersey, USA.

Pedroni, P. (1995) 'Panel Cointegration ; Asymptotic and Finite Sample Properties of Pooled Time Series Tests with an Application to the PPP Hypothesis' *Indiana University Working Papers in Economics,* No. 95-013.

Pedroni, Peter (1999) 'Critical Values for Cointegration Tests in Heterogeneous Panels with Multiple Regressors' *Oxford Bulletin of Economics and Statistics*, vol 61, pp 653-70.