Economics Bulletin

Volume 37, Issue 2

Investigating the link between the exchange rate regime and underlying misalignments

Ferdinand Owoundi
C.R.I.E.F, University of Poitiers (France)

Abstract

This paper investigates the link between the exchange rate regime and underlying misalignments within two groups of Sub-Saharan African countries experiencing different exchange rate arrangements, with the goal of providing useful recommendations for economic policy. To this end, we first compute misalignments relying on the well-known behavioral approach to the equilibrium exchange rate which we modify by introducing dummy variables to account for the type of the exchange rate regime. Resulting misalignments are then compared through a mean comparison test. As a proof of consistency, we asses a new equilibrium exchange rate based on the so-called "Natural" approach to the equilibrium exchange rate and resulting misalignments are also compared through another mean comparison test. Overall, results show that the exchange rate regime is not responsible for misalignments or even their potential growth repercussions.

I am grateful to the two anonymous referees and particularly to Christian Aubin from University of Poitiers for very helpful comments on earlier drafts of this paper. However, I am solely responsible for any remaining mistakes.
Citation: Ferdinand Owoundi, (2017) "Investigating the link between the exchange rate regime and underlying misalignments ", *Economics Bulletin*, Volume 37, Issue 2, pages 880-888
Contact: Ferdinand Owoundi - ferdinand.owoundi.fouda@univ-poitiers.fr.
Submitted: July 24, 2014. **Published:** April 22, 2017.

Economics Bulletin

Submission Number: EB-14-00640

Real exchange rate misalignments: is the exchange rate regime matters? evidence from sub-saharan african countries

Ferdinand Owoundi
University of Poitiers (France)

Abstract

This article examines the impact of exchange rate regime on the real exchange rate misalignments in Sub-Saharan African countries. To this end, we compare misalignments of 17 countries divided into two groups defined by the membership to a monetary union or not. For a robust analysis, we adopt two approaches for determining the equilibrium exchange rate (BEER and NATREX). Then, we apply the Pooled Mean Group method, which we compare to alternative methods, relying on annual data between 1980 and 2011. Our results show that misalignments do not differ in average from one group of countries to another.

The author whishes to thank Professors Christian Aubin and Jean-Pierre Fouda Owoundi for very helpful comments on earlier drafts of this paper. However, he is alone accountable for all remaining mistakes in the text.
Submitted: July 24, 2014.

1. Introduction

Exchange rate fluctuations are commonly studied since the collapse of the so-called "Bretton Woods system" and the establishment of flexible rates. Resulting volatility in the global economy amplified by the financial integration has notably raised interest about the equilibrium levels of exchange rates. For that reason, particular care is commonly paid to sustained deviations of real rates around their long run equilibrium levels. Such a concern is justified, since these deviations, also called "misalignments", are likely to alter resource allocation, disrupt price formation or investment decisions with adverse impact on growth consequently.

Therefore, the assessment of the exchange rate efficiency in adjusting an economy depends on knowledge of the so-called equilibrium rates, as one assume that they simultaneously achieve both internal and external balances over the medium-long run (Thibault, Couharde, and Borowski 1998). However, assessing equilibrium levels remains a major issue due to the underlying theoretical debates about their right determinants or even the appropriate econometric approach for estimates (Clark and Mac Donald 1998). Nevertheless, attempts to assess these equilibrium rates have been significant since resulting misalignments may fuel growth or rather lead to poor economic conditions as explained above. More specifically, idiosyncratic effects of misalignments have recently been a central focus of both researchers and practitioners since Asian countries experienced rapid growth via the export-led strategy and the deliberate manipulation of their exchange rates.

In this context, some authors have tried to link the extent of misalignments to the type of exchange regime on a worldwide basis (Coudert and Couharde 2009; Dubas 2009). Despite this, we believe that these studies do not allow one to focus on the case of Sub-Saharan African Countries (SSA countries) and specifically countries belonging to the Franc Zone. These countries are for interest here owing to the poor growth performances they have experienced but more importantly because of the unique features of the Franc Zone in the world. Indeed, this monetary union is the only regime in which the exchange rate is strictly peg to another currency since the end of the World War II with devaluation as last resort to deal with severe crisis. Given the current economic situation in these countries, one can blame the faulty responsibility of this official arrangement.

Consequently, this paper investigates the link between the exchange rate regime and underlying misalignments within two groups of SSA countries experiencing different exchange rate arrangements, with the goal of providing useful recommendations for economic policy. To this end, we first compute misalignments relying on the well-known behavioral approach to the equilibrium exchange rate (BEER) which we modify by introducing dummy variables to account for the type of the exchange rate regime. Since deriving estimates do not appear to reveal any difference related to the exchange rate regime, we confirm this intuition by running a mean comparison test. As a proof of consistency, we then assess a different equilibrium exchange rate based on the so-called "Natural" approach to the equilibrium exchange rate (NATREX) and we compare resulting misalignments through another mean comparison test.

Given the foregoing, section 2 presents our methodology for misalignments determination; Section 3 presents the analysis of the exchange rate regime impact on misalignments; Section 4 briefly presents our robustness analysis and section 5 concludes this paper.

2. Determining the equilibrium exchange rate and misalignments

To determine the long run equilibrium exchange rate, we rely on the behavioral approach (BEER; see (Clark and Mac Donald 1998)) which is more appealing than other approaches (notably the Fundamental Equilibrium Exchange Rate - FEER) as it is less based on complex theory but reports exchange rate developments on an empirically basis. Simply put, the BEER approach states that the current real exchange rate (q_t) can be disaggregated into a systematic or long run component ($\bar{q}_t$) and the real interest rate differential $\left(r_t - r_t^*\right)$ as follows:

$$q_t = \bar{q}_t + \left(r_t - r_t^*\right) \tag{1}$$

where r_t and r_t^* are the domestic and foreign real interest rates respectively. It should be noted that to identify long run determinants of the exchange rate, authors commonly consider specific features of the countries they are studying. Therefore, here we assume that the long run equilibrium exchange rate ($BEER_{it}$) is expressed as follows:

$$BEER_{it} = \alpha Open_{it} + \beta Nfa_{it} + \delta \Pr od_{it} + \gamma Gov_{it} + \omega Tot_{it} + \theta \operatorname{Re} g1 + \rho \operatorname{Re} g2 \tag{2}$$

where *Open* is the openness degree of the economy[1], which reflects the influence of the country's commercial policy. Increased openness degree tends to alleviate domestic prices rising with real depreciation as a consequence; *Nfa* is net foreign asset position which is assumed to be positively linked the real exchange rate (RER); *Prod* represents the productivity of a single country relative to others[2] which enable us to account for the positive relationship between this variable and the RER ("Balassa-Samuelson effect"[3]); *Gov* stand for government expenditures. As one can assume that they are mostly devoted to non-tradable goods, we expect that increased public consumption raise the demand and prices for these goods leading to real appreciation; *Tot* stand for terms of trade defined as the relative price of exports compared to imports. It is hard to predict their effects as the price of tradable goods includes both prices of exports and imports.

Unlike the traditional approach, we add two dummy variables *Reg1* and *Reg2* in equation (2), to account for panel heterogeneity related to the affiliation or not to the fixed exchange rate regime (Franc Zone and Common Monetary Area). More specifically $Reg1 = 1$ if a country belongs to the fixed exchange rate regime, and zero otherwise (inversely for *Reg2*). It should be noted that we do not expect any sign on both variables.

Based on the above, we finally determine the misalignment percentage (*%mis*) as shown by equation (3):

$$\%mis = \frac{REER - BEER}{BEER} \times 100 \tag{3}$$

where *REER* is the real effective exchange rate.

---

[1] The Openness degree is the total trade (sum of exports and imports) as a percentage of GDP.

[2] For each country, the productivity indicator is computed as the ratio of the real GDP per capita to that of OECD countries (Baffes, Elbadawi, and O'Connell 1999).

[3] The Balassa-Samuelson effect underlines the real appreciation immediately following an increased productivity in the open sector.

3. Assessing the exchange rate regime impact on misalignments

We rely on the Pooled Mean Group (PMG; (Pesaran, Shin, and Smith 1999)) estimator to assess the equilibrium exchange rate for 17 Sub-Saharan African countries over the period 1980-2011[4]. This estimator is reliable for dynamic panels and allows estimating long-run relationship within a comprehensive framework without any prior precaution regarding stationary and cointegration issues.

For this study, countries are clustered depending on the exchange rate regime (see table 1). This clustering is quite different from the IMF's official classification which lists height exchange rate regimes and three main underlying categories namely: pegged, intermediate and flexible exchange rate regimes. More precisely, since our focus is just in the fixed regime, we simply distinguish between countries belonging to a fixed exchange rate regime (Franc zone and Common Monetary Area) and countries that do not belong to a fixed regime (independent exchange rate regime). As an explanation, this simple approach allows us to recover the larger number of countries regarding data availability, thus enabling to shed light on the Franc zone as a case study while providing further insights to the issue of monetary regionalization in developing countries. Moreover, our approach is consistent with the so-called "coarse" classification proposed by (Reinhart and Rogoff 2004).

Table 1 – Clustering countries

Clusters	Countries
Countries belonging to a monetary union	Cameroon, Central African Republic, Ivory Coast, Gabon, Equatorial Guinea, Lesotho, Togo
Countries with an independent exchange rate regime	Burundi, Congo, Gambia, Ghana, Malawi, Sierra Leone, South Africa, Uganda, Zambia

Source: Author's construction

Estimated results of the equilibrium exchange rate are based on the best underlying specification to the PMG estimator (which we select among other relevant specifications through information criteria; see table 2). Overall, results are in line with our theoretical expectations (see table 3). Indeed, they support the Balassa-Samuelson hypothesis as improved productivity[5] in the open sector leads to currency appreciation.

Table 2 – Choosing the best underlying specification

	ARDL (1,1,2,1,1,1,1,1)	*ARDL (1,3,3,1,1,1)*	*ARDL (1,1,1,1,3,1,1)*
AIC	-986.7505*	-679.807	-901.1081
BIC	-933.771*	-642.6848	-855.6886

Source: Author's construction. Numbers in brackets refer to the lags for each variable. * indicates the minimal value of the retained criteria.

Similarly, a rise in terms of trade results in real appreciation signifying that the spending effect supersedes the income effect as confirmed by (Bouoiyour, Marimoutou, and Rey 2004), or (Coudert, Couharde, and Mignon 2013). However, the greater openness degree of the economy depreciates the national currency, as showed by (Dufrénot and Yehoue 2005). Similarly, increasing net foreign asset position results in real depreciation suggesting national preference for imported goods. Public spending effect is also negative meaning that real depreciation stem from a rise in government consumption. This result goes against the common finding in the

[4] Data are from the World Development Indicators (2014) and the International Financial Statistics (2012).

[5] In this article, productivity is approximated by the ratio of the real GDP per capita of a country over that of OECD countries. This approach is also used by (Baffes, Elbadawi, and O'Connell 1999) for the case of Ivory Coast and Burkina Faso. But, given difficulties to compute productivity, it is common to consider the US real GDP per capita as a proxy to the productivity of the rest of the world (Coudert 1999). However, this seems to us to be limited because it does not really consider the weight of different partners in a country's trade relations.

literature which is based on the assumption that public spending is mainly used to purchase non-tradable goods (Mongardini and Rayner 2009). As a matter of fact, government expenditures are also diverted by part of the upper class whose consumption is oriented towards luxury and high-tech goods (see the Corruption Perception Index of Transparency International for details).

Table 3 – Estimates of the equilibrium real exchange rate

Variables[6]	Pooled Mean Group (ARDL (1,1,2,1,1,1,1,1))
Productivity	0.28*** *(4.55)*
Net foreign asset position	-0.005** *(-1.96)*
Terms of trade	0.26*** *(3.46)*
Openness degree of the economy	-0.15*** *(-2.19)*
Government spending	-0.24*** *(-2.31)*
Reg1 (fixed exchange rate regime)	5.58*** *(11.26)*
Reg2 (floating exchange rate regime)	5.99*** *(11.65)*
Adjustment multiplier	-0.11*** *(-2.00)*

Source: Author's construction. *, ** and *** indicate significance at 10%, 5% and 1% respectively.

Regarding the exchange rate regime influence, estimates appear to show no differential effects depending on the type of arrangements as the corresponding coefficients are very similar. This conclusion is further confirmed when we compare misalignments that derive from each exchange rate regime relying on a simple mean comparison test. Precisely, we have computed the mean of misalignments for each group and we have tested the hypotheses that the difference in misalignments between these groups is "less than 0" or rather "greater than 0". Details are displayed in table 4.

Table 4 – Mean comparison test

	Mean	Standard deviation
Countries with a fixed exchange rate regime (Fix)	3.39	11.41
Countries with an independent exchange rate regime (Float)	3.32	10.72
alternative hypothesis	**Probability**	
Average (Float) – Average (Fix) < 0	0.47	
Average (Float) – Average (Fix) # 0	0.94	
Average (Float) – Average (Fix) > 0	0.53	

Source: Author's construction

Before concluding about the exchange rate regime influence, it is convenient to run a robustness analysis to compare results. With this aim in mind, we first check that the main hypothesis of the PMG estimator is reliable[7]. That is why we run the simple *Likelihood Ratio* test displayed in Table 5 which do not reject the null of parameters equality in the long run. In other words, this test reveal that the assumption of long run homogeneity is relevant in this context.

[6] Variables have been turned into logarithms except the net foreign asset position which is expressed as a share of GDP.

[7] Recall that the main hypothesis of this estimator is that estimated coefficients remain equal in the long run relationship for all countries in the sample (long run homogeneity).

Table 5 – ***Likelihood Ratio*** **test**

Null Hypothesis: parameters equality in the long-run	**Statistic**	**Probability**
Chi2 (75)	*-224.02*	*1.00*

Source: Author's construction.

Second, we go further by considering a different approach to the equilibrium exchange rate as showed in the following section.

4. Robustness check

We now rely on the so-called "Natural" approach to the equilibrium exchange rate (NATREX) to check whether previous results are reliable. As a definition, the Natural Real Exchange Rate ensures external balance when cyclical and speculative factors have been cleared, unemployment rate being at its NAIRU level. Generally, this approach suggests that the real exchange rate path may be decomposed as the sum of three components belonging to the short, the medium and long run respectively. Conditions to achieve the macroeconomic balance through dynamic transitions between each time horizon are expressed in a set of equations with a solid microeconomic foundation. But, as regards small open economies for which it still possible to distinguish between tradable and non-tradable goods, (Lim and Stein 1995) rather propose a variant of the traditional model. Based on their analysis, we now express the equilibrium exchange rate by the following reduced form equation:

$$e^* = e(\overset{+}{g_N}, \overset{-}{g_T}, [z + \overset{+}{r}.f], \overset{+}{\rho}, \overset{-}{\eta}, \overset{?}{\tau}) \quad (4)$$

This equation shows that a rise in both public spending on non-tradable goods (g_N), productivity (ρ) and $[z+r.f]$ generate a real appreciation. The latter variable (renamed "Trans" hereafter) is the difference between the current account and the trade account representing the amount of transfers coming from abroad. Thus, a rise in this variable generates the real appreciation through reduced incentives for production in the tradable goods sector. Conversely, public spending on tradable goods (g_T) and trade openness (η) generate a real depreciation. As before, external terms of trade (τ) impact is unknown because of the conflicting income and substitution effects. It should be noted that at the empirical level it is not possible to distinguish between governments spending on tradable goods to those on non-tradable goods. Thus "government's spending" remains the same as before. Furthermore, external terms of trade are those of advanced economies[8].

As previously, estimated results are based on the best underlying specification to the PMG estimator (see table 6).

Table 6 – **Selecting the best specification**

	ARDL (1, 1, 1, 2 3, 2, 1)	*ARDL (1, 1, 2, 3, 2, 1)*	*ARDL (1, 1, 2, 3, 4, 1)*
AIC	-404.61*	-378.92	-393.51
BIC	-362.56*	-366.83	-351.88

Source: Author's construction. Numbers in brackets refer to the lags for each variable. * indicates the minimal value of the retained criteria.

Results based on this new specification are consistent with those deriving from the previous analysis (see table 7). Indeed, an increase in the openness degree of the economy generates the real depreciation. The Balassa-Samuelson effect is also confirmed as improving productivity leads to the real appreciation. Furthermore, in accordance with our theoretical expectations, a

[8] This is a default choice imposed by data unavailability.

widening of the gap between the current account and the trade balance (a rise in "Trans"), should generates the real appreciation. The external terms of trade effect also highlight the spending effect as improvement in the external terms of trade raise the national income in terms of imported goods leading to the rise in the demand for all goods.

Table 7 – Estimate of the Natural Real Exchange Rate

Variables	Pooled Mean Group (ARDL (1,1,2,3,3,1))
Openness degree of economy	*-0.81*** (7.46)*
External terms of trade	*1.04*** (-7.84)*
Productivity	*0.16*** (-3.33)*
Government spending	*-0.53*** (3.66)*
Trans	*0.02** (-2.16)*
Adjustment Multiplier	-0.11*** (-2.69)

Source: Author's construction. *, ** and *** indicate significance at 10%, 5% and 1% respectively.

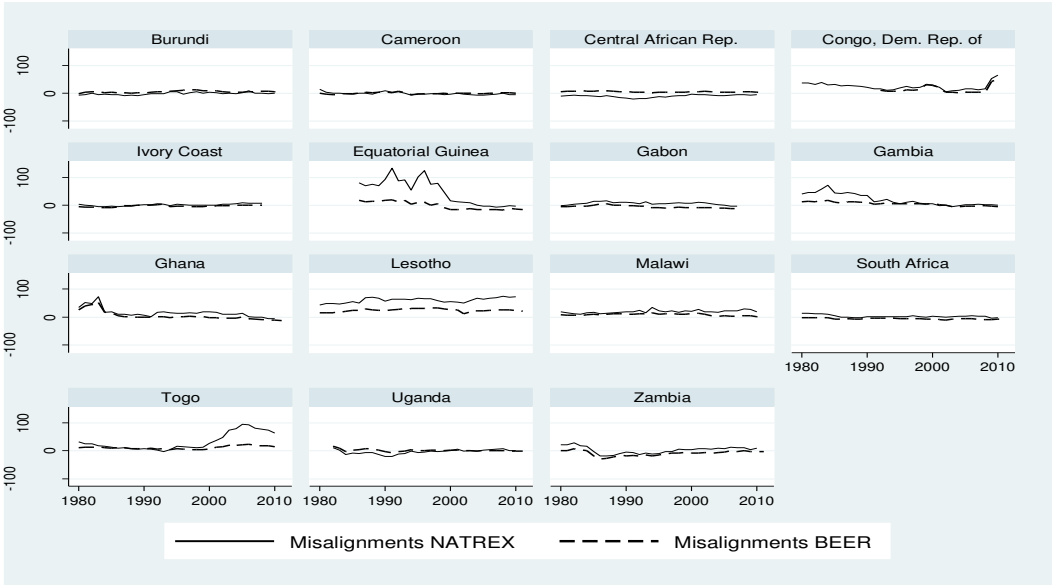
Therefore, we compute new misalignments based on equation (3) and we run a new mean comparison test (Table 8) which reveals that there is no difference between misalignments although they exist in the two types of exchange rate arrangement (a graphical comparison is also provided on the chart below for further illustration). This result is thus in line with the finding of (Dubas 2009) showing that for developing countries, the choice of an exchange rate regime does not seem to matter in limiting misalignments.

Table 8 – Mean comparison test

	Mean	Standard deviation
Countries with a fixed exchange rate regime (Fix)	10.72	1.72
Countries with an independent exchange rate regime (Float)	10.87	1.26
alternative hypothesis	**Probability**	
Average (Float) – Average (Fix) < 0	0.53	
Average (Float) – Average (Fix) # 0	0.94	
Average (Float) – Average (Fix) > 0	0.47	

Source: Author's construction.

Chart - Estimated misalignments



5. Conclusion

This paper investigated the link between the exchange rate regime and corresponding misalignments with Sub-Saharan African countries as a case study. More explicitly, we addressed the issue of the exchange rate regime influence in limiting these misalignments. The specific focus to Sub-Saharan African countries seems justified since one need to compare economic performances which may result from each exchange rate arrangement within that region, with the aim to provide further insights to the debate on the future of the Franc Zone. As a matter of fact, countries belonging to this monetary union have recently been concerned with the real appreciation of the euro with respect to the US dollar which would have adversely affected their economies in terms of price competitiveness, thus leading some of them to consider the exiting of the monetary union as the last resort.

Under these conditions, we propose a simple approach which evaluates and compares misalignments of 17 countries depending on the type of exchange rate regime they experience, within the limits imposed by data availability. To this end, we first rely on the well-known behavioral approach to the equilibrium exchange rate which we modify by introducing dummy variables to account for the type of the exchange rate regime. Since deriving estimates do not appear to reveal any difference related to the exchange rate regime, we confirm this intuition by running a mean comparison test. As a robustness check, we then asses a new equilibrium exchange rate based on the Natural approach to the real exchange rate and we compare resulting misalignments through another mean comparison test. Overall, it appears that misalignments do not depend on the type of the exchange rate arrangement, suggesting that potential gains or losses in competitiveness arising from these misalignments rather depend on intrinsic features. From this point of view, the exiting of the monetary union seems not to be founded and would probably not help to address structural issues in concerned countries. However, it should be noted that some improvements might strengthen previous results notably by including interactions terms in our equations to consider both the exchange rate regime and political stability or rather by using an estimator allowing for possible non-linear effects depending on the output level for instance.

6. References

Baffes, John, Ibrahim A. Elbadawi, and Stephen D. O'Connell (1999) "Single-Equation Estimation of the Equilibrium Real Exchange Rate." In *Exchange Rate Misalignment Concepts and Measurement*, by Lawrence E. Hinkle and Peter Montiel. Policy Research Departement. Washington, DC.

Bouoiyour, Jamal, Velayoudom Marimoutou, and Serge Rey (2004) "Taux de Change Reel D'equilibre et Politique de Change Au Maroc : Une Approche Non Parametrique." *Economie Internationale*, no. 97: 81–104.

Clark, Peter B., and Ronald Mac Donald (1998) "Exchange Rates and Economic Fundamentals: A Methodological Comparison of BEERs and FEERs." SSRN Scholarly Paper ID 882342. Rochester, NY.

Coudert, Virginie (1999) "Comment Definir Un Taux de Change D'equilibre Pour Les Pays Emergents?" *Economie Internationale*, no. 77: 45–66.

Coudert, Virginie, and Cécile Couharde (2009) "Currency Misalignments and Exchange Rate Regimes in Emerging and Developing Countries." *Review of International Economics* 17 (1): 121–36.

Coudert, Virginie, Cécile Couharde, and Valérie Mignon (2013) "On Currency Misalignments within the Euro Area." *Review of International Economics* 21 (1): 35–48.

Dubas, Justin (2009) "The Importance of Exchange Rate Regime in Limiting Misalignment." *World Development* 37 (10): 1612–22.

Dufrénot, Gilles, and Etienne B. Yehoue (2005) "Real Exchange Rate Misalignment: A Panel Co-Integration and Common Factor Analysis." SSRN Scholarly Paper ID 888033. Rochester, NY.

Lim, Guay, and Jerome L. Stein (1995) "The Dynamics of the Real Exchange Rate and the Current Account in a Small Open Economy: Australia." In *Equilibrium Exchange Rates*, by Jerome Stein and Ronald MacDonald. Massachussets.

Mongardini, Joannes, and Brett Rayner (2009) "Grants, Remittances, and the Equilibrium Real Exchange Rate in Sub-Saharan African Countries." IMF Working Paper 09/75.

Pesaran, M. Hashem, Yongcheol Shin, and Ron P. Smith (1999) "Pooled Mean Group Estimation of Dynamic Heterogeneous Panels." *Journal of the American Statistical Association* 94 (446): 621–34.

Reinhart, Carmen, and Kenneth Rogoff (2004) "The Modern History of Exchange Rate Arrangements: A Reinterpretation." *The Quarterly Journal of Economics* 119 (1): 1–48.

Thibault, Florence, Cécile Couharde, and Didier Borowski (1998) "Les Taux de Change D'équilibre Fondamentaux : De L'approche Théorique À L'évaluation Empirique." *Revue Française D'économie* 13 (3): 177–206.