

Exchange Rate Policy in Morocco and Persistence of Real Exchange Rate Misalignments

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ABSTRACT: In this paper, we measure, using Moroccan data, the misalignment of the real exchange rate of the Dirham, based on estimates in respect of the period from 1980 to 2012, a long term relationship between the real exchange rate and its fundamentals: namely terms of trade, trade policy, the growth rate of real GDP, Gross Fixed Capital Formation, the flow of foreign capital and government spending. The objective of this article is to highlight the persistent nature of misalignments of the real exchange rate of the Dirham, especially since the adoption by Morocco of a policy exchange rate based on the attachment of the Dirham to a basket of currency and fixing the nominal exchange rate by the monetary authorities. The econometric estimations show that persistent misalignments may find its explanation in the structural characteristics of the Moroccan economy represented by the fundamental variables used in the estimated model (productivity, investment, trade policy, etc.).

Keywords: equilibrium real exchange rate; misalignment; cointegration; persistence.

JEL Classifications: C13; C32; F31

1. Introduction

Morocco has established currency convertibility for current account and capital account transactions for non-residents from 1993¹ and forwards to facilitate payments for transactions under the capital account for residents. A pre-condition for the establishment of the current convertibility and full convertibility is an “appropriate” exchange rate. The real exchange rate when necessary restrictions on payments are abolished must be a real equilibrium exchange rate.

The choice of the appropriate level which is the real exchange rate equilibrium is very important because if it is not respected, it can have a negative impact both on the internal balance or external balance of the economy. These distortions are reflected in what is commonly known in the literature misalignments². Whether positive or negative misalignment reflects a poor exchange rate policy, costly in terms of external balance, allocation of productive resources and well-being and can lead up to the crisis (the Asian crisis of the 90s is an example).

An undervalued exchange rate can generate a current account surplus by making more profitable exports and imports more expensive, which would result in inflationary pressures (as in Yugoslavia and Brazil during the 80s). An overvalued exchange rate can widen the current account deficit and draining foreign exchange reserves abroad (in the case of Mexico in 1994, Asian countries: South Korea, Malaysia, the Philippines and the Indonesia in 1997, Brazil in 1999). These countries have followed a fixed nominal anchor or crawling peg it was difficult to bear with the massive outflow of capital at the time of crisis.

¹Circular of the Exchange Office N°1606 on 21 September 1993.

²Deviations supported the observed real exchange rate from its equilibrium level of long-term according to Edwards (1989).

The exchange rate regime followed by Morocco since April 25, 2001, is a fixed exchange rate “basket peg” resulting in an anchor, with a constant rate, of the local currency to a basket of currencies of major trading partners. These amounts to the monetary authorities may fix the weights of the basket of trading in order to avoid any loss of competitiveness - price and offset the inflation differential between Morocco and its partners.

The rest of the paper is organized as follows. The second section reviews the chronology of the exchange rate policy in Morocco. The third section presents the theoretical foundations of the model of equilibrium real exchange rate. The fourth section is devoted to an empirical estimate of the rate and the fifth section provides a measure of misalignment and its persistence from annual data. Finally, the sixth and final section concludes.

2. Chronology of Change Policy in Morocco

2.1. Overview of the evolution of the exchange rate system in Morocco

From independence until the breakup of the Bretton Woods system in 1973, Morocco has maintained a fixed parity with the French Franc and used this indirectly pegged to determine the course of the dirham against other foreign currencies.

Thus, from 1959 to 1969, this ratio was set at 0.9756 francs for one dirham before being revised to 1.09755 FRF for a dirham on August 10, 1969 following the devaluation of the French currency of 11.1% compared to gold and the dollar.

From May 1973 as a result of the abandonment of the fixed exchange rate system after the collapse of Bretton Woods, the Moroccan monetary authorities have set up a new exchange system to shelter the domestic currency erratic fluctuations in the exchange rate. And a specific quotation was adopted based on a reference currency is the French franc and a basket of eight currencies that best suits the structure of foreign trade of the country.

Between 1973 and 1979, the system of currency trading has been relatively stable despite a change in the structure of foreign trade of Morocco in particular because of oil shocks that resulted in a change in the relative weight of energy imports in total imports.

It was not up to 1980 that a review of currency basket weights was made to reflect the growing role of the dollar in international regulation.

From 1980 until 1986, the Moroccan political exchange rate entered a new cycle characterized by a shift in the value of the dirham, the adjustments have occurred mainly to offset the inflation differential between Morocco and key partners and correct the overvaluation in real terms dirham recorded in the late 70s. This cycle could be currency two phases. The first phase starts from September 1980, when the first devaluation in August 1983 was a moderate devaluation of the dirham. Indeed, with the exception of the dollar whose skyrocketing has led to its strong appreciation against the dirham (+87.5%), the Moroccan currency depreciated to a lesser extent compared to other major currencies forming the basket. Second phase slip dirham which begins in August 1983, the date of commencement of the structural adjustment program, and lasts until the end of March 1986 was characterized by a faster rate of slippage. At this time of active exchange rate policy to a gradual depreciation of the dirham has taken over a relatively stable period from 1987 to mid-1990. During this phase, the nominal effective appreciation of the dirham over 13% was somewhat more than offset by the slight increase in the index of cost of living relative to the partner countries.

However, and due to the deterioration of terms of trade during the period 1987-1989 that caused a worsening of the trade deficit, the Moroccan authorities decided in May 1990 to devalue the dirham by 9.25% to further support the competitiveness of the export sector and improve the profile of the balance of payments.

From May 1990 to May 2001, the monetary authorities did not intervene to change the value of the dirham except the consolidation currency of the Euro-zone in early 1999 with the introduction of the single European currency.

Contrary to expectations and anticipations, the new European currency has experienced since its launch a sharp depreciation losing in less than a year and a half by 25% of its value against the dollar.

Given the continued weakness of the euro against the dollar, the Moroccan monetary authorities conducted April 25th, 2001 a redesign of the dirham basket which led to devaluation of the order of 5% of the value the dirham. This was done according to Moroccan officials to give some impetus to Moroccan exports and employment in this sector, to facilitate the continuation of a positive trend in

remittances from Moroccans living abroad (MRE) and tourism receipts and encourage foreign investment in the country.

The redevelopment of the basket trading of Bank Al Maghrib which took place April 25th, 2001, increasing the share of the euro, has allowed dirham after 2001 to find its actual 1996 level.

Between 2001 and 2007, the value of the Euro against the Dirham grew by only 9.2%. While that of the dollar against the dirham depreciated by 28.25% during the same period. As for the euro / dollar exchange rate, it grew by 52.2% over seven years.

The strong presence of the dirham to the euro has strengthened its position in relation to so-called major currencies such as the pound sterling, the Japanese yen and the Swiss franc.

Recent years (2007 to 2012), the dirham depreciated against the dollar by about 8% and rose 1.7% against the euro.

The evolution of the Euro-dollar was not without effect on trade through its impact on the value of the dirham. The latter is indexed to a basket of these currencies, with a large part of the Euro against the greenback. Such a structure allows the national currency to maintain a relatively stable position relative to the euro. In 2012 for example, this change would have resulted, all things being equal, an increase in the trade deficit Morocco about 4.9 billion dirhams in the first eight months of 2012 due to the currency effect. This deficit is due to an increase in the value of imports of about 8 billion dirham's, against improving the export of more than 3 billion.

2.2. An international context requires a more flexible management of the exchange rate policy

The importance of the exchange rate as instrument of economic policy is highlighted with open economies, the growth of international alliances and the emergence of new players in the global economy. In the case of Morocco, an additional element occurred in connection with the introduction of the Euro in January 1999.

The new international context is also marked by profound changes in the exchange rate regimes in emerging countries. Following the Asian crisis, the countries of Southeast Asia have abandoned the dollar peg to float their currencies and operate competitive devaluations of high intensity.

This strategy, complemented by other policy measures, allowed Asian countries out of the crisis very quickly. In addition, the current Turkish crisis has again put the spotlight on the issue of sustainability of exchange rate regimes in emerging economies.

A flexible exchange rate policy occurred under market pressure also in the countries of Central and Eastern Europe (CEE) and Latin America in recent years.

2.3. The current system of exchange and the challenges of opening

After the mission of the IMF in the country in 2006 and the collection of economic and financial information, the Board of Directors of the monetary organization, in its conclusions, supports the intent of the Moroccan government to move towards a rate currency more flexible.

There are important to note that the choice of exchange rate regime is of great importance. Must commit to the rules of economic policy and be consistent with monetary and fiscal policies. It involves a country's economic policy, its room for maneuver and its macroeconomic adjustment mode. It also implies, partners of the country which is sensitive to the consequences of a regime change in their relative competitiveness.

Thus the flexibility of the exchange rate is crucial to the attractiveness of foreign investment in a specific country as well as its integration into world trade. As against its adoption for low-and emerging economies can significantly increase the fragility of the country against the international speculation. Until then, the exchange system that Morocco was widely administered. The exchange rate can fluctuate outside a given regularly by the Bank Al Maghrib range. The scoring system in Morocco is based on a basket defining the dirham. Indeed, the exchange rate regime, or the determination of the external value of the dirham, is based on the mechanism of a basket of key international currencies whose weights are determined in principle by the geographical distribution of foreign trade of Morocco. The objective of this incorporation multi-currency is to minimize the impact of changes in exchange rates of these currencies recorded since fluctuations in different directions. But this current regime, called «**the system of nominal anchor to a currency basket (Basket peg)**» is incompatible in a context of increasing mobility of capital movements and eventual full convertibility of the dirham. Hence the need to find a diet that would be optimal in this new situation, knowing that between fixed and flexible, there are several intermediate exchange rate regimes.

The current method of trading³ is in force since 25 April 2001. Its establishment coincided with the devaluation of the dirham, decreasing its value by 5%. The dollar was worth 0.8967 euro.

The conversion to a foreign exchange market completely free, where the dirham exchange rate is determined by supply and demand and without limits set by the central bank requires a strong enough financial and economic base. The flexibility of the exchange rate is certainly beneficial data that can result in many benefits. In particular, improving the competitiveness of the national economy, diversification of doors sheets of economic agents internationally, increased return on savings, protection against currency risk and efficiency of the domestic financial intermediation.

But the risk of a floating regime are also numerous. It was verified following the recent crises in developed and emerging countries, the fixed exchange rate regime is inherently more vulnerable to crises. It can also enhance growth by playing on investment and trade by reducing transaction costs and creating a predictable environment for international traders.

Finally, it appears that Morocco should adopt monetary policies and exchange prudent to counteract any form of currency crisis in the context of financial liberalization. The transition to international financial markets (given the internal constraints and requirements of financial openness on the outside) should be gradually brought under certain preconditions such as the adaptation of the domestic banking sector, consistent mix of monetary policy and budget, adoption procedures and credible political risk management.

3. The Theoretical Reference Model

In the economic literature, the analysis of the equilibrium real exchange rate is based on two different theoretical approaches: the first-called fundamental (Williamson, 1994) and the second-called behavioral approach (Clark and MacDonald, 1998).

The basic approach is usually used for a purpose of macroeconomic policy and emphasizes the components of economic policy that affect short-term variations of the real exchange rate.

The behavioral approach, however, has a high utility for economic policy and emphasizes the macroeconomic determinants of long- run real exchange rate. This approach does not seek to determine the level of the real exchange rate equilibrium compatible with the internal and external balance, but the long-term determinants of the real exchange rate.

As part of this work, the estimate of the equilibrium real exchange is in reference to the so-called "behavioral" approach because our goal is to determine the macroeconomic variables that influence the real exchange rate long term for Morocco.

In this respect, the basic model builds on the work of Emre et al. (2000)⁴, where the simultaneous balance of the current account and the market for non-tradable is made. Is a small country with open three types of goods: an exportable good, an importable good and a non-tradable good. The economy produces tradable and non-tradable goods consumed and importable goods. The economy with flexible exchange rates and the nominal exchange rate is denoted "E". This assumption may seem surprising at first glance, especially since the country adopted a fixed exchange rate regime. However, the reasoning here is done in a long-term perspective and the estimate is based elsewhere in the econometric part of a long-term relationship.

Of course, the exchange rate can be fixed in the short and medium term, but in the long term to maintain parity, the country must have sufficient foreign currency, which is not the case for Morocco. As the nominal exchange rate will eventually adjust to term, we assume from the outset that here is flexible.

Either P_X and P_N respectively the domestic price of tradables and non-tradables. The world price of tradables is normalized to unity $P_X^* = 1$, and the domestic price of tradable goods is defined by $P_X = EP_X^* = E$. The world price of importable goods is noted P_M^* .

Either e_M and e_X respectively inside relative price of importable goods and tradable versus non-tradable goods:

$$e_M = \frac{P_M}{P_N} \quad (1)$$

³The scoring method of the dirham is made public for the first time in the report of Bank Al-Maghrib for 2006.

⁴This model is in line with the work of Edwards (1993).

$$e_X = \frac{E}{P_N} \quad (2)$$

The relative price of importable relative to non-tradable goods is:

$$e_M^* = \frac{EP_M^*}{P_N} \quad (3)$$

We assume that the economy takes tariff restrictions on imports as:

$$P_M = EP_M^* + \tau$$

where τ is the tariff on imports (specific rate).

The total production of the two goods that economy will be defined by:

$$Q = Q_X(e_X) + Q_N(e_X) \quad (5)$$

with $Q_X' > 0$ and $Q_N' < 0$.

The overall private consumption is given by:

$$C = C_M(e_M) + C_N(e_M) \quad (6)$$

with C_M and C_N respectively domestic consumption of importable and non-tradable and $C_M' < 0$, $C_N' > 0$.

We define the real exchange rate as the relative price of tradable relative to non-tradable, namely:

$$e = \alpha e_M + (1 + \alpha) e_X = \frac{E(\alpha P_M^* + (1 - \alpha)) + \alpha \tau}{P_N} \quad (7)$$

In this equation $\alpha \in (0, 1)$.

We assume that capital is perfectly mobile in the long term and we denote by "A" foreign assets. The agents hold a portion of their wealth in the form of foreign assets whose return is r^* . The current account of the country is the sum of net return on foreign assets and net trade balance expressed in foreign currency, defined as the difference between exports and consumption of importable, including:

$$CA = r^* A + Q_X(e_X) - P_M^* C_M(e_M) \quad (8)$$

The change in foreign exchange reserves in the economy is given by:

$$\Delta R = CA + KI \quad (9)$$

with KI the net capital flows.

In the short and medium term the economy can deviate from equilibrium, defined by $\Delta R = 0$, and the stock of assets in the economy may vary. The current account is called sustainable when the current account deficit is compensated by net capital flows. Thus, the external balance is achieved when the sum of the balance of current account and capital flows is zero, or:

$$r^* A + Q_X(e_X) - P_M^* C_M(e_M) + KI = 0 \quad (10)$$

On the other hand, the internal balance is achieved "when the domestic non-tradable is in equilibrium", or:

$$C_N(e_M) + G_N = Q_N(e_X) \quad (11)$$

with G_N public spending on non-tradable.

The equilibrium exchange rate is defined as the relative price which ensures both the external balance and internal balance. From (9) and (10) we can define the equilibrium exchange rate, e^* , in terms of P_M^* , τ , r^* , A , KI et G_N , or :

$$e^* = e^*(P_M^*, \tau, r^*, A, KI, G_N) \quad (12)$$

The equilibrium level of the real exchange rate is based on the terms of trade, trade policy, foreign interest rates, foreign capital inflows, and government spending. The variables in the equation (12) are the fundamentals of the real exchange rate equilibrium long time.

Increased public spending on non-tradable goods leads to a real appreciation of the exchange rate, a deterioration of the competitive position of the country. Trade liberalization leads to a real depreciation of the domestic currency needed to improve the competitive position of the country. An

improvement in the current account is associated with long-term appreciation of the real exchange rate.

Indeed, trade liberalization through a relaxation of trade restrictions which reflects the country's trade policy affects the real exchange rate. A reduction in import duties for example, can reduce the domestic price of imports is part of tradable goods.

In return, the local price of tradable goods decreases and lead to an appreciation of the real exchange rate. For cons, the opposite effect occurs due to an increase in import duties: the domestic currency price of imports increases, reflecting a depreciation of the real exchange rate.

Reforms which aim to liberalize trade would therefore compatible with an improvement in external competitiveness, namely exchange rate depreciated.

Moreover, the effect of terms of trade is uncertain. On the one hand, the increase in the terms of trade leads to an increase in national income and thus spending, which leads to a real appreciation. On the other hand, this increase will generate a substitution effect that leads to a real depreciation.

Elbadawi and Soto (1995) studied seven developing countries and found that for three of them improved terms of trade leads to an appreciation of the real exchange rate, while for the other four, it causes impairment. Feyzioglu (1997) found for Finland, an improvement in the terms of trade leads to an appreciation of the real exchange rate.

4. Estimation of EREER and Measurement of Misalignments

The estimate of the equilibrium real exchange rate (ERER) will be conducted according to the method of cointegration applied to non-stationary series. Before estimating the model, we must define the variables and determine the characteristics of time series econometric study.

4.1. Definition and selection of model variables

The basic theoretical model developed above, defines a long-term relationship between the real exchange rate and its fundamentals namely terms of trade, trade policy, foreign interest rates, capital flows foreign and public spending.

Note that the unavailability of data for some macroeconomic variables leads us to make some approximations. The first relates to public expenditure: as we can't break down spending in tradable and non-tradable goods, we use as a proxy the log of public expenditure (LDP). The second relates to trade policy. In general, in the literature, the degree of openness of the economy is approximated by the share of foreign trade in value in the nominal GDP. It will be designated BCGDP. This approximation is justified by the fact that, all things being equal, moreover, increased trade liberalization helps to intensify trade and price convergence. In our case, we refer to the traditional ratio of the opening rate measured as the sum of exports and imports relative to GDP. It will be noted TOUV.

For their part, capital flows are approximated by net inflows of foreign direct investment. They will be graded IDE.

Furthermore, to measure the Balassa-Samuelson effect, we take as a proxy the growth rate of Real GDP. It is expected that in fact the coefficient on the growth rate of Real GDP is negative for economic development is accompanied by a growing gap between the relative productivity in the tradable sector, which leads to an appreciation real exchange rate.

With regard to the fundamental variable used in our model is that the real effective exchange rate of the dirham, it was calculated according to the proposed by the Directorate general economic policy of the Ministry of Finance in Morocco method⁵.

Moreover, it was considered useful to strengthen the model by variables other than those identified by the theoretical model that has been extracted mainly from the main empirical work on the fundamentals of the exchange rate.

⁵ Working Paper No. 26, March 2003, Direction de la Politique Economique et Générale, (2003).

Table 1. Fundamentals of the exchange rate from the main empirical works

Authors	Countries	Fundamentals of exchange rate	Methods
Edwards (1989)	12 countries (Brazil, Colombia, Israel, Malaysia, etc.)	Terms of trade flows, openness, public expenditure, tariff on imports, productivity differentials (linear trend), domestic credit, nominal devaluation)	Panel data, instrumental variables with fixed-effect equations with dynamic adjustment allowing short-term effects of dummy variables including the rate of devaluation, - method of Beveridge-Nelson
Ades (1996)	Twelve countries (1980-1996 quarterly data)	Terms of trade flows, openness, public expenditure, foreign interest rate, technology (linear trend)	- Cointegration and error-correction model - Moving average
Elbadawi (1994)	Three countries (Chile, Ghana and India) (1967-1990)	Terms of trade flows, openness, government expenditure, tariff barriers on imports, productivity differentials (linear trend), domestic credit, nominal devaluation)	Cointegration and error-correction model - Beveridge-Nelson decomposition - Moving average
Cottani et al. (1990)	Twenty-four countries, including Argentina, Bolivia, Chile, Colombia, Jamaica ... etc.	Terms of trade net capital flows, openness, excessive domestic credit, GDP growth, inflation, linear trend	- Estimated by weighted least squares (Pooled OLS) - moving average
Xiaopu (2002)	Twenty-four countries, including Argentina, Bolivia, Chile, Colombia, etc.	Terms of trade indicator of economic openness, government expenditure on GDP report	- Tests of the Johansen cointegration - error correction model - HP Filter
Bouoiyour, Marimoutou and Rey (2004)	Morocco (1967-2000 quarterly data)	Terms of trade indicator of economic openness, government expenditure to GDP ratio, the ratio between the trade balance and GDP	- Tests of the Johansen cointegration - error correction model - Moving average
Sekkat and Achy (2007)	Morocco, Algeria, Tunisia, Egypt and Turkey (1970-1997)	Terms of trade, international transfers, the closure rate of the economy, net capital flows, excess domestic credit and domestic credit growth	Panel Data

Thus, the following two variables were included in the model:

- The Gross Fixed Capital Formation in log (LGFCF) to measure the effect of tangible and intangible investments on the real exchange rate;
- External Public Debt in log (LEPGPD) as an indicator for assessing the effects of foreign interest rates on the real exchange rate.

4.2. Testing the stationarity of fundamental variables

To test the hypothesis that long-term convergence between the exchange rate and the fundamentals⁶, we study the statistical properties of different series with unit root tests namely the Dickey-Fuller, Augmented Dickey-Fuller test, test and Phillips-Perron test Kwiatowski, Phillips, Schmidt, Shin.

Then we will test the relationship of long-term convergence between the exchange rate and fundamentals through two methods namely the method Johansen method.

We test the unit root hypothesis against the alternative hypothesis of stationarity. The fundamental test of stationarity gives us the following results:

⁶ Data sources: Ministry of Finance, HCP, World Bank and Base SLAM (Harmonised Accounts on Trade and the World Economy) constructed and updated by the CEPII (Centre for Prospective Studies and International Information, Paris).

Table 2. Unit root test on the model variables

Part A: ADF Test on the variables in level				
Variables	model *	value ADF (t)	critical Value t_c (with the threshold 5%)	stationarity
ERER	model 2	- 5,26	- 2,96	Yes
LDP	Model 3	- 2,43	- 3,56	No
LIDE	Model 3	- 2,96	- 3,56	No
TOUV	Model 3	- 2,67	- 3,56	No
CRGDP	Model 2	- 11,16	- 2,96	Yes
LEPGDP	Model 2	- 3,89	- 2,96	Yes
TMCHE	Model 3	- 0,29	- 3,56	No
BCGDP	Model 3	- 1,22	- 3,56	No
LGFCF	Model 3	- 7,22	- 3,56	Yes
Part B : ADF test on the variables in first difference				
ERER	model 1	- 2,00	- 1,95	Yes
LDP	model 2	- 4,22	- 2,96	Yes
LIDE	model 1	- 7,69	- 1,95	Yes
TOUV	model 1	- 7,83	- 1,95	Yes
CRGDP	model 2	- 4,22	- 2,95	Yes
LEPGDP	model 1	- 8,08	- 1,95	Yes
TMCHE	model 2	- 4,93	- 2,96	Yes
BCGDP	model 1	- 5,88	- 1,95	Yes
LGFCF	model 1	- 11,87	- 1,95	Yes

(*) Model 1: without constant or trend, model 2 with constant, model 3: with constant and trend.

From the results obtained, we can conclude that the stationarity of the series in first difference. Now that all series model taken separately are integrated of order one, you can go to the cointegration test will include all variables used as the basic model.

Table 3. Number of lags in the model

lag	Value of Akaike	Value of Schwarz
1	4,60	5,02
2	4,72	4,19

The number of lags corresponds to the values that minimize the Akaike and Schwarz criteria in the table is the lag of one (1).

4.3. Estimated long-term relationship

Recall that for a long-term relationship between several variables, two conditions must be met: first variables must be non-stationary and integrated of the same order (in our case, all the variables are integrated of order one). Secondly their stochastic trends must be linked.

Table 4. Testing the hypothesis of cointegration between the real effective exchange rate of the dirham and some basic in Morocco on annual data (1983-2012)

Trace test				
Null hypothesis	Alternative hypothesis	Trace statistic	Critical Value (at 5%)	Cointegration
$r=0$	$r \geq 1$	341,30	197,30	No
$r \leq 1$	$r \geq 2$	219,06	159,62	Yes
$r \leq 2$	$r \geq 3$	142,75	125,61	Yes
$r \leq 3$	$r \geq 4$	77,29	95,75	No

With r : the number of cointegrating relationships.

H0: $r = 0$ if acceptable $t_s \leq t_c$; H1: $r = 1, 2, 3, 4, 5 \dots$ acceptable if $t_s \geq t_c$

The cointegration test indicates the presence of two cointegrating relationships. We can therefore estimate the VCEM. The value of the trace of 341.30 > 197.30 rejects the hypothesis of the existence of more than 95% zero vector and accept the alternative hypothesis that there is at least one cointegrating vector. The long-term relationship between the significant real exchange rate and the basic model can be expressed in the following table 5.

Table 5. Long-term relationship between the real exchange rate and the fundamental

ERER	LTOT	LGFCF	LDP	LEPGDP	CRGDP	TOUV
1	0,74	0,50	-1,93	0,40	0,16	0,02
t-stat	4,182	6,169	-11,995	12,989	20,042	6,737

The six variables playing the role of fundamentals of the economy are good sign and statistically significant. The other variables are statistically insignificant result; they were rejected by the model. It is the ratio of FDI and the trade balance to GDP ratio value.

Empirically, improved terms of external trade (an increase of TOT), causes an appreciation of the ERER. So, the income effect outweighs the substitution effect. Regarding the coefficient of the variable differential growth (productivity indicator measuring the Balassa-Samuelson effect) shows that more growth is increasing in Morocco compared with its partners over the real exchange rate appreciates. This is the effect *Product augmenting* dominates.

In other words, technology shock produces a positive income effect develops an excess of non-tradable goods and hence a real appreciation of the ERER request. An increase in public external debt and gross fixed capital formation as well as a relaxation of trade restrictions (Increase open rates) are associated with an appreciation of the real exchange rate. However, public spending has been accompanied by a depreciation rate.

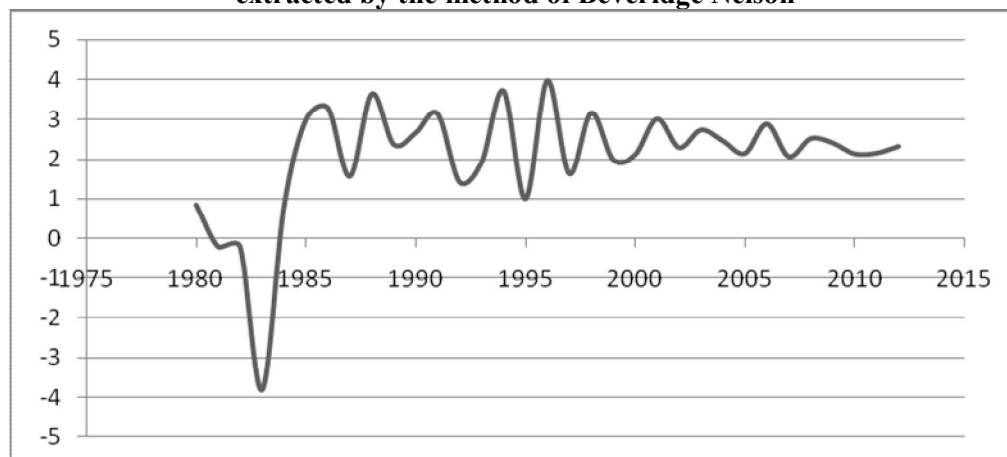
4.4. Determination of the real exchange rate equilibrium

The real exchange rate of long-term equilibrium is influenced by the terms of trade, spending and public and external debt productivity, the opening and GFCF, the combination of these six fundamental variables following rate the long-term relationship allows us to generate the equilibrium real effective exchange rate for each period values.

However, to do this, you must know what values to use in the fundamental equation. Most authors choose to replace with sustainable human centered moving averages over several years (4-5 years in most cases) (Edwards 1989, El Badawi, 1994) fundamentals observed. In our case, the method adopted is one that has been proposed by Beveridge and Nelson (1981) for the calculation of sustainable values of a given variable.

The application of this method was used to determine the basic model variables to be taken into account for the calculation of misalignment.

Figure 1. Real exchange rate equilibrium in logarithm calculated from sustainable values extracted by the method of Beveridge Nelson



4.5. Measurement of Dirham misalignments over the period 1980-2012

Our goal here is to calculate at first the extent of misalignment of the exchange rate of the Moroccan Dirham compared to its equilibrium level. Then, in a second step, we will detect periods of overvaluation and undervaluation periods, using the indicator of misalignment.

From the estimated long-term relationship, it is possible to calculate the relative difference existing between the observed real exchange rate and balance; we get a measure of actual current misalignment. This can be measured by the following formula:

$$\Omega = E - E^*$$

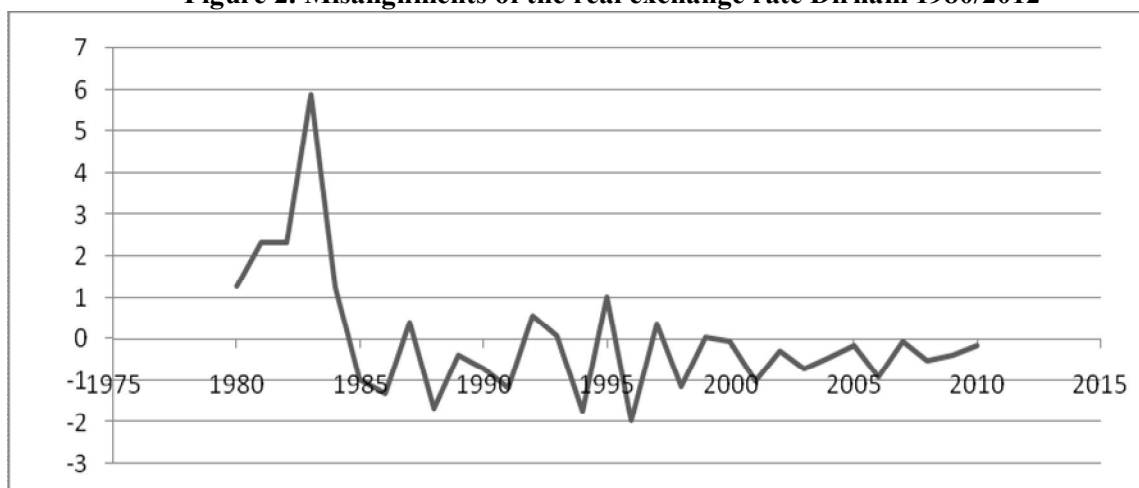
with Ω , E and E^* represent the misalignment indicator, the real exchange rate and the observed equilibrium real exchange rate.

According to the formula of the indicator misalignment, three scenarios are possible:

- (i) if Ω is positive, the real exchange rate is overvalued;
- (ii) if Ω is negative, the real exchange rate is undervalued;
- (iii) if Ω is zero the real exchange rate is aligned.

The application of this formula allows us to deduce the following misalignments of the real exchange rate of the dirham:

Figure 2. Misalignments of the real exchange rate Dirham 1980/2012



As calculated using the Beveridge and Nelson method, overvaluation lasted for four years from 1980, but its magnitude is small and its maximum is reached on the eve of the adoption of the Structural Adjustment Program (1983). During this period, the active exchange rate policy of the Moroccan authorities has led to a gradual depreciation of the dirham, which is taken over a relatively stable period from 1987 to mid- 1990.

During this phase, the nominal effective appreciation of the dirham over 13 % was somewhat more than offset by the slight increase in the index of cost of living relative to the partner countries.

However, due to the deterioration of terms of trade during the period 1987-1989 that caused a worsening of the trade deficit , the Moroccan authorities decided in May 1990 to devalue the dirham 9.25% to further support the competitiveness the export and improve the profile of the balance of payments sector.

The period from the 1990s to the end of 2000 has been marked by alternating periods of undervaluation and overvaluation and monetary authorities did not intervene to change the value of the dirham except consolidation currency area Euro in early 1999 with the introduction of the single European currency which allowed Dirham reach its equilibrium value in 1999 (misalignment = 0.04).

In that date a period of undervaluation persisted (especially with the redevelopment of the basket of currencies in 2001) until the end of 2010 where Dirham began to wrap around its equilibrium value (when it deviates slightly as shown by calculating the misalignment, a restoring force him back to the estimated value), although in 2012 a slight undervaluation returns (about 10%), which allows to note that the deviations exchange rate of the dirham from its equilibrium value have a

persistent character (persistent overvaluation in the 1980s and persistent undervaluation of 10 years ranging from 2000 to 2012).

So we will look more closely at the persistence of these deviations.

5. The Persistence ERE Misalignments of the Dirham

The most striking point in the analysis of the deviations of the real exchange rate of the dirham from its equilibrium value is the persistent nature of these misalignments. Indeed, the analysis (R/S)⁷ to calculate the Hurst exponent and deduct the "d" parameter of the ARFIMA process, gives us the following results:

Considering a time series $Y_t, t = 1, \dots, T$ and Y medium.

The range R is defined by:

$$R = \max_{1 \leq k \leq T} \sum_{j=1}^k (Y_j - \bar{Y}_T) - \min_{1 \leq k \leq T} \sum_{j=1}^k (Y_j - \bar{Y}_T)$$

The calculation of statistics (R/S) is to divide the area by the standard deviation S_T series, namely:

$$Q_T = \frac{R}{S_T} = \frac{1}{\left[\frac{1}{T} \sum_{j=1}^T (Y_j - \bar{Y}_T)^2 \right]^{1/2}} \left[\max_{1 \leq k \leq T} \sum_{j=1}^k (Y_j - \bar{Y}_T) - \min_{1 \leq k \leq T} \sum_{j=1}^k (Y_j - \bar{Y}_T) \right]$$

The value of the R/S analysis is that it gives rise to the Hurst exponent:

$$H \sim \frac{\log Q_T}{\log T}$$

The Hurst exponent is particularly interesting in that its value is used to classify time series according to their dependence structure.

Knowledge of the Hurst exponent to calculate the "d" parameter of ARFIMA process, from which it is possible to make a classification of time series⁸.

The relationship between H and d is described as follows:

$$d = H - \frac{1}{2}$$

- If $0 < d < \frac{1}{2}$: the ARFIMA process is a stationary long memory process. Autocorrelations are positive and decreases hyperbolically to 0 when the delay increases. We are facing a persistent process;
- If $d = 0$, the ARFIMA process reduces to the standard ARMA process and has no structure of long-term dependence;
- If $-\frac{1}{2} < d < 0$, the process is anti-persistent. Autocorrelations alternate sign and the spectral density is dominated by high-frequency components.

The application of this method on the series of misalignments obtained in the Moroccan case we can deduce the following:

- 1) $R = 13,0706452$;
- 2) $ST = 1,4883584$;
- 3) $QT = R/ST = 8,78192051$;
- 4) $H = \log(QT) / \log(T) = 0,632703$;
- 5) $d = H - \frac{1}{2} = 0,1327 < \frac{1}{2}$

Hence the persistent nature of misalignments in Morocco.

⁷This statistic is defined as the range of partial sums of deviations of a time series from its mean divided by its standard deviation.

⁸Mignon and Lardic (2002)

6. Conclusion

This study evaluated the evolution of the exchange rate of the dirham observed relative to its equilibrium value, based on sustainable values of the fundamentals of the Moroccan economy. Misalignments estimated by the method of Beveridge -Nelson are generally consistent with the results obtained by other studies using different methods (moving average, see Bouoiyour et al. (2004) and more standard econometric approaches (Model Johansen, in particular).

However, the magnitude of the distortion, resulting in the identification of a time back to the equilibrium real effective exchange rate of the dirham relatively long, must lead us to reflect on the causes of the persistence.

The persistent distortion of real exchange rate that reveals this study can be attributed to a specific policy change for Morocco as it can find its explanation in the structural characteristics of the Moroccan economy (lack of productivity in sectors degree of openness of the economy , the degree of flexibility of the labor market ... etc.).

The persistence raised by this article deserves special attention since it is likely to affect the country's economic performance. Indeed, sustainable misalignments can lead to distortions in the relative price of tradable relative to non- tradable goods, which therefore generate some instability.

In addition, the effects can be differentiated if undervaluation and overvaluation of currencies. If the currency is undervalued, competitiveness has increased which stimulates domestic production, investment and exports and reduce imports. It follows an improvement in the current account balance, GDP and employment.

Instead, overstatements generally reflect some inconsistency macroeconomic policy decisions, leading to an increase in the likelihood of balance of payments crises and currency, thus contributing to the deterioration of economic growth. Although the monetary authorities have allowed greater flexibility in the real effective exchange rate in early 2001, continued to rule anchor real exchange rate has been successful in Morocco, given the absence of significant effects on the period after the devaluation shock, adopting a pricing policy and rigid wages and prudent macroeconomic policies. However, the limitations of this rule are beginning to emerge in the context of an economy that is increasingly open either by trade (free trade agreements with the United States or Europe) or its capital.

The need to relax capital controls to diversify sources of external financing in the context of full convertibility of the dirham and opt for a clear monetary policy targeting price stability as the main objective , requires the Central Bank to reduce its interventions in the foreign exchange market with a potential target to float the dirham . Indeed, the new environment would not only have a significant impact on the real exchange rate equilibrium but would make it more difficult to assess.

It is for these reasons that the monetary authorities would find it more difficult to protect an anchorage from the real exchange rate, which pushes them to consider adopting alternative exchange rate regimes, by moving more towards a more flexible exchange rate would seem more appropriate.

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