Cahiers Economiques et Sociaux, Volume, 40 N°3

The Determinants of Real Exchange Rate Misalignment: Empirical Evidence from Sub-Saharan Africa

Par :
Allegra KABAMBA MBUYI *

https://doi.org/10.68573/ces.ires.40.3.04

Résumé

Dans cet article, nous analysons les déterminants du déséquilibre du taux de change réel en Afrique subsaharienne. Pour ce faire, nous considérons que le modèle pertinent doit répondre à certaines exigences liées à la fois au contenu théorique et opérationnel. Les estimations montrent qu'une augmentation de 1 % du taux d'ouverture commerciale de l'économie entraîne une dépréciation réelle du taux de change de 0,64 %. Si l'on examine les effets sur la productivité réelle, il apparaît que cela favorise l'appréciation du taux de change de 0,46 %. En outre, l'amélioration des termes de l'échange de 1 % entraîne une appréciation réelle de la monnaie de 2,16 %. Plus précisément, les résultats montrent qu'une amélioration de 1 % de la position extérieure nette génère une appréciation réelle de 0,059 % de la monnaie locale.

Mots clés : **Mésalignement, taux de change, SSA.**

ABSTACT

In this paper we analyse the determinants of real exchange rate misalignment in Sub-Saharan Africa. To achieve this, we consider that the relevant model must meet certain requirements that relate to both theoretical and operational content. The estimates show that a 1% increase in the trade openness rate of the economy induces a real depreciation of the exchange rate of 0.64%. Looking at the real productivity effects, it appears that it favours the appreciation of the exchange rate by 0.46%. In addition, the improvement of the terms of trade by 1% leads to a real appreciation of the currency by 2.16%. Specifically, the result shows that a 1% improvement in the net international investment position generates 0.059% real appreciation of the local currency.

Keywords : **Misalignment, exchange rates, SSA.**

* Professeure au Département des Sciences Economiques. FASEG/Université de Kinshasa. E-mail : allegrakabamba@gmail.com

1. INTRODUCTION

The exchange rate is one of the key variables of economic policy, depending on whether it is an instrument of monetary policy and in turn an important lever of economic growth (Razin and Collins, 1997; Owoundi, 2016). Indeed, the waves of financial and exchange rate crises in the European monetary system (1992, 1993, 1995), Mexico (1994), Argentina (1998, 2001, 2014) or the US housing market (2007) have weakened the economic situation of developing countries and have thus led to a proliferation of a research works on the effectiveness of the exchange rate in the adjustment to equilibrium. The effectiveness of the exchange rate as an economic policy instrument depends on the knowledge of its equilibrium level, without which the exchange rate misalignment (ERM) is meaningless. Indeed, the misalignment of the ERR reflects the differences between the observed values of the real effective exchange rates and their equilibrium value (Coudert et al., 2013). According to Razin and Collins (1997), TCR misalignments are defined as a situation that is characterised by inconsistency of TCR movements with fundamentals over an extended period of time. For Williamson (1998), a TCR misalignment occurs when the TCR deviates from its equilibrium path. A more structured definition is that given by Edwards (1989) for whom exchange rate misalignments reflect a deviation of the ERR from its equilibrium value in the long term. This definition is similar to that of Montiel (1999, 2003) and Razin and Colins (1999).

Real exchange rate misalignment is usually associated with the choice of exchange rate regime, mainly following the collapse of the Bretton Woods system in 1973. Normally, each country declares its choice of exchange rate regime to international organisations such as the IMF. This is called a de jure regime. However, in practice, the de jure regime and the regime actually implemented rarely coincide. This discrepancy leads to the development of the concept of the de facto regime (Reinhart and Rogoff, 2004; Levy-Yeyati and Sturzenegger, 2005), which refers to the exchange rate regime actually implemented. In view of this, this paper focuses on the de facto concept.

In general, each country can convert its de facto exchange rate to another currency, let it float freely or control its floating. Each category includes some variant regimes. Exchange rate regimes refer to the level of the nominal exchange rate and the association with a certain level of misalignment. According to standard macroeconomic models, it is not, a priori, clear which of the exchange rate regimes induces more misalignment. Under a flexible exchange rate regime, the exchange market determines the appropriate level of the nominal exchange rate. Therefore, real exchange rate misalignment can only be temporary. Under fixed regimes, nominal exchange rates cannot be adjusted, which induces the risk of misalignment. However, if goods markets are perfectly efficient, prices could respond to market pressures and bring the real exchange rate back to its equilibrium level, even if the nominal exchange rate does not change. In reality, the real exchange rate shows a non-negligible degree of misalignment under both fixed and flexible exchange rate regimes. Under fixed exchange rate regimes this could be related to nominal price rigidity (Engle, 2010). Under fixed exchange rate regimes, it could be due to imperfect information among investors (Edwards, 2011). Some empirical analyses confirm that the real exchange rate can be unaligned regardless of the nominal regime (Coudert et al., 2013; Nouira et al., 2011).

While several studies show that the real exchange rate can be misaligned regardless of the regime, other studies have focused on showing whether a given regime is more prone to misa-

lignment than others. In this view, Dubas (2009) has shown that misalignment is more pronounced in developing countries, finding that free floating leads to much more misalignment. In contrast, Coudert and Couharde (2009) and Holtemoller and Mallick (2013) found that the fixed exchange rate regime induces more misalignment than the floating exchange rate regime. The divergence of the two study results could be due to the econometric approaches, the characteristics of the samples studied. Collins (1996) suggests that the accepted or tolerated degree of real exchange rate misalignment depends on other eco-political factors or on inflationary pressures.

The recent literature identifies two factors that are crucial in determining the level of acceptance or tolerance of real exchange rate misalignment. These two factors are the quality of institutions and financial development. For example, Rodrik (2008) recommends a strategy based on a disequilibrium exchange rate when domestic institutions are weak. Also, Aghion et al. (2009) and Elbadawi et al. (2012) find that the effect of exchange rate misalignment on growth is negligible when the country's financial system is developed. This low cost of misalignment could make the country relatively more tolerant to misalignments. The remainder of this paper presents the method of estimating the misalignment and the calculation for the case of countries in the sub-Saharan African region, the empirical results of the determinants of equilibrium real exchange rates and the conclusion which highlights some implications in terms of recommendations.

2. METHODOLOGICAL STRATEGY

2.1. Theoretical Foundations

Before turning to the determinants of the misalignment of the equilibrium exchange rate according to the dynamic approach, we first present the theoretical foundations of this approach. Developed by Stein and Allen (1997), NATREX is defined as the real exchange rate that ensures balance of payments equilibrium in the absence of cyclical factors (production at potential), speculative capital flows and changes in foreign exchange reserves. In other words, it guarantees the simultaneous long-term achievement of the internal and external balances of the economy. It is therefore a prime reference for the determination of exchange rate misalignments due to its dynamic characteristic.

NATREX is based on the idea that the path of the RER can be decomposed into three horizons of short, medium and long term. The short-medium term dynamics are based on the convergence of the real exchange rate towards its medium-term equilibrium value through the equalisation of financial returns and the absence of speculative capital flows. In the medium term, two variables are not stabilised: the capital stock per capita and the net international investment position. Indeed, investment continues to inflate the capital stock and current account imbalances cause the net international investment position to vary. In the long run, the capital stock and the net international investment position are, by definition, stable. This implies that the equilibrium exchange rate depends only on fundamentals. Therefore, the exchange rate is constant and converges to its PPP level.

But the starting point of the NATREX analyses is that in the long run, any excess of investment over domestic savings must be financed by external borrowing, so that the real market equilibrium coincides with the external equilibrium of the economy, via changes in the real exchange rate. Formally, let the following fundamental market equation apply:

$$\boxed{I - S + \mathrm{CA} = 0} \quad (1)$$

Where I represent investment; S, savings; and

CA, the current account. If we assume the equilibrium of the system at the initial period ($S - I = \mathrm{CA}$) then any external shock that creates a negative difference between national savings and investment, causes capital inflows. These in turn lead to a real appreciation of the exchange rate and a deterioration of the current account until the initial equilibrium situation is restored. The real exchange rate is thus the variable which carries out the adjustment to the long-term equilibrium. Specifically, it is the «Internal» real exchange rate defined as the relative price of non-tradable goods (NP) compared to that of non-tradable goods (Pt). It is defined by the following relation (2):

$$e = \frac{P_N}{P_T} \quad (2)$$

An increase in (e) reflects a real appreciation and vice versa. Indeed, any fall in the production of tradable goods generates, at the internal level, an excess of demand for these goods with a consequent increase in their price and therefore an increase in the exchange rate. The description of internal and external equilibrium, respectively through the market equilibrium of non-tradable goods and the long-term stock equilibrium approach, leads to the following formulation of the equilibrium real internal exchange rate (e):

$$e^* = h\big(g_N, g_T, \big[z + r \cdot f\big], \rho\big) \quad (3)$$

Where gN and gT are government expenditure on non-tradable and tradable goods respectively; z is the total net aid received by the government, r is the real rate of return on foreign assets expressed in terms of tradable goods, f is the stock of net foreign assets and an indicator of productivity. Relationship (3) is an expression of the long-run equilibrium exchange rate that does not incorporate major fundamentals such as the terms of trade or trade policy. Following Baffes et al (1999), it can be modified to incorporate these fundamentals. This results in the following equation:

$$e^* = h\big(g_N, g_T, \big[z + r \cdot f\big], \rho, \eta, \tau\big) \quad (4)$$

Where e* represents trade policy measures and the external terms of trade respectively. Equation (4) implies that increases in government spending on non-tradable goods, increases in productivity, and trade restrictive measures lead to an increase in e (real appreciation). Indeed, the increase in public spending on non-tradable goods and trade restrictive measures lead to an increase in the demand for these goods and a rise in their price; whereas a productivity shock leads to a reduction in the supply of non-tradable goods and finally to a rise in their price. On the other hand, an improvement in the trade balance and an increase in government spending on tradable goods leads to a real depreciation. As for the effect of the external terms of trade, this is not known a priori. On the one hand, the increase in the terms of trade may result in an increase in national income in terms of imported goods and an expenditure effect, with an increase in demand for all goods and an increase in the real exchange rate. On the other hand, the expenditure effect may be supplanted by a substitution effect in favour of exported goods, resulting in real depreciation.

From a practical point of view, some authors estimate equation (4) by substituting the real effective exchange rate (REER) for the real internal exchange rate (REER), in order to overcome the constraint linked to the unavailability of data. However, such a procedure is likely to bias the results obtained, as there is no clear justification for the equality between the REER and the fundamentals of the internal RER. However, the expression of the REER can be decomposed in such a way as to find a formulation similar to that of equation (4). Formally, let $\mathrm{TCR}_t{}^j$ be the bilateral real exchange rate between a country and its partner j, $\mathrm{TCR}_0{}^j$the same rate in the reference period, and the partner's share in the total trade of the country considered. The REER

is given by the relation (5):

$$\mathrm{TCER} = \left\{ \prod_{j=1}^{N} \left[\frac{\mathrm{TCR}^{t}}{\mathrm{TCR}^{0}} \right] \right\}^{\theta j} \qquad (5)$$

With $\mathrm{TCR}^{j} = \frac{S^{j} \cdot P}{P^{j}}$, S^{j}, PS^{j}, P et P^{j} representing respectively the nominal exchange rate quoted at the certainty, the prices of domestic goods and of foreign goods. In the knowledge that and can be expressed in terms of tradable and non-tradable goods and if we assume that $P_T \equiv P_X$ et $P_T{}^{j} \equiv P_M{}^{j}$, we can still express the TCR as follows :

$$\mathrm{TCR}^{j} = \frac{S^{j} PX}{\mathrm{P_M}^{j}} \cdot \frac{\frac{\mathrm{P_T}}{\mathrm{P_N}}^{(\alpha-1)}}{\frac{\mathrm{P_M}^{j}}{\mathrm{P_N}^{j}}}^{(\beta-1)} \qquad (6)$$

Where the price of the imports of the country concerned from the partner j; and represent the share of the tradable goods price in the domestic and foreign price, respectively. We note $c = \frac{\mathrm{P_M}^{j}}{\mathrm{P_N}^{j}}$ the relative price of foreign non-tradable goods and the latter is assumed to be equal to 1 following Lim and Stein (1995). By introducing this relationship into the equation (5), we obtain a new expression for TCER:

$$\mathrm{TCER} = \mathrm{P_X} \cdot \frac{\mathrm{P_T}}{\mathrm{P_N}}^{(\alpha-1)} \cdot \prod_{j=1}^{N} \left[\frac{S^{j}}{\mathrm{P_M}^{j}} \right]^{\theta j} = \frac{\mathrm{TCEN} \cdot \mathrm{P_X}}{\mathrm{P_M_{eff}}} \cdot e^{(\alpha-1)} \qquad (7)$$

Where TCEN is the nominal effective exchange rate, a synthetic index of the unit price of the country's exports, and a synthetic index of the unit price of imports from that country. Finally, we obtain the following relationship from TCER as a function of an indicator of the relative price of non-tradable goods:

$$\mathrm{TCER} = \mathrm{TOT} \cdot e^{(\alpha-1)} \qquad (8)$$

With TOT the terms of trade. From this equation, we proceed to determine the NATREX de long term in two stages. We first estimate an indicator of the relative price of equilibrium non-tradable goods according to the fundamentals identified by equation (4), in particular by posing:

$$\overline{\ln\left\{e^{(\alpha-1)}\right\}} = \ln T\mathrm{CER} - \ln \overline{\mathrm{TOT}}$$

Where $\overline{\mathrm{TOT}}$ represents the equilibrium terms of trade.

In the end, the NATREX approach is dynamic and explicitly based on the long-term determinants of the equilibrium real exchange rate. Indeed, NATREX incorporates stock effects through the dynamics of the net international investment position and the capital stock. It allows the calculation of an equilibrium path from the medium to the long term. Nevertheless, NATREX suffers from the assumptions made about internal equilibrium: the labour market is assumed to be in equilibrium; the dynamics of price and wage adjustment are ignored. Moreover, NATREX is presented as a theory of the equilibrium real exchange rate; however, it only becomes a theory of the nominal exchange rate by evacuating the price formation mechanisms. Furthermore, NATREX assumes that agents are unable to anticipate ex ante exchange rate variations and therefore assumes that agents anticipate exchange rate stability. This assumption has little theoretical basis (although empirically it is difficult to predict the exchange rate better than by predicting that it will maintain its current value). NATREX can be seen as the reduced form of the exchange rate equation of a macro-econometric model.

Empirical model and presentation of variables

In order to estimate NATREX, we used the Pool Mean Group (PMG) estimator. The choice of this estimation method is motivated by the advantages it offers from a practical point of view. On the one hand, the Pooled Mean Group (PMG) estimator allows an efficient treatment of dynamic panels, especially those for which the number of temporal observations T is as large as that

of the individuals (Pesaran et al., 1999). On the other hand, it offers the possibility of estimating a long-term relationship between different variables, without prior precautions concerning stationarity or even the existence of a cointegrating relationship between the latter. To do this, the estimation assumes that the model constant, as well as the short-term coefficients and error variances, can differ between individuals, while the long-term coefficients are identical. This estimator is constructed under the assumption of heterogeneity of the short-term coefficients and homogeneity of the long-term slope coefficients (Pesaran et al., 1999). The initial conditions are treated as fixed or random and the long-term coefficients are a non-linear combination of the short-term coefficients. The Pooled-Mean Group uses the ARDL (autoregressive distributed lag) order $(P\,\mathrm{i},\, q_i)$.

$$\Delta y_{i,t} = \varphi_i y_{i,\text{t-1}} + \beta_i x_{i,t} + \sum_{j=1} p^i - 1\left\{\varphi_{i,j}\Delta y_{i,\text{t-j}}\right\} + \sum_{j=1} q^i - 1\left\{\delta_{i,j}\Delta x_{i,\text{t-j}}\right\} + \alpha_i + \varepsilon_{i,t} \qquad (9)$$

Where , $y_{i,t}$ is the dependent variable, the vector of explanatory variables, is the coefficient that captures the country specificity , $\delta_{i,j}$ et , $\varphi_{i,j}$ are the coefficients of the short-run dynamics for each country and is the error term of the model.

In our case, this dependent variable is the real equilibrium exchange rate. The vector of explanatory variables is represented by the fundamentals of the economy which determine this long-term equilibrium exchange rate. We mainly retain:

The rate of openness of the economy (Open), which reflects the influence of the trade policy of the country concerned. Its influence on the REER is a priori indeterminate. On the one hand, trade openness may cause the real appreciation of the national currency via the improvement of the current account. But on the other hand, greater trade openness favours the moderation of the rise in domestic prices, which itself leads to the real depreciation of the national currency (Goldfajn and Valdes, 1999). This relationship is confirmed in the empirical work of Dufrénot and Yehoue (2005) or Mongardini and Rayner (2009), which is why we expect trade openness to have a negative effect on the REER;

The net international investment position as a proportion of GDP (NIFA), associated with the gap between domestic savings and investment. For debtor countries such as those in SSA, any deterioration in the net international investment position is expected to generate interest on debt payments; improving the trade balance through real depreciation is then required to generate positive net exports and help restore equilibrium (Lee et al., 2008). This mechanism is more commonly referred to as the «transfer effect» (Obstfeld and Rogoff, 1995; Lane and Milesi-Ferretti, 2004). According to this mechanism, the variable Nfa should be assigned a positive coefficient;

Relative productivity (Prod), which captures the Balassa-Samuelson effect. As a reminder, the latter reflects the phenomenon of real appreciation resulting from an increase in productivity in the exposed sector compared to the rest of the world. To obtain a good approximation of this indicator, it is common practice to use data on labour productivity in the open and sheltered sectors (De Gregorio Giovannini and Krueger, 1994). But these data are generally unavailable for developing countries, leading Baffes et al. (1999) to use a proxy defined by the ratio of a given country's GDP per worker to the OECD's GDP per worker. However, the non-significance of this variable for all the estimates leads the authors to remove it from the final specification.

For this reason, we follow Lane and Milesi-Ferretti (2004) in constructing our productivity indicator from real GDP per capita data as follows:

$$\text{Prod}_{i,t} = \frac{\text{PIBRPHBT}_{i,t}}{\text{PIBRPHBTOCDE}_{i,t}}$$

This variable is positively related to the RCW according to the Balassa-Samuelson hypothesis. Government final consumption expenditure (Gov), whose effect depends on its composition in terms of tradable and non-tradable goods. However, following Froot and Rogoff (1995), it can be assumed that most of this spending is on non-tradable goods. Under these conditions, the increase in spending leads to an increase in the demand for these goods, which generates the rise in their relative price and the real appreciation of money. The empirical studies of De Gregorio et al. (1994) or Chinn (1999) confirm this relationship, which is why we expect this variable to be associated with a positive coefficient;

The terms of trade (Tot), defined as the ratio of the price of exports to that of imports. Their influence on the RER is indeterminate a priori. On the one hand, the rise in the terms of trade may lead to an increase in the volume of exports, an improvement in the trade balance and ultimately to a real appreciation of the national currency. On the other hand, the improvement in the price of exports can lead to an increase in the general price level, so that the previous income effect is supplanted by a substitution effect in favour of imported goods (which become less expensive), thus leading to real depreciation. However, empirical work such as that of Dufrénot and Yehoue (2005) generally emphasises the superiority of the income effect. The coefficient associated with this variable should be positive.

Based on this specification, the long-term coefficients ϕ_i et β_i are assumed to be the same for all countries. Thus, if is significantly negative, then it can be concluded that there is a long-run relationship between the independent variable and the explanatory variables. The PMG approach is essentially a version of the ARDL panel procedure and consists of the estimation of the ARDL model by maximum likelihood, which can be rewritten as an error correction model (ECM). The estimation of this model simultaneously evokes the intra and inter-dimensions. Pesaran, Shin and Smith (1999) did not propose a formal test for cointegration but derived asymptotic properties for the estimation of both stationary and non-stationary series regressors.

After estimating relation (9), we make a forecast on the equilibrium exchange rate for each period and country. And the misalignment is determined by the following relation:

$$\text{MIS_NATREX} = \frac{\text{TCER}-\text{NATREX}}{\text{NATREX}} \quad (10)$$

Results of the Analysis

3.1. The Dynamic Approach to the Real Equilibrium Exchange Rate (NATREX)

The estimation of the dynamic equilibrium exchange rate by the PMG method is presented in Table 1. We are only interested in the long-run results given the NATREX basis. The results provided by this table are broadly consistent with our theoretical expectations. Indeed, a 1% increase in the trade openness rate of the economy induces a real depreciation of the exchange rate of 0.64%. This relationship is consistent with the work of authors such as Dufrénot and Yehoue (2005) and Owoundi and Bikai (2018). Looking at the effects of real productivity, it appears that it favours the appreciation of the exchange rate by 0.46%. This suggests the existence of a Balassa-Samuelson type effect. This effect is also confirmed in the empirical work of Chinn (1999), Coudert (1999) or Elbadawi et al. (2012). In addition, the improvement in the terms of trade (1%) leads to a real appreciation of 2.16% of the currency, which confirms the superiority of the expenditure effect highlighted

elsewhere in the work of Bouoiyour et al. (2004) or Coudert et al. (2013).

Moreover, our estimation highlights the existence of a positive effect of government consumption expenditure on the real exchange rate. In other words, the increase in this expenditure contributes to an appreciation of the local currency as suggested by Mongardini and Rayner, (2009) as well as Coulibaly and Gnimassoun (2013). Indeed, they note that the increase in government spending leads to real appreciation insofar as these are mainly intended for the acquisition of non-tradable goods. Moreover, several of these economies have embarked on vast development programmes which are materialised by investments of a structural nature. The effect on the net international investment position is positive. Specifically, the result obtained shows that a 1% improvement in the net international investment position generates 0.059% of real appreciation of the local currency. This result can be partly justified by the role played by the increase in commodity prices between 2005 and 2013. Indeed, as a result of the commodity price boom, SSA economies recorded large inflows of foreign reserves and experienced a boom in commodity exploitation.

Table 1. Determinants of the real equilibrium exchange rate (NATREX approach)

	Coefs. estimates	Std. Dev.	z-statistics	p-value
Long term relationship				
Openness	-.6366598***	.1901279	-3.35	0.001
Productivity	.4638457***	.1124842	4.12	0.000
Government spending	.2274377***	.0443412	5.13	0.000
Net position	.0578229***	.0142537	4.06	0.000
Terms of exchange	2.164149***	.397284	5.45	0.000
Short term Relationship				
Recall Force	-.0709792***	.016559	-4.29	0.000
D. Openness	-.8264208**	.4224115	-1.96	0.050
D. Productivity	-.3781211	.2359568	-1.60	0.109
D. Government spending	.2619148	.2083017	1.26	0.209
D. Net position	-.0010817	.003534	-0.31	0.760
D. Terms of exchange	-.179102	.1883079	-0.95	0.342
Constant	.3175597***	.0963643	3.30	0.001
Countries	28			
Observations	1049			

The Behavioural Approach to the Real Equilibrium Exchange Rate (REER)

The concept of the behavioural equilibrium exchange rate (or BEER) belongs to the class of so-

called «underlying macroeconomic equilibrium» models (Clark and Mac Donald, 1998). In its original version, it was proposed by MacDonald (1997) and Clark and MacDonald (1999). It is based on a deliberately positive approach to the equilibrium exchange rate, in contrast to Williamson's normative model (Mac Donald, 2002). The basic relationship of the model is the financial equilibrium condition given by the uncovered interest rate parity. Formally, for a maturity horizon of «t + k» and under the assumption of risk neutrality, the absence of arbitrage in equilibrium is expressed by the relationship (11), in the appendix.

In this function, the fundamentals used are the same as in the NATREX estimation. Unlike the NATREX determination equation, the BEER evaluation considers the nature of the exchange rate regime in force in an economy, in this case the fixed exchange rate regime, whose effect is considered by the indicator variable Reg1. Specifically, Reg1=1 for a country with a fixed exchange rate regime. The introduction of an indicator variable in the equilibrium exchange rate equation has also been proposed by some authors such as Mulder and Baldi (2004) or Carrera and Restout (2008). From a theoretical point of view, this variable should be associated with a positive coefficient that reflects the real appreciation generated by exchange rate fixity. Indeed, in the hypothesis of a persistent and negative shock on production, a country with a fixed exchange rate regime is forced to defend a parity whose level no longer reflects the level of the fundamentals on which it was set. To defend this parity, the central bank is forced to limit capital outflows through operations that increase the money supply if they are not sterilised. This leads to an increase in domestic prices which in turn leads to an appreciation of the currency.

Table 2. Determinant of the real equilibrium exchange rate (behavioural approach)

D.ln_reeer	Coef.	Std. Err.	Z	P>z
Short term				
Openness	-.0644806	.0790491	-0.82	0.415
Productivity	.1675005	.0467298	3.58	0.000
Government Spending	.0719942	.0668545	1.08	0.282
Net position	.0033577	.0013205	2.54	0.011
Term	-.1697725	.0745035	-2.28	0.023
Fix	.7520346	.2102942	3.58	0.000
Long term				
ec	-.1641728	.0240929	-6.81	0.000
D1. Openness	-.7831233	.4250091	-1.84	0.065
D1. Productivity	-.3979574	.2324812	-1.71	0.087
D1. Government Spending	.2589928	.2079272	1.25	0.213
D1. Net position	.000694	.0034633	0.20	0.841
D1. Termes Terms	-.2313891	.1838535	-1.26	0.208
Constant	.8969837	.1197812	7.49	0.000

Source: Authors

Conclusion

This paper has analysed the determinants of exchange rate misalignment in SSA countries. To do so, this study first used the NATREX model. In a second step, we used the BEER model. The results obtained showed that a 1% increase in the trade openness rate of the economy induces a real depreciation of the exchange rate of 0.64%. Looking at the effects of real productivity, it appears that it favours the appreciation of the exchange rate by 0.46%. In addition, the improvement in the terms of trade (1%) leads to a real appreciation of the local currency of 2.16%, which confirms the superiority of the expenditure effect highlighted elsewhere in the work of Bouoiyour et al. (2004) or Coudert et al. We conclude that NATREX is a useful guide for monetary authorities and private operators.

Furthermore, our estimation highlights the existence of a positive effect of government consumption expenditure on the real exchange rate. In other words, the increase in this expenditure contributes to an appreciation of the local currency as suggested by Mongardini and Rayner (2009) and Coulibaly and Gnimassoun (2013). Indeed, they note that the increase in government spending leads to real appreciation insofar as these are mainly intended for the acquisition of non-tradable goods. Moreover, several of these economies have embarked on vast development programmes which are materialised by investments of a structural nature. The effect on the net international investment position is positive. Specifically, the result obtained shows that a 1% improvement in the net international investment position generates 0.059% of real appreciation of the local currency. This result can be partly justified by the role played by the increase in commodity prices between 2005 and 2013. Indeed, as a result of the commodity price boom, SSA economies recorded large inflows of foreign reserves and experienced a boom in commodity exploitation.

BIBLIOGRAPHY

1. Aghion, P., Bacchetta, P., Ranciere, R., and Rogoff, K. (2009). Exchange rate volatility and productivity growth: The role of financial development. Journal of monetary economics, 56(4):494–513.
2. Baffes, J., O'Connell, S. A., and Elbadawi, I. (1999). Single-equation estimation of the equilibrium real exchange rate.
3. Bouoiyour, J., Marimoutou, V., and Rey 1, S. (2004). Taux de change réel d'équilibre et politique de change au maroc: une approche non paramétrique. Économie internationale, (1):81–104.
4. Carrera, J. E. and Restout, R. (2008). Long run determinants of real exchange rates in latin america.
5. Clark, P. B. and MacDonald, R. (1999). Exchange rates and economic fundamentals: a methodological comparison of BEERs and FEERs. Springer.
6. Collins, C. (1996). Local economy.
7. Coudert, V. and Couharde, C. (2009). Currency misalignments and exchange rate regimes in emerging and developing countries. Review of International Economics, 17(1):121–136.
8. Coudert, V., Couharde, C., and Mignon, v. (2013). On currency misalignments within the euro area. Review of International Economics, 21(1):35–48.
9. Coudert, V. et al. (1999). Comment definir un taux de change d'equilibre pour les pays emergents? Economie internationale, (77):45–66.
10. Coulibaly, I. and Gnimassoun, B. (2013). Optimality of a monetary union: New evi-

dence from exchange rate misalignments in west africa. Economic Modelling, 32.

11. De Gregorio, J., Giovannini, A., and Krueger, T. H. (1994). The behavior of nontradablegoods prices in europe: Evidence and interpretation. Review of International Economics, 2(3):284–305.16

12. Dubas, J. M. (2009). The importance of the exchange rate regime in limiting misalignment. World Development, 37(10):1612–1622.

13. Dufrénot, G. and Yehoue, E. B. (2005). Real exchange rate misalignment: A panel co-integration and common factor analysis.

14. Edwards, S. (1989). Exchange rate misalignment in developing countries. The World Bank Research Observer, 4(1):3–21.

15. Edwards, S. (2011). Exchange-rate policies in emerging countries: eleven empirical regularities from latin america and east asia. Open Economies Review, 22:533–563.

16. Elbadawi, I. A., Kaltani, L., and Soto, R. (2012). Aid, real exchange rate misalignment, and economic growth in sub-saharan africa. World Development, 40(4):681–700.

17. Froot, K. A. and Rogoff, K. (1995). Perspectives on ppp and long-run real exchange rates. Handbook of international economics, 3:1647–1688.

18. Goldfajn, I. and Valdes, R. O. (1999). The aftermath of appreciations. The Quarterly Journal of Economics, 114(1):229–262.

19. Holtemöller, O. and Mallick, S. (2013). Exchange rate regime, real misalignment and currency crises. Economic Modelling, 34:5–14.

20. Hossfeld, O. (2010). Equilibrium real effective exchange rates and real exchange rate misalignments: Time series vs. panel estimates. Technical report, FIW Working paper.

21. Jahjah, M. S. and Montiel, M. P. (2003). Exchange rate policy and debt crises in emerging economies. International Monetary Fund.

22. Lane, P. R. and Milesi-Ferretti, G. M. (2004). The transfer problem revisited: Net foreign assets and real exchange rates. Review of Economics and Statistics, 86(4):841–857.

23. Levy-Yeyati, E. and Sturzenegger, F. (2005). Classifying exchange rate regimes: Deeds vs. words. European economic review, 49(6):1603–1635.

24. MacDonald, I. L. and Zucchini, W. (1997). Hidden Markov and other models for discrete valued time series, volume 110. CRC Press. 17

25. MacDonald, R. (2002). Modelling the long–run real efeective exchange rate of the newzealand donald. Australian Economic Papers, 41(4):519–537.

26. Mongardini, J. and Rayner, B. (2009). Grants, remittances, and the equilibrium real exchange rate in sub-saharan african countries.

27. Montiel, P. J. and Hinkle, L. E. (1999). Exchange rate misalignement: concepts and measurement for developing countries.

28. Mulder, N., Baldi, A.-L., et al. (2004). The impact of exchange rate regimes on real exchange rates: Abc and mexico in the 1990s.

29. Owoundi, F. (2016). Do exchange rate misalignments really affect economic growth? The case of sub-saharan african countries. International Economics, 145:92–110.

30. Pesaran, M. H., Shin, Y., and Smith, R. P. (1999). Pooled mean group estimation of dynamic heterogeneous panels. Journal of the American statistical Association, 94(446):621–634.

31. Razin, O. and Collins, S. (1999). Real exchange rate misalignments and growth, George Town university. International Economic Integration: Public Economics Perspectives. Cambridge: Routledge, 268p.

32. Razin, O. and Collins, S. M. (1997). Real exchange rate misalignments and growth.

33. Reinhart, C. M. and Rogoff, K. S. (2004). The modern history of exchange rate arrangements: a reinterpretation. the Quarterly Journal of economics, 119(1):1–48.

34. Rodrik, D. (2008). The real exchange rate and economic growth. Brookings papers on economic activity, 2008(2):365–412.

35. Stein, J. L. and Allen, P. R. (1997). Fundamental determinants of exchange rates. Oxford University Press.

36. Williamson, O. E. (1998). The institutions of governance. The American Economic Review, 88(2):75–79.

Appendix

Descriptive Statistics and Stylised Facts

Table 0.1

Variable	Obs	Mean	Std. Dev.	Min	Max
ln_reeer	1,143	3.912732	4.904737	-24.5043	26.1955
ouv	1,317	68.8104	47.6072	6.32034	531.737
ln_pro	1,316	-3.397881	1.053758	-5.21978	-.009874
generalgov~o	1,299	14.92383	6.83997	0	84.5081
nfa	1,247	-6.776811	15.1153	-140.727	49.1124
term	1,317	.7864805	.3828131	.097273	2.71911

Table 0.2

	ln_reeer	ouv	ln_pro	genera~o	nfa	term
ln_reeer	1.0000					
ouv	0.0009	1.0000				
ln_pro	-0.0481	0.3814	1.0000			
generalgo-v~o	-0.0672	0.3628	0.2995	1.0000		
nfa	-0.0546	-0.1909	0.4612	-0.1268	1.0000	
term	-0.0781	0.0989	0.5524	-0.1038	0.7647	1.0000


Afrique du Sud
Benin
Cameroon
Central african republic
Chad
Congo, Dem, Rep,
Congo, Rep,
Cote d'Ivoire
Equatorial Guinea
Eswatini
Gabon
Gambia, The
Ghana
Guinea-Bissau
Kenya
Madagascar
Mali
Mozambique
Niger
Nigeria
Rwanda
Senegal
Seychelles
Sierra Leone
Togo
Uganda
Zimbabwe
botswana
burkina faso
burundi
sudan
-20 0 20 40
1980 2000 2020
date
TCER
NATREX