# Exchange Rate Regime Classification and Real Performances: New empirical evidence

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### Abstract

This study investigates the link between real performances and the exchange rate arrangement depending on alternative exchange rate regime classifications: the official one (IMF) and two *de facto*, a statistical one proposed by Levy-Yeyati and Sturzenegger (2000a) (LYS) and an historical one suggested by Bubula and Ötker-Robe (2002) (BOR). Some studies consider that major economic and political events represent main shocks on economic time series. These shocks may be detected in using outlier methodology. Hence, we identify outliers for fourteen West African countries in inflation and growth series. Assuming that outliers may be associated with exchange rate regime shifts, we compare issues depending on the three classifications. Our results confirm two main things: first, there is a strong relationship between exchange rate arrangement and real performances; second, *de facto* classifications have to be taken into account to improve empirical studies relative to the choice of exchange rate regime and its impact on real performances.

**Keywords:** Exchange rate regime, *de jure* and *de facto* classifications, inflation, growth, outliers and shocks.

**JEL Classification:** C10, E31, E42.

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# 1  Introduction

The choice of an optimal exchange rate regime is one of the major unresolved questions of international macroeconomics. Contemporary discussion on costs and benefits of exchange rate flexibility is heavily influenced by the large number of studies on the empirical differences in growth, trade, business cycles, inflation under different exchange rate arrangements (Hoffmaister *et al.* (1998), Baxter and Stockman (1989), Flood and Rose (1995)). Nevertheless, all of them fail to detect any significant difference across fixed and floating rates. Even if a relationship is assumed between exchange rate regime and real performances, it's quite difficult to underscore, except maybe between inflation and exchange rate arrangement. Nearly, all such studies are based on the official or "standard" classification annually published in the IMF's *"Annual Report on Exchange Rate Arrangements and Exchange Restrictions"*, which until 1999 asked member states to self-declare their arrangement. Specifically, the *de jure* classification until 1999 distinguished between three main categories: (i) pegged regimes, (ii) regimes with limited flexibility (those that permit the exchange rate to fluctuate within a range or within a cooperative arrangement), and (iii) more flexible arrangements, in which the exchange rate is managed or allowed to float freely. Yet, a closer reading of the experience suggests that these official classifications often fail to describe actual country practice (Calvo and Reinhart (2000)), implying that the gap between *de facto* and *de jure* can be vast. A few previous studies attempted to either extend the official classification into a more informative meaningful categorization (Gosh *et al.* (1995)) or rely it on purely statistical methods in order to regroup country practices (Bailliu *et al.* (2000), Benassy-Quéré and Coeuré (2001), Levy-Yeyati and Sturzenegger (2000a)). The IMF, recognizing the limitations of its former classification, significantly revised and upgraded the standard official approach toward classifying exchange rate arrangements in 1997, though it did not re-evaluate its historical classification after the fact. Recently, Bubula and Ötker-Robe (2002) and Reinhart and Rogoff (2002) present monthly databases of *de facto* exchange rate arrangements to examine the evolution of various exchange rate regimes. The formers construct a database for all IMF members since 1990 using the IMF's nomenclature adopted in 1999. The latters present a monthly database for 153 countries over the period 1946-2001. They adopt a broadly similar nomenclature to the new IMF classification, and verify their

classification by applying a variety of descriptive statistics.

The objective of this paper is twofold. First, we compare three kinds of classification, the official one, the statistical one proposed by Levy-Yeyati and Sturzenegger (2000a) (LYS thereafter), and the historical one suggested by Bubula and Ötker-Robe (2002) (BOR thereafter) for 14 African developing countries belonging to the ECOWAS (Economic Community of West African States). This area is studied for two main reasons: (i) the range of exchange rate regime is large including 8 members of CFA franc zone and is time-varying (depending on the official classification and the LYS one); (ii) even if the region already includes a monetary union, the West African Economic and Monetary Union (WAEMU), a number of countries that are not members of it propose to create a second monetary zone, the West African Monetary Zone (WAMZ) and so coordinate their exchange rate policy. The choice of the exchange rate regime is then crucial, notably its impact on real performances.

Gosh *et al.* (1995), Bailliu *et al.* (2000) and Levy-Yeyati and Sturzenegger (2000b) suggest that empirical studies fail to reveal a strong relationship between real performances and the exchange rate regime because they only use the official classification. Hence, the second objective of our paper is to detect outliers in inflation and growth and rely them to exchange rate regime modifications depending on the three classifications previously mentioned. So, Section 2 briefly compares the alternative classifications available. Section 3 reports the outliers method and the empirical results observed in the ECOWAS area. Finally, Section 4 concludes and proposes some perspectives.

## 2   Classifying countries' exchange rate regimes

A country's actual exchange rate regime may differ from its official notification. Over the past decade, a number of countries that had officially declared to be floating were in reality targeting stable exchange rates. Several reasons may explain this divergence: the political cost of undertaking visible devaluations under a formally announced peg; the "fear of floating" argument proposed by Calvo and Reinhart (2000) to limit the potential effect of exchange rate depreciation on inflation and balance sheets when is high degree of dollarization; or large exchange rate exposure in the domestic economy (Collins (1996), Hausmann *et al.* (2000)). Such a divergence between stated and actual policies has in turn been used to challenge the lack of relationship between

real performances and exchange rate arrangement (Bailliu *et al.* (2000) and Levy-Yeyati and Sturzenegger (2000b)). A natural question then is whether the absence of relationship would still be supported if the analysis is based on *de facto* exchange rate regimes. Providing an answer to this question requires studying alternative exchange rate arrangement classifications, the official one and two *de facto*, one proposed by Levy-Yeyati and Sturzenegger (2000a) and another by Bubula and Ötker-Robe (2002).

## 2.1  The IMF's official classification

Characterizing exchange rate policies actually pursued by countries has been one of the greatest challenges to empirical analyses of exchange rate regimes. From 1975 through 1998, the official IMF exchange regime classification system categorized members' exchange rate policies based on their official notifications to the IMF. Members' arrangements were grouped depending on their own official statements about the degree of exchange rate flexibility. Before 1998, the IMF considered three basic categories: (i) pegs, (ii) limited flexibility and (iii) more flexibility[1]. Among the key advantages of the *de jure* classification were its comprehensiveness in terms of country coverage, frequent updating (on a quarterly basis) and long history, and many empirical analyses of exchange rate regimes have relied on it.

However, this system is limited, the most important shortcoming was its failure to capture differences between what countries claimed to be doing and what they were doing in reality. No effort is made to ensure that this *de jure* classification is consistent with actual practices, however, recently the IMF seeks to identify deviations from country's declaration and its formal regime[2]. Some countries with pegged regimes managed frequent devaluations, using the exchange rate as a safeguard for export competitiveness. Others, identified themselves as floaters, actually follow more rigid exchange rate arrangements. The resulting divergence between the *de jure* and *de facto* regimes reduced the transparency of exchange rate policy, clouding the policy implications derived from research and policy work using this classification. A second weakness of the system was that, by lumping rigid forms of pegs together with soft pegs, it fails to acknowledge the different degree of monetary autonomy afforded by each

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[1]It allows several subgroupings.

[2]This arrangement is identified by the subscript 6 in International Financial Statistics (1999).

regime. To answer to these shortcomings, the IMF adopted a new classification method based on *de facto* policies, which is become official since January 1999. The new system was changed to an eight-way grouping : regime with no separate legal tender, currency boards, conventional fixed (peg against a single currency or a basket of currencies), pegged exchange rates within horizontal bands, crawling pegs, crawling bands, managed floating with no predetermined path for exchange rate and free float.

Nevertheless, it is possible to identify instances in which actual regimes differ from the stated arrangements. Levy-Yeyati and Sturzenegger (2000a) find that of the 35 countries identified as free floats in 1998, 12 (all of them emerging countries) could not be considered floaters. Calvo and Reinhart (2000) even conclude that most countries identify themselves as floaters actually follow more rigid exchange rate arrangements. While the new scheme adopted by the IMF in 1999 is a marked improvement over the former classification, the lack of a historical database limites its usefulness for empirical analysis. So, Bubula and Ötker-Robe (2002) construct a monthly database on *de facto* regimes for all member countries that extends the current classification back in time from the beginning of 1990 to the end-2001. The sample period is limited but its analysis is interesting because it differs from *de facto* existing classifications, LYS for instance, which ignore the IMF's old official classification. Now, we briefly present these both *de facto* classifications used here near the official one.

## 2.2   Alternative *de facto* Classifications

The method presented by Levy-Yeyati and Sturzenegger (2000a) aims to capture actual exchange rate policies on the basis of the observation of three variables closely related to exchange rate behaviour: (i) Exchange rate volatility, measured as the average of the absolute monthly percentage changes in the nominal exchange rate during the year; (ii) Volatility of exchange rate changes, evaluated with the standard deviation of the monthly percentage changes in the exchange rate; and (iii) Volatility of reserves, measured as the average of the absolute monthly change in international reserves relative to the monetary base in the previous month[3]. The idea of the LYS classification is that we should be able to identify the exchange rate regime that a country is actually following, depending on the behavior of these three variables. A textbook flexible exchange

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[3]According to the authors it's a correct way of assessing the monetary impact of the exchange rate intervention.

rate arrangement is characterized by no or little intervention in the foreign exchange market together with high exchange rate volatility. Conversely, a fixed exchange rate regime should display little volatility in the nominal exchange rate while reserves fluctuate substantially. Finally, an intermediate regime corresponds to the case in which volatility is relatively high across all variables, with exchange rates moving in spite of active intervention. Table 1 extracted from Levy-Yeyati and Sturzenegger (2000a) presents the patterns that, *a priori*, should be expected for the different arrangements in term of the three classification variables.

Table 1: LYS classification benchmark

| Type | Exchange Rate Volatility | Volatility of Exchange Rate Changes | Volatility of Reserves |
|---|---|---|---|
| Inconclusive | Low | Low | Low |
| Flexible | High | High | Low |
| Dirty FLoat | High | High | High |
| Crawling Peg | High | Low | High |
| Fixed | Low | Low | High |

The authors use a K-means procedure to classify countries into the five clusters described in Table 1. They construct an alternative classification but it's only based on the behavior of exchange rates and reserves, implying limitations in terms of country coverage, due to the limited availability of relevant exchange rate and official reserves data for all countries[4]. Incorrect inferences about the actual exchange rate regime may occur with such data. Since many aspects of economic policy have an effect on the exchange rate, it's difficult to distinguish the actions aimed at stabilizing the exchange rate from those directed to other goals (direct inflation targeting for instance). For these reasons, among others[5], Bubula and Ötker-Robe (2002) present an historical database based on the new categorization of the IMF. Given the limitations of the classification based only on quantitative analysis, they use a combination of quantitative and qualitative analysis in constructing the database on *de facto* regimes based on the current official IMF classification. They identify the *de facto* policies in collecting

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[4]Most of developing countries are under the inconclusive group.

[5]See Bubula and Ötker-Robe (2002).

various informations from member countries and IMF country desk economists. These views are improved with other sources of information, including press reports, news articles and other relevant papers, supported by an analysis of observed exchange rate and reserves behaviour to get a final view on the *de facto* regimes. Bubula and Ötker-Robe (2002) succeed in classifying all IMF member countries but the period is short, composed only of 11 years (1990-2001). Regarding the benefits and shortcomings of all classifications we consider that they have to be used simultaneously to understand globally the effect of exchange rate arrangement.

Following these classifications, we study outliers which can be observed on annual inflation and growth series for 14 African developing countries. Empirical work and results are presented in the following section.

## 3 Identification of outliers

On April 2000, the leaders of six west African countries[6] declared their intention to proceed to monetary union among the non-CFA countries of the region in January 2003, as a first step towards a wider monetary union including all the ECOWAS countries in 2004. The countries committed themselves to create a Convergence Council to help coordinate macroeconomic policies, and to set up a common central bank. Although the goal of a monetary union in ECOWAS has long been an objective of the organization, there has been little progress to date. Masson and Patillo (2001) concluded that instead of trying to meet a very short deadline for monetary union, the countries of the region should invest their energies into reinforcing convergence on low inflation, sustainable fiscal policies, and structural policies necessary for strong growth. A degree of exchange rate stability as well as the benefits of mutual surveillance over macroeconomic policies could be achieved through a form of regional monetary cooperation. Hence, their study shows that real performances and exchange rate arrangement are main objectives for the West African countries.

Recently, some studies consider that main economic events represent major shocks on economic time series. This type of events includes, for example, the 1973 and 1979 oil crisis, the major twentieth century wars, financial slumps, changes of political and exchange rate regime, natural catastrophes, etc. The presence of these shocks can be sought in the form of outliers using the method

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[6]Gambia, Ghana, Guinea, Liberia, Nigeria and Sierra Leone.

developed by Tsay (1986) and Chen and Liu (1993). Actually, Balke and Fomby (1991, 1994), Franses and Haldrup (1994), Bradley and Jansen (1995), Everaert (2001) and Tolvi (2001) have also used this approach on several macroeconomic time series. This method should provide a certain amount of information concerning the nature and magnitude of the exchange rate regime shifts.

According to Bailliu *et al.* (2000), Levy-Yeyati and Sturzenegger (2000b) and Gosh *et al.* (1995), the difficulty to investigate the relationship between real performances, notably growth, and the exchange rate regime may be due to the use of the IMF official classification. Therefore, we decide to use alternative classifications in identifying outliers in inflation and growth series for 14 West African countries. We test whether it's possible to associate with each outlier an exchange rate regime modification depending on the three classifications.

## 3.1   Methodology

Outliers represent sudden temporary or permanent shifts in the level of a time series. We use the method developed by Gómez and Maravall (1997, 2000) based on the approach proposed by Tsay (1986) and Chen and Liu (1993). This procedure is incorporated in the TRAMO (Time Series Regression with ARIMA Noise, Missing Observations, and Outliers) program. In this method, the outliers are classified and modelled by regression polynomials. If $y_t$ denotes the original series, it can be decomposed as follows:

$$y_t = y_t^* + \sum_I \omega_i \nu_i(B) I_t(t_i)$$

where $y_t^*$ is an ARIMA process, $\nu_i(B)$ is the polynomial characterizing the outlier occurring at time $t_i$, $\omega_i$ is its impact on the series, and $I_t(T)$ is an indicator function with the value of 1 at time $t_i$ and of 0 elsewhere.

Four main types of regression variables exist for the treatment of outliers which are classified as Additive Outliers (AO) that affect only a single observation at some points in time series and not its future values. In terms of regression polynomials, this type can be modelled by setting $\nu_i(B) = 1$; Innovational Outliers (IO) that affect temporarily the time series with the same dynamics as an innovation. The polynomial is then $\nu_i(B) = \theta(B)/\phi(B)$; Level Shifts (LS) that increase or decrease all the observations from a certain time point onward by some constant amount. In this case, the polynomial $\nu_i(B) = 1/(1 - B)$; and

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Temporary Changes (TC) that allow an abrupt increase or decrease in the level of a series which then returns to its previous level exponentially rapidly. Their speeds of decay depend on the parameter $\nu_i(B) = 1/(1 - \delta B)$, where $0 < \delta < 1$.

It is considered that AOs and IOs are outliers and that TCs and LSs are more in the nature of structural changes. TCs represent ephemeral shifts in a series whereas LSs are more the reflection of permanent shocks.

The TRAMO program based on the approach of Tsay (1986) and Chen and Liu (1993) uses the following methodology[7]: the model is first adjusted to the series and the remainders obtained; the estimators of the $\omega_i$ and their $t$-value are then calculated for each remainder; an outlier is detected (at time $t_i$) when the $t$-value of $\omega_i$ exceeds a critical level[8]; the different $t$-values of the estimators (at time $t_i$) are compared in order to identify the type of outlier. The outlier chosen is that with the greatest significance. Finally, a multiple regression of the series is performed on the various outliers detected to identify fallacious outliers. An outlier is eliminated if its $t$-value is smaller than the critical value and the procedure is repeated until no outlier is eliminated.

## 3.2 Application and results

We study 14 West African developing countries which aim to join a monetary union soon: Benin, Burkina Faso, Gambia, Ghana, Guinea, Guinea Bissau, Ivory Coast, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone and Togo. We wish we improved previous studies in including various measurements of exchange rate regime (official, LYS, and BOR classifications) and in studying it with an alternative econometric method. We examine the nature and amplitude of shocks on annual inflation and output growth series for these countries from outliers methodology. We try to associate the identified shocks with the exchange rate regime shifts proposed by the three classifications.

We use two variables: $dy$ represents real GDP's growth rate (base 1995), and $dp$ is the real inflation evaluated with the GDP's deflator. We cover the 1960-2001 period for the GDP and 1960-1999 for inflation. Data are extracted from CHELEM-CEPII Database. In Tables 2 to 5, we present the detected shocks and their nature, and we also report the events that could have affected the series: exchange rate arrangement shifts.

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[7] The processing of outliers used in TRAMO is based on intervention analysis as originally proposed by Box ans Tiao (1975).

[8] The critical value is determined by the number of observations in the series.

We report all outliers detected, nevertheless, as we are interested in the relationship between exchange rate arrangement and outliers, we don't comment shifts before 1973, date of the Breakdown of the Bretton Woods system.

First, results are different within the studied variable. Output and prices aren't affected by same events. Moreover, shifts are more important for inflation than for growth, except for three countries: Ghana, Guinea Bissau and Liberia. These latters are characterized by unstable political governments (military coups and civil wars). Obviously, inflation is an important issue for developing countries, and is more sensitive to external shocks.

Second, we can distinguish countries belonging to the CFA french zone. In fact, Benin, Burkina, Ivory Coast, Niger, Mali, Senegal, and Togo have pegged their currencies to the French franc since 1948. In CFA french area,no level shift (LS) is observed, there is no permanent modification in the series. *A contrario*, temporary changes (TC) and additive and innovative outliers (AO and IO) are detected. It is worth noting that during the decade 1975-1985, output growth was twice as high and the rate of inflation was half in the CFA franc countries than in non-CFA franc countries, where exchange rate arrangements offered a potentially greater flexibility (Hoffmaister *et al.* (1998)). Actually, a credible arrangement can lower inflation by inducing greater policy discipline and instilling greater confidence in the currency. It's notably the multilateral system which enhances credibility. Countries belonging to the CFA french area are less subject to crises than the others. Between zero and three shifts are observed in CFA french area[9], whereas non members of CFA french zone show between zero and eight outliers.

Moreover, in inflation series for CFA french area, all countries show a shift in 1994: Benin, Burkina and Mali present a temporary change while Ivory Coast, Niger, Senegal and Togo an additive outlier. Indeed, the severe currency crises occurring in the European Monetary System in 1992-1993 involved the french franc devaluation, hence, it strongly affected prices in CFA french area, and then the authorities were obliged to devalue the CFA franc too.

Third, we seek to identify robust differences between the three classifications BOR's LYS's and IMF's[10]. We try to associate each shocks with a shift in exchange rate arrangement. Concerning output growth, nine outliers may

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[9]Except for Togo, where four outliers are estimated.

[10]All classifications are reported in Appendix.

correspond to shifts in the LYS classification: Guinea Bissau in 1999 (IO), Ghana in 1975 (IO), 1978 (AO) and 1984 (LS), Ivory Coast in 1980 (TC), Mali in 1975 (TC), Niger in 1984 (AO), Sierra Leone in 1997 (AO), and Togo in 1993 (AO). Depending on IMF's classification, we identify only two outliers: Guinea Bissau [11] in 1977 and 1978 (AO). No outlier may be associated with a shift in exchange rate arrangement from the BOR classification. As growth presents less outliers than inflation, results on inflation may be more interesting.

Concerning inflation, we used real inflation but also inflation evaluated with the Consumer Price Index[12], and results converge. We identify twenty eight outliers which may correspond to shifts in the exchange rate regime depending on LYS classification: Benin in 1974 and 1994 (TC), Burkina Faso in 1977 and 1994 (TC) and 1986 (IO), Gambia in 1985 (TC), Ghana in 1978, 1980 and 1983 (TC) and 1984 and 1985 (AO), Guinea in 1993 (LS) (also according to BOR classification), Guinea Bissau in 1998 (LS), Ivory Coast in 1976, 1977, 1980 and 1994 (AO), Niger in 1975 and 1994 (AO), Nigeria in 1992 and 1999 (AO), Mali in 1975 and 1994 (TC), Senegal in 1994 (AO), and Togo in 1974, 1978, 1994 (AO) and 1976 (TC). With the official classification, five outliers are identified, of which only one has been yet identified with the *de facto* classification (Ghana in 1985 (AO)). Four outliers are only determined from the IMF classification: Guinea Bissau in 1984 (IO), Liberia in 1998 (AO), Nigeria in 1987 (IO), and Sierra Leone in 1986 (AO).

Therefore, shifts in real performances seem to be better explained by LYS classification than the others.

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[11] Several outliers are found for this series, maybe because of its political instability.

[12] Results aren't reported here, but are available from the authors upon request.

Table 2: Outliers detection.

| Country | Series | Date | Type | t-value | Events |
|---------|--------|------|------|---------|--------|
| Benin   | dy     | -    |      |         |        |
|         | dp     | 1974 | TC   | 3.15    | ERR shift (LYS) |
|         |        | 1982 | AO   | 3.61    |        |
|         |        | 1994 | TC   | 9.14    | ERR shift (LYS) |
| Burkina | dy     | -    |      |         |        |
|         | dp     | 1977 | TC   | 3.34    | ERR shift (LYS) and fall of military government |
|         |        | 1986 | IO   | -3.61   | ERR shift (LYS) |
|         |        | 1994 | TC   | 6.83    | ERR shift (LYS) |
| Gambia  | dy     | -    |      |         |        |
|         | dp     | 1968 | AO   | -3.38   |        |
|         |        | 1974 | TC   | 4.75    |        |
|         |        | 1985 | TC   | 9.35    | ERR shift (LYS) |
| Ghana   | dy     | 1966 | AO   | -3.89   | Military coup |
|         |        | 1970 | IO   | 3.37    |        |
|         |        | 1972 | AO   | -3.75   | Military coup |
|         |        | 1975 | IO   | -8.59   | ERR shift (LYS) |
|         |        | 1978 | AO   | 5.35    | ERR shift (LYS) |
|         |        | 1984 | LS   | 7.00    | ERR shift (LYS) |
|         | dp     | 1978 | TC   | 6.75    | ERR shift (LYS) |
|         |        | 1980 | TC   | -4.68   | ERR shift (LYS) |
|         |        | 1983 | TC   | 14.45   | ERR shift (LYS) |
|         |        | 1984 | AO   | 5.21    | ERR shift (LYS) |
|         |        | 1985 | AO   | -3.45   | ERR shift (LYS,IMF) |

ERR shift: Exchange Rate Regime shift.

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Table 3: Outliers detection.

| Country | Series | Date | Type | t-value | Events |
|---------|--------|------|------|---------|--------|
| Guinea | dy | 1977 | IO | -3.32 | |
| | | 1983 | AO | -3.74 | |
| | dp | 1985 | TC | 6.40 | Coup attempt |
| | | 1986 | AO | 48.32 | Guinean franc replace syli |
| | | 1993 | LS | -4.45 | ERR shift (LYS,BOR) |
| Guinea Bissau | dy | 1971 | AO | -5.32 | |
| | | 1977 | AO | -5.29 | ERR shift (IMF) |
| | | 1978 | AO | 4.56 | ERR shift (IMF) |
| | | 1980 | AO | -9.25 | Military coup |
| | | 1981 | AO | 6.22 | |
| | | 1983 | AO | -6.20 | Peso devaluation (50%) |
| | | 1998 | IO | -14.41 | Civil war |
| | | 1999 | IO | -10.48 | ERR shift (LYS) and dismissal of the President |
| | dp | 1984 | IO | 3.31 | Peso devaluation (50%) and ERR shift (IMF) |
| | | 1986 | TC | 7.52 | |
| | | 1998 | LS | -4.52 | Civil war and ERR shift (LYS) |
| Ivory Coast | dy | 1980 | IO | -4.22 | ERR shift (LYS) |
| | dp | 1973 | AO | 2.65 | Coup attempt |
| | | 1974 | IO | 3.83 | |
| | | 1976 | AO | 3.04 | ERR shift (LYS) |
| | | 1977 | AO | 5.45 | ERR shift (LYS) |
| | | 1980 | AO | 5.08 | ERR shift (LYS) |
| | | 1984 | AO | 3.67 | |
| | | 1994 | AO | 5.16 | ERR shift (LYS) |

ERR shift: Exchange Rate Regime shift.

Table 4: Outliers detection.

| Country | Series | Date | Type | t-value | Events |
|---------|--------|------|------|---------|--------|
| Liberia | dy | 1973 | AO | -5.08 | Economic crisis |
| | | 1975 | AO | -6.08 | Economic crisis |
| | | 1980 | TC | -4.42 | Coup |
| | | 1990 | TC | -13.12 | Civil war |
| | | 1992 | AO | -8.12 | ONU military embargo |
| | | 1994 | AO | -31.70 | |
| | | 1997 | AO | 7.86 | End of civil war |
| | dp | 1964 | AO | 3.14 | |
| | | 1974 | TC | 7.51 | Economic crisis |
| | | 1976 | AO | -3.51 | Economic crisis |
| | | 1990 | AO | 6.69 | Civil war |
| | | 1998 | AO | 109.88 | ERR shift (IMF) |
| Mali | dy | 1975 | TC | 3.01 | ERR shift (LYS) and |
| | | | | | Frontier conflict with Burkina-Faso |
| | | 1980 | TC | -3.65 | |
| | dp | 1968 | IO | 4.82 | Military coup |
| | | 1975 | TC | 5.30 | ERR shift (LYS) and |
| | | | | | Frontier conflict with Burkina-Faso |
| | | 1980 | TC | 4.76 | |
| | | 1981 | AO | 3.35 | |
| | | 1994 | TC | 7.84 | ERR shift (LYS) |
| Niger | dy | 1973 | AO | -4.55 | Dryness |
| | | 1984 | AO | -4.47 | ERR shift (LYS) |
| | dp | 1973 | IO | 6.18 | Dryness |
| | | 1975 | AO | -4.05 | Military coup in 1974 |
| | | | | | and ERR shift (LYS) |
| | | 1985 | TC | -3.82 | |
| | | 1994 | AO | 6.23 | ERR shift (LYS) |

ERR shift: Exchange Rate Regime shift.

| Country | Series | Date | Type | t-value | Events |
|---|---|---|---|---|---|
| Nigeria | dy | 1967 | IO | -4.06 | Biafra war |
| | | 1969 | TC | 5.88 | |
| | | 1981 | TC | -3.59 | |
| | dp | 1971 | AO | -3.38 | |
| | | 1987 | IO | 5.61 | ERR shift (IMF) |
| | | 1992 | AO | 3.80 | ERR shift (LYS) |
| | | 1999 | AO | 8.29 | ERR shift (LYS) |
| Senegal | dy | 1982 | AO | 3.01 | |
| | dp | 1974 | AO | 3.63 | |
| | | 1994 | AO | 10.09 | ERR shift (LYS) |
| Sierra Leone | dy | 1997 | AO | -4.60 | ERR shift (LYS) and military coup |
| | dp | 1986 | AO | 8.48 | ERR shift (IMF) |
| Togo | dy | 1993 | AO | -3.92 | ERR shift (LYS) and civil war |
| | dp | 1974 | AO | 6.77 | ERR shift (LYS) |
| | | 1976 | TC | 4.16 | ERR shift (LYS) |
| | | 1978 | AO | -4.73 | ERR shift (LYS) |
| | | 1994 | AO | 5.11 | ERR shift (LYS) |

Table 5: Outliers detection.

ERR shift: Exchange Rate Regime shift.

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Assuming that outliers may be associated with exchange rate arrangement shifts, we identify several shocks depending on the alternative classifications. The official classification and the historical one present few shifts in exchange rate arrangement whereas exchange rate policy in developing country is quite unstable with the LYS classification. Combining these three classifications, we succeed in associating outliers with exchange policy shifts. We supplement this first analysis in reporting political or economic events occurring during the year of the shift. Hence, note that several political events correspond to shocks on inflation and growth series. The main political events are the civil wars, for example, in Guinea Bissau (1998), Liberia (1990) and Togo (1993), and coup attempts and successes, for instance, in Ghana (1966,1972), Guinea (1985), Guinea Bissau (1980), Ivory Coast (1973), Liberia (1980), Mali (1968), Niger (1974) and Sierra Leone (1997).

Regarding our results, we aren't able to promote one classification rather than another. Nevertheless, we can think that they are complementary. The three kinds of classification should be used to study the impact of exchange rate regime on real performances. A strong relationship seems to exist between political events or exchange rate regime shifts and shocks in growth and inflation series.

# 4   Conclusion

This paper contributes to the exchange rate regime literature and its impact on real performances. Previous studies fail to identify a strong relationship between exchange rate arrangement and inflation and growth. Divergence between the actual exchange rate regime and its official notification may explain this lack of relationship. Thus, a natural question is whether the absence of linkage would still be supported if the analysis is based on the *de facto* exchange rate regime near the official one. So, our work exceeds previous studies in two main ways. First, we compare and use in our empirical study three alternative exchange rate regime classifications one *de jure*, IMF classification, and two *de facto*, statistical one proposed by Levy-Yeyati and Sturzenegger (2000a) and historical one suggested by Bubula and Ötker-Robe (2002). Second, we use these classifications to underscore the relationship between exchange rate arrangement and real performances in implementing an original econometric method. We detect outliers for fourteen West African countries. Shocks may be related to

exchange rate arrangement shifts, depending on the alternative classifications, notably the LYS one. Results, as suggested by Bailliu *et al.* (2000), Levy-Yeyati and Sturzenegger (2000b) and Gosh *et al.* (1995), show that *de facto* classifications have to be taken into account to improve empirical studies relative to exchange rate regime and its impact on real performances.

Following these first results, several perspectives occur. Statistical methods should be implemented to check the actual exchange policy followed by emerging countries. Thus, in order to complete existing work relative to the evolution of exchange rate regime in the last decade, we should introduce different kinds of classification (*de facto* near *de jure*).

# Appendix: Alternative Classifications from 1960 to 2001[13]

Table 6: Alternative Classifications

| Country | Year | IMF | Year | LYS | Year | BOR |
|---------|------|-----|------|-----|------|-----|
| Benin | 1974 | CFA | 1974 | DF | | |
| | | | 1975 | P | | |
| | | | 1976-1977 | DF | | |
| | | | 1978-1989 | P | | |
| | | | 1990-1993 | na | 1990-2001 | CU |
| | | | 1994 | DF | | |
| | | | 1995-1999 | P | | |
| Burkina Faso | 1974 | CFA | 1974-1975 | na | | |
| | | | 1976 | IF | | |
| | | | 1977 | DF | | |
| | | | 1978-1978 | P | | |
| | | | 1980-1982 | Inc | | |
| | | | 1983 | P | | |
| | | | 1984 | Inc | | |
| | | | 1985 | P | | |
| | | | 1986-1993 | na | | |
| | | | 1994 | P | 1990-2001 | CU |
| | | | 1995-1999 | na | | |
| Ivory Coast | 1974 | CFA | 1974 | na | | |
| | | | 1975 | P | | |
| | | | 1976 | IF | | |
| | | | 1977 | DF | | |
| | | | 1978 | P | | |

CFA: CFA Area, DF: Dirty Float, P: Peg, Inc: Inconclusive, CP: Crawling Peg, IF: Independant Float, CU: Currency Union, MF: Managed Float, CB: Currency Board, na: not available.

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[13]BOR classification is only available from 1990 to 2001.

| Country | Year | IMF | Year | LYS | Year | BOR |
|---|---|---|---|---|---|---|
| Ivory Coast | 1979 | CFA | 1979 | na | | |
| | | | 1980-1981 | P | | |
| | | | 1982 | na | | |
| | | | 1983-1985 | P | | |
| | | | 1986-1993 | na | | |
| | | | 1994 | DF | 1990-2001 | CU |
| | | | 1995 | na | | |
| | | | 1996-1997 | P | | |
| | | | 1998 | na | | |
| | | | 1999 | P | | |
| Gambia | 1973-1985 | P | 1973-1983 | P | | |
| | | | 1984 | DF | | |
| | 1986-1999 | IF | 1985-1987 | P | | |
| | | | 1988 | DF | | |
| | | | 1989-1992 | P | | |
| | | | 1993 | IF | 1990-2001 | IF |
| | | | 1994-1995 | P | | |
| | | | 1996 | IF | | |
| | | | 1997 | P | | |
| | | | 1998 | DF | | |
| | | | 1999 | P | | |
| Ghana | 1973-1978 | P | 1974-1977 | P | | |
| | | | 1978 | DF CP | | |
| | 1979-1981 | IF | 1979 | P | | |
| | | | 1980 | na | | |
| | | | 1981 | P | | |
| | 1982-1984 | IF | 1982 | Inc | | |
| | | | 1983 | DF CP | | |
| | | | 1984 | DF | | |
| | 1985-1986 | P | 1985 | IF | | |
| | 1987-1999 | IF | 1986 | DF | | |

CFA: CFA Area, DF: Dirty Float, P: Peg, Inc: Inconclusive, CP: Crawling Peg, IF: Independant Float, CU: Currency Union, MF: Managed Float, CB: Currency Board, na: not available.

Table 8: Alternative Classifications

| Country | Year | IMF | Year | LYS | Year | BOR |
|---------|------|-----|------|-----|------|-----|
| Ghana | | | 1987 | DF CP | | |
| | | | 1988 | P | | |
| | | | 1989 | IF | | |
| | | | 1990-1992 | P | 1990-2001 | MF |
| | | | 1993 | IF | | |
| | | | 1994-1996 | P | | |
| | | | 1997 | IF | | |
| | | | 1998 | DF CP | | |
| | | | 1999 | DF | | |
| Guinea | 1973-1986 | P | 1992 | DF | 1990-1991 | MF |
| | 1987-1988 | IF | 1993 | DF CP | 1992 | P |
| | 1989-1995 | MF | 1994-1995 | na | 1993-1995 | MF |
| | 1996-1999 | IF | 1996 | DF CP | 1996-2001 | MF |
| | | | 1997 | DF | | |
| Guinea Bissau | 1977 | P | 1989 | DF | | |
| | 1978 | IF | 1990 | P | 1990-1996 | CP |
| | 1979-1983 | P | 1991-1992 | DF | | |
| | 1984-1996 | MF | 1993-1995 | IF | | |
| | 1997-1999 | P | 1996 | DF | | |
| | | | 1997 | P | 1997-2001 | CU |
| | | | 1998 | na | | |
| | | | 1999 | P | | |
| Liberia | 1973-1997 | P | | na | 1990-1998 | P |
| | 1998-1999 | IF | | na | 1999 | IF |
| Mali | 1973 | CFA | 1974 | DF CP | | |
| | | | 1975 | P | | |
| | | | 1976-1993 | na | | |
| | | | 1994 | DF | 1990-2001 | CU |
| | | | 1999 | P | | |

CFA: CFA Area, DF: Dirty Float, P: Peg, Inc: Inconclusive, CP: Crawling Peg, IF: Independant Float, CU: Currency Union, MF: Managed Float, CB: Currency Board, na: not available.

| Country | Year | IMF | Year | LYS | Year | BOR |
|---------|------|-----|------|-----|------|-----|
| Niger | 1973 | CFA | 1974-1975 | na | | |
| | | | 1975 | P | | |
| | | | 1976-1977 | DF | | |
| | | | 1978-1981 | P | | |
| | | | 1982 | na | | |
| | | | 1983-1985 | P | | |
| | | | 1986 | na | | |
| | | | 1987 | P | | |
| | | | 1988-1993 | na | 1990-2001 | CU |
| | | | 1994 | DF | | |
| | | | 1995-1999 | P | | |
| Nigeria | 1973 | P | 1974 | P | | |
| | 1974-1981 | IF | 1975 | DF CP | | |
| | | | 1976 | P | | |
| | | | 1977 | DF CP | | |
| | | | 1978 | DF | | |
| | | | 1979 | P | | |
| | | | 1980-1981 | IF | | |
| | 1982-1986 | MF | 1982 | DF | | |
| | | | 1983-1985 | IF | | |
| | 1987-1993 | IF | 1986-1987 | DF | | |
| | | | 1988 | IF | | |
| | | | 1989 | DF | | |
| | | | 1990 | P | 1990-1992 | MF |
| | | | 1991 | DF | | |
| | | | 1992 | DF CP | | |
| | | | 1993 | IF | 1993-1994 | CB |
| | 1994-1997 | P | 1994 | na | | |
| | | | 1995-1998 | P | 1995 | MF |
| | 1998-1999 | MF | 1999 | DF | | |

CFA: CFA Area, DF: Dirty Float, P: Peg, Inc: Inconclusive, CP: Crawling Peg, IF: Independant Float, CU: Currency Union, MF: Managed Float, CB: Currency Board, na: not available.

Table 10: Alternative Classifications

| Country | Year | IMF | Year | LYS | Year | BOR |
|---------|------|-----|------|-----|------|-----|
| Senegal | 1973 | CFA | 1974-1975 | P | | |
| | | | 1976 | DF | | |
| | | | 1977 | IF | | |
| | | | 1978-1983 | P | | |
| | | | 1984-1985 | na | | |
| | | | 1986 | P | | |
| | | | 1987-1993 | na | 1990-2001 | CU |
| | | | 1994 | DF | | |
| | | | 1995-1999 | na | | |
| | | | 1999 | P | | |
| Sierra Leone | 1973-1979 | P | 1974-1977 | P | | |
| | | | 1978 | IF | | |
| | 1980-1982 | P | 1979-1981 | P | | |
| | | | 1982 | na | | |
| | 1983 | MF | 1983 | DF CP | | |
| | 1984 | P | 1984 | IF | | |
| | 1985 | P | 1985-1986 | DF | | |
| | 1986-1987 | IF | 1987 | DF CP | | |
| | 1988-1990 | P | 1988-1991 | DF | | |
| | 1991-1999 | IF | 1992-1993 | P | 1990-2001 | IF |
| | | | 1994-1997 | DF | | |
| | | | 1998-1999 | IF | | |
| Togo | 1973 | CFA | 1974 | DF CP | | |
| | | | 1975 | P | | |
| | | | 1976 | DF | | |
| | | | 1977 | IF | | |
| | | | 1978 | P | | |
| | | | 1979-1980 | Inc | | |
| | | | 1981 | P | | |
| | | | 1982-1992 | Inc | | |
| | | | 1993 | P | 1990-2001 | CU |
| | | | 1994 | DF | | |
| | | | 1995-1999 | P | | |

CFA: CFA Area, DF: Dirty Float, P: Peg, Inc: Inconclusive, CP: Crawling Peg, IF: Independant Float, CU: Currency Union, MF: Managed Float, CB: Currency Board, na: not available.

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