Exchange Rate Regimes
and Misalignments in Emerging Countries

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1. Introduction

Pegged exchange rate regimes are often considered to generate risk of misalignment, because their real exchange rates have a tendency to appreciate. The issue of real appreciation in pegged exchange rate regimes was first raised by Obsfeld and Rogoff (1995). By definition, the real appreciation happens each time the domestic inflation is higher in the home country than in the country issuing the anchor currency. Such situations occur regularly, because fixed exchange rates are often introduced as a means of fighting high inflation. As inflation falls only gradually after the peg has been implemented, the currency appreciates in real terms. The ensuing loss of competitiveness may create a current account deficit, thereby leading to financing difficulties or a speculative attack. The empirical study by Goldfajn and Valdés (1996) confirms this result, evidencing that real exchange rates appreciate more frequently under fixed exchange rate regimes.

In this framework, Obsfeld and Rogoff (1995) see fixed exchange rates as inherently vulnerable and with a duration necessarily finite. According to these authors, the lifespan of a pegged exchange rate does not exceed four or five years. Once this period is over, the real exchange rate is generally overvalued and the country has no choice but to devalue suddenly, triggering a crisis. This view is consistent with further research on the topic. In their empirical study, Rogoff and Reinhart (2002) estimate a much longer lifespan for fixed exchange rates – around 12 years – however, that is simply because they do not take into account devaluations. They consider that the exchange rates remain fixed, if, after a devaluation, a fixed rate system is reinstated.

Bouts of real exchange rate appreciation do not occur only under hard pegs, like Argentina's currency board, or soft pegs, like the de facto anchors of the Asian countries. They also affect the intermediate regimes, particularly crawling pegs, as evidenced for example by Turkey's experience in 2001.

Gosh and alii (1997) identify a possible link between exchange rate regimes (ERR) and the long-term behaviour of the real exchange rate (RER). In the long run, on average, the currencies of all emerging and developing economies have a tendency to depreciate in real terms. But this trend is far more pronounced in countries with floating exchange rates. Fixed exchange rates prevent countries from raising their competitiveness through nominal depreciations, other than when the

peg collapses. Even if in theory, the nominal variables are neutral in the long run, empirically, we see different behaviour patterns in the real exchange rate: countries with fixed exchange rates depreciate less in real terms than others. However, the results by Gosh and alii (1997) are not entirely convincing, because they rely on the old "de jure" classification by the IMF, which is not really relevant to represent the true exchange rate policies implemented by governments. That is why efforts have been made since that time to improve the classification of countries by exchange rate regimes.

The aim of this paper is to check if pegged exchange rate regimes are more prone to overvaluation than floating ones. Section 2 defines the fixed and floating exchange rate regimes according to the current de facto classification systems. We then use the data of Levy-Yeyati and Sturzengger (2003), covering 172 countries for period 1970-2000. In section 3, we test if the real exchange rate behaviour is significantly different under pegged, intermediate and floating exchange rate regimes. We also test if the exchange rate regime has an impact on the current account and the inflation rate. Section 4 addresses the issue of overvaluation. We assess the misalignment of a large sample of currencies, by using a purchasing power parity criterion corrected by a Balassa effect; we then test if the misalignment significantly varies across exchange rate regimes.

2. Classification of exchange rate regimes

2.1. Defining exchange rate regimes

One of the first questions that we must ask ourselves is what exactly is meant by a fixed (or pegged) exchange rate. In the strictest sense, this is a system where the exchange rate is maintained within fluctuation bands around a pre-announced central parity. However, it is more pertinent to use a broader definition that encompasses two other categories. First, there are "crawling pegs", in which the exchange rate is pegged to a reference rate that is devalued regularly according to a pre-announced schedule. Second, there are de facto fixed exchange rates that are reported as floating rates. Brought to light by Calvo and Reinhart (2000 and 2002), this category is widespread among the emerging economies. Most of the Asian countries, including Thailand, South Korea, Indonesia and the Philippines, were using systems like this, before the 1997 meltdown, as shown by Bénassy-Quéré and Coeuré (2002) and Coudert and Dubert (2004), among others.

Given the existence of "disguised" fixed exchange rate regimes, the category itself becomes somewhat blurred. As a result, before assessing the impact of different exchange rate arrangements, one of the first tasks must be to identify what kind of system is being used. Several methods exist for ascertaining the de facto regime adopted by a country, as compared with the de jure regime reported to the IMF (International Monetary Fund) by member states. These techniques are based on an examination of the policies implemented and their results. Until 1999, countries completed a form in which they told the IMF what kind of regime they were using. The IMF then used these reports to publish a *de jure* classification. However, there were many divergences between the *de jure* classification and actual exchange rate movements. This prompted the IMF to revise its method; now, country reports are adjusted to take into account statistical information on currency-market movements.

Calvo and Reinhart (2002) show that many countries that reported floating their currency in fact intervened regularly on the market to contain the parity. The authors see this as evidence of a widespread "fear of floating" among emerging economies, which can be ascribed to the inability of floating exchange rate regimes to guarantee independent monetary policies and to stabilise economic shocks. Calvo and Reinhart (2002) combine several criteria in order to identify *de facto* exchange rate arrangements, including the variance of exchange rates, interest rates and official reserves. Floating rates feature high variance in the exchange rate and low variance in official reserves. Fixed exchange rates naturally display low variance in the exchange rate, but high variance in reserves or interest rates, depending on whether the monetary authorities are defending the peg by buying and selling currencies or by manipulating interest rates.

The Levy-Yeyati and Sturzenegger (2000, 2003) or "LYS" classification is based on an exhaustive statistical analysis of the systems used worldwide. Their approach is based on the behaviour of the exchange rate and the official reserves (see section 3.2). Many studies have used the LYS classification as a basis, for it is available on-line on their web site (for example, Von Hagen and Zhou, 2002; Juhn and Mauro, 2002).

With their new "Natural" classification, Reinhart and Rogoff (2002) improve on existing methods in two ways: first, they use exchange rates on parallel markets for countries where a dual currency market is in effect; second, they employ a monthly classification, which solves problems related to regime modifications during the year. Reinhart and Rogoff also introduce a new category of "freely falling" currencies, which are seen in countries with high inflation (over 40% a year). Previously, these currencies were wrongly grouped with floating exchange rates, which helped to overestimate the inflationary bias of floating rates. The *de facto* classifications reveal that many countries say they have adopted floats but in fact employ fixed or intermediate exchange rate

policies, thus betraying their "fear of floating" according to Calvo and Reinhart's analysis (2002). For example, in Reinhart and Rogoff's Natural classification (2002), just 20% of the countries reporting a pure float actually used such a system.

Concerning the macroeconomic impact of exchange rate regimes, studies on this issue (Gosh et alii, 1997; Levy-Yeyati and Sturzenegger, 2001; Rogoff et alii, 2003) obtain broadly similar findings. These are gathered together by Rogoff et alii (2003), who use the three main classifications: IMF *de jure*, LYS and Reinhart and Rogoff (2003). They come to two main conclusions. First, the different systems show little difference in terms of GDP growth. Second, fixed exchange rates are associated with significantly lower inflation than other regimes. This last result was obtained from a large sample of countries and has been verified for developing and emerging countries, but is not significant among advanced countries. The decline in inflation in developing countries with pegged rates can be mainly attributed to the enhanced credibility resulting from the announcement of the peg, and not to better "discipline", which proxied by a slower growth in the money supply. Thus, having a de facto fixed exchange rate in place, with no prior announcement, does not have a significant effect on inflation.

2.2. The LYS classification

Levy-Yeyati and Sturzenegger (LYS) (2000, 2003) propose an exhaustive statistical analysis of the exchange rate regimes for 172 countries in the period 1974-2000. The "LYS" classification is based on the volatility of the exchange rate and of the official reserves. Floats are characterised by high variance in the exchange rate and low variance in official reserves. Pegged regimes display low exchange rate variance, with high reserves variance. To discriminate between crawling pegs and dirty floats, two measures are made for the volatility of the exchange rate: the average of the absolute monthly percentage change in the exchange rate, and the standard deviation of the monthly percentage change in the exchange rate, both being calculated for a calendar year. Reserves volatility is measured by the average of absolute monthly change in net dollar reserves divided by the monetary base of the previous month taken in dollars too.

The problem of the anchor currency was dealt with as follows: for countries reporting a peg to a given currency, the exchange rate used was calculated against that currency; otherwise, the exchange rate was calculated against a number of currencies (USD, FRF, DEM, GBP, SDR, XEU, JPY) and the bilateral exchange rate exhibiting the lowest variance was used. Countries that pegged their currency to a basket were excluded unless the central peg parity or the basket weights were known.

Next, the problem is to determine whether the values of the calculated variables are low or high. Levy-Yeyati and Sturzenegger solve it by means of cluster analysis. Once the three variables have been computed for each year and for each of the countries being analysed, the entire set of observations is grouped into five clusters: flexible, dirty float, crawling peg, fixed and inconclusive. The cluster analysis is made in two rounds: among 2860 observations, 1062 are classified in the first round; the remaining 1798 observations are submitted to the same treatment, in order to reduce the number of inconclusive observations. At the end of the second round, 698 observations, which amount to 24% of the total, are still found "inconclusive".

To solve this problem, the authors had to add another step to the process, in the latest version of their study. They considered that the inconclusive observations are pegs either if the volatility in their exchange rate is zero, or if they are declared as fixers by the IMF and the volatility in their nominal exchange rate is smaller than 0,1%. This latest step allows to drastically reduce the number of inconclusive observations, which falls to 2.4%.

3. Real exchange rate behaviour and exchange rate regimes: empirical results

Here we revisit the question of the real exchange rate behaviour under different exchange rate regimes, by using the LYS de facto classification. We expect to find that real appreciation is more likely in emerging countries with pegged exchange rates rate than in floating regimes, suggesting a more likely overvaluation. We also try to measure if this situation has an impact on the current account. Indeed, if pegged exchange rates countries have more often an overvalued currency, they should also have a higher deficit of current account.

Data on exchange rate regimes are taken from the exchange rate regime are taken from the LYS data base. The initial sample includes 172 countries; however we retain only 152 in the following calculations because of the lack of available series of inflation for 20 small countries. Data on inflation, nominal and effective exchange rates are taken from International Financial Statistics of the IMF. We use current account data in % of GDP from the World Bank database. The overall period is 1974-2000. The panel sample is unbalanced because of the unavailability of some country data. Three types of ERR are retained: pegged exchange rates, intermediate regimes, that include crawling pegs and managed floats; and floating exchange rates.

We compare the evolution of the nominal and real exchange rate, inflation and current account by category of exchange rate regimes. For doing this, we first compute the average of these variables over the whole sample and by category. Then, we perform a mean comparison test to

check if the results are significantly different on the sub-samples of pegs and floating. As usual in this type of test, the null hypothesis H_0 is that the mean of the variable X is equal in the two sub-samples of pegged (respectively, intermediate) and floating exchange rates. We compute the quantity :

$$t = \overline{X}_i - \overline{X}_0 \Big/ \sqrt{[\overline{S}_i^2 / n_i + \overline{S}_0^2 / n_0} \quad (1)$$

where $\overline{X}_i$, $\overline{S}_i^2$, n_i are respectively the empirical mean, the empirical variance and the size of the sub-sample of pegged exchange rates (or intermediate) and $\overline{X}_0$, $\overline{S}_0^2$, n_0 stands for the same statistics calculated on the sub-sample of floating exchange rates. The statistic t is supposed to follow a $N(0,1)$ distribution.

First, we check that the results are not distorted by the presence of high inflation countries. Consequently, we separate the sample into two types of countries, those with inflation higher than 40% and the others. This threshold is similar to the one chosen by Reinhart and Rogoff (2003) for defining high inflation countries in their classification.

Indeed, the sub-sample of high-inflation countries is very specific, since average annual depreciation is 352% per year (table 1). This fits the category of "free falling" currencies, defined by Reinhart and Rogoff (2003). Of course, pegged exchange rates depreciate less in nominal terms than floating currencies, and their real exchange rates appreciate significantly more than for floating currencies. The inflation rates and the current accounts are not significantly different across exchange rate regimes (table 2).

Table 1: Means of variables by category of exchange rate regimes, for the sample of high inflation countries, average yearly percentage change

	Full sample	Pegged	Intermediate	Floating
Number of observations	*243*	*36*	*137*	*70*
Exchange rate (1)	-352.2	-34.0	-585.4	-59.5
Real exchange rate (1)	-4.1	25.7	-18.6	8.8
Consumer price index	353.8	101.6	563.0	74.3
Current account, in % of GDP	-4.8	-5.2	-5.2	-3.6
Number of observations(2)	*99*	*12*	*54*	*33*
Effective exchange rate (1)	-40.0	-21.2	-44.4	-39.6
Real effective exchange rate (1)	5.1	20.3	1.2	5.9

(1) an increase means an appreciation (2) following data are on a smaller sub-sample, because of data availability.

source: LYS, IMF, World Bank, authors' calculations

Table 2: Tests of comparison of means between two categories of EER : pegged and intermediate exchange rate versus floating (1), for the sample of high inflation countries

	Pegged versus floating	p-value	Intermediate versus floating	p-value
Exchange rate	2.46	.014	-3.74	.000
Real exchange rate	4.28	.000	-2.38	.017
Consumer price index	1.10	.271	3.71	.000
Current account	-0.60	.548	-1.38	.167
Effective exchange rate	0.81	.42	-0.28	.779
Real effective exchange rate	1.12	.263	-0.76	.447

(1) H_0 = mean of X is equal in two sub-samples of pegged ERR (or intermediate) and floating EER.

Second, we drop high inflation countries from the sample. Results are displayed on tables 3 and 4. According to these figures, pegged currencies depreciate less in nominal terms than floating ones. This is far from surprising and consistent with common knowledge. This result is significant for the exchange rate against dollar and the effective one. What is more interesting for us, is that pegged currencies appreciate in real terms significantly more than floating currencies. This result is significant at a 99% confidence level.

The other results show that pegged ERR have significantly smaller inflation than floating ones, which is consistent with the results by Levy-Yeyati and Sturzennegger (2002) and Reinhart and Rogoff (2003). Pegged ERR also have a significantly higher current account deficit, which is in line with the loss of competitiveness implied by their appreciating currency. Intermediate regimes currencies depreciate significantly more than floating ones in nominal terms, which can be

explained by their higher inflation rate. The same is true for their real exchange rate that also depreciates more than the one of floating ERR.

Table 3: Means of variables by category of exchange rate regimes, for countries with inflation<40%, average yearly percentage change

	Full sample	Pegged	Intermediate	Floating
Number of observations	*2127*	*1224*	*376*	*527*
Exchange rate (1)	-6.9	-2.9	-16.9	-8.8
Real exchange rate (1)	2.1	4.2	-3.7	1.6
Consumer price index	9.3	7.8	12.0	10.8
Current account, in % of GDP	-4.8	-5.2	-5.2	-3.6
Number of observations (2)	*821*	*487*	*145*	*189*
Effective exchange rate (1)	-0.8	-0.8	-3.9	-2.8
Real effective exchange rate (1)	-0.8	0.7	-4.8	-1.5

(1) an increase means an appreciation; (2) following data are on a smaller sub-sample, because of data availability.

source: LYS, IMF, World Bank, authors' calculations

Table 4: Tests of comparison of means between two categories of EER : pegged and intermediate exchange rate versus floating (1), for countries with inflation<40%

	Pegged versus floating	p-value	Intermediate versus floating	p-value
Exchange rate	8.87	.000	-4.13	.000
Real exchange rate	4.46	.000	-3.59	.000
Consumer price index	-6.41	.000	1.89	.059
Current account	-5.67	.000	0.61	.541
Effective exchange rate	2.42	.016	-0.47	.638
Real effective exchange rate	2.78	.005	-2.44	.015

(1): H_0 = mean of X is equal in two sub-samples of pegged ERR (or intermediate) and floating ERR.

We perform the same calculation after splitting the sample, according to the evolution of the dollar. We consider the effective exchange rate of the dollar against industrial countries. The first sub-sample includes only periods of dollar depreciation, the second those when the dollar appreciates. In periods of dollar depreciation, pegged currencies are stable on average against dollar (tables 5, 6), while in period of dollar appreciation, they have a tendency to depreciate. This confirms the stylised fact that most devaluation in pegged exchange rate regimes occur when the dollar is strong. This is due to the decrease of incentive in maintaining the peg against dollar, when this implies a loss of competitiveness against third currencies. This can also be due to market reactions to this loss of competitiveness, like in the case of the 1997 Asian crises, which also took place in a period of dollar appreciation against industrial countries.

Table 5: Means of variables by category of exchange rate regimes and according to the dollar evolution

	Periods of dollar depreciation				Periods of dollar appreciation			
	Full sample	PEGGED	INTER	FLOAT	Full sample	PEGGED	INTER	FLOAT
Number of observations	*1101*	*570*	*266*	*265*	*1269*	*690*	*247*	*332*
Exchange rate	-42.4	-0.6	-160.7	-13.6	-42.2	-6.5	-177.4	-15.6
Real exchange rate	3.3	7.8	-8.7	5.7	-0.1	2.3	-6.7	-0.1
Consumer price index	48.9	11.1	157.6	21.0	40.9	9.9	160.8	16.0
Current account, in % of GDP	-3.7	-4.7	-2.7	-2.7	-4.5	-5.2	-4.1	-3.3

Table 6: Tests of comparison of means between periods of dollar appreciation versus periods of dollar depreciation

	Total	p-value	PEGGED	p-value	Inter	p-value	Float	p-value
Exchange rate	0.01	.992	-7.96	.000	-0.21	.834	-0.82	.412
Real exchange rate	-2.16	.0308	-9.11	.000	0.32	.749	-5.67	.000
Consumer price index	-0.49	.624	-0.65	.516	0.04	.968	-2.17	.030
Current account. in % of GDP	-2.10	.036	-0.85	.395	-2.10	.036	-1.33	.1834

H_0 ⇔ mean of X_1 = mean of X_0. X_1: sub-sample of dollar appreciation ; X_0: sub-sample of dollar depreciation

4. Exchange rates regimes and overvaluation

In a number of cases, the real exchange rate appreciation may turn out in an overvaluation. Nevertheless this should be carefully checked. Real exchange rate overvaluation refers to a situation in which a country's RER is more appreciated than its equilibrium level. The latter is generally defined as the real exchange rate that, for given values of fundamentals, is consistent with the simultaneous achievement of internal and external equilibrium. After the Mexican crises in 1995 and East Asian crises in 1997, which were often imputed to overvaluation, economists have stepped up efforts for finding methodologies in order to assess real exchange rate misalignment in emerging economies. Empirical works include various types of analysis, as there are different ways of defining fundamentals and thus of measuring the equilibrium real exchange rate (ERER).

4.1. Usual ways of measuring overvaluation

Economic data are much less available for emerging countries, than for developed countries, and they are often incomplete. That is why, one of the most common methods for assessing real exchange rate misalignment is based on reduced-form equations estimates. In comparison, for developed countries, ERER consistent with constructed proxies of external and internal balances can be calculated by simulating large multi-country macro models (like the IMF's Multimod) (Williamson, 1995).

A frequently used measure of misalignment is the deviation of the real exchange rate from its long term average, which implicitly assumes the Purchasing Power Parity (PPP) hypothesis. The consumer prix index (CPI) deflated real exchange rate deviation from its long term average is predominant in empirical studies of currency crises (Kaminsky and Reinhart, 2001). Nevertheless, the real appreciation measured by the consumer price index (CPI) is not entirely fitted to assessing an overvaluation, especially for emerging countries. As productivity gains are concentrated in the traded goods sector, prices grow much less rapidly in this sector, making real appreciation much weaker for traded goods. So when using CPI deflators, the increase in prices in traded goods will be overestimated and consequently this will lead to an upward bias in the RER appreciation. This phenomenon, known as the Balassa effect, explains why a continuous RER appreciation in catching-up countries may not result in an overvaluation. If RERs were deflated by traded good prices, a large part of the real overvaluation would possibly disappear. Deflating with unit labour costs in manufacturing would probably yield still lower RER overvaluation (Coudert and Couharde, 2003). The Balassa effect allows defining a reference exchange rate for a PPP taking into account the international differences in relative productivity between the tradable goods sector and the non-tradable goods sector.

Other approaches rely on a more elaborated definition of the ERER. Several economic variables, including the Balassa effect, are considered to affect the real exchange rate. These variables are called "fundamentals". They are taken into account in a variety of ways in the determination of equilibrium exchange rates, depending the considered time horizon: medium or long run[3].

An ERER can be defined as the real exchange rate that would have prevailed in the absence of price rigidities, frictions and other short run factors. Consequently, the misalignment of the RER is explained by variables that only affect the real exchange rate in short run. For example, Razin and Collins (1997) develop a stochastic version of the Mundell-Fleming open economy model which allows them to distinguish a RER that is affected by short run rigidities and a RER that

[3] For the formalisation of these different definitions of the equilibrium RER, see Clark & MacDonald (1998).

would be obtained in the absence of such rigidities. The misalignment corresponds to the difference between these two RER. Other approaches define the ERER as the real exchange rate that, for sustainable values of fundamentals, results in the simultaneous attainment of internal and external equilibrium[4] in medium-long run. These fundamentals usually include the country's terms of trade, its degree of openness, government expenditures, net foreign assets… according to the underlying theoretical model. In a first step, the RER is regressed on these fundamentals. In a second step, there are two options, depending on the considered time horizon. In the medium run, the fitted values of the regression are directly interpreted as ERER and the residuals as the misalignment. This is the approach taken in Coudert (1999), where the findings point to overvaluation in the periods preceding the crises in Mexico in 1994 and in South-East Asia in 1997. In the long run, in calculating the fitted value, the permanent components of the fundamentals are substituted to their observed values; the misalignment depends on the residuals of the equation plus the deviation of the fundamentals from their long-run value.

4.2. Misalignment calculations

Although these approaches represent a major improvement over simple PPP-based calculations, they are often still subject to the same kind of critics. The main caveat is that the real exchange rate is assumed to be in equilibrium in average during the period under study. This occurs as long as the regression is performed on a single-country basis and includes an intercept. It is also the case when using a panel-data sample including country fixed effects. The problem of finding the appropriate intercept is very important for it influences all misalignment calculations. In the methods cited above, one can get away with this intercept problem. However, the question is only apparently resolved by fixing a null misalignment on average, whatever the estimation period is.

Here, we overcome this caveat, by two means. Firstly, we use variables in level, instead of using evolutions or indices, as it is commonly done. Relative price levels between countries provide us with RER levels. To be consistent, explicative variables are defined in level too. Secondly, we make panel-data estimations with a common intercept. This allows us to get rid of the benchmark period. In this way, a country may have a non zero average misalignment over the sample. Therefore we estimate an equation of the following type:

$$(2) \qquad Log\left(P_{i,t} / P_{US,t}\right) = \alpha_{i,0} + \alpha_{i,1} Log\left(X_{i,t}\right) + \varepsilon_{i,t}$$

[4] Internal balance refers to the economy operating at full employment and at full capacity output. External balance refers to a sustainable current account position given a country's desired capital position, as a net lender or borrower.

where $P_{i,t}$ stands for the price level of country i ; $X_{i,t}$ is a country i's set of fundamentals in level.

We assume a common regression coefficient:

(3) $$\alpha_{i,1} = \alpha_1 \ , \forall i = 1,..., N$$

We test different specifications for the intercept. However, we prefer a model with a common intercept, for the reasons stated above:

(4) $$\alpha_{i,0} = \alpha_0 \ , \ \forall i = 1,..., N \ .$$

In the estimation of equation (2), we retain one fundamental variable, standing for a Balassa effect. The choice of this variable is justified by many empirical evidences. It appears significant in most papers on emerging countries equilibrium exchange rates (for a survey see Edwards, 1999). Here we proxy it by PPP GDP per capita. Therefore, the estimated equation is the following:

(5) $$Log\left(P_{i,t} / P_{US,t}\right) = \alpha_0 + \alpha_1 \, Log\left(GDP_{i,t} / GDP_{US,t}\right) + \varepsilon_{i,t}$$

where $P_{i,t}$ stands for the price level of country i; $GDP_{i,t}$ is the PPP GDP per capita of country i.

The analysis is carried out on the same sample than in section 3, which is an unbalanced data set on the period 1973-2000 with 152 countries. Price and GDP data are calculated from the CEPII-CHELEM database. The results are presented in Table 7.

Table 7: Estimation results

Model	TOTAL estimates (Common intercept)	BETWEEN estimates	WITHIN estimates	VARIANCE COMPONENTS estimates
GDP per capita relative to the US	0.262 (32.86)	0.236 (8.15)	0.468 (16.90)	0.343 (18.36)
Constant	3.212 (133.47)	3.216 (37.89)	-	2.929 (50.32)
F-test (country dummies)			44.38	
Hausman test				37.29
R-squared	0.27	0.22	0.85	0.27

t-statistics are in parentheses. The Hausman test is χ^2 test for the significance of random effects (against fixed effects). The F-test refers to the significance of country dummies.

The GDP per capita coefficient is highly significant in all specifications; its value is relatively stable across the different models (total, within, between, random effects). The random effects model performs poorly, as shown by the Hausman test. Fixed effects could be taken up on the basis of the F-test. However, we prefer not to retain this model as it relies on an assumption of a null misalignment on average for each country of the sample. Therefore we calculate misalignments as the residuals of the first specification (total estimates).

4.3. Misalignments according to the exchange rate regime

We now compare the RER misalignments across the three considered exchange rate regimes, by using the LYS classification. We expect to find that overvaluation is more likely in pegged exchange rate regimes. As above, we split the sample, by distinguishing countries with low inflation and countries with high inflation.

Results show that pegged currencies are more prone to overvaluation (table 8). They are overvalued by 6% on average when taking the whole sample and 4% when dropping high inflation countries. This is consistent with the RER appreciation of pegged currencies, found in section 3. This result is significant at a 99% confidence threshold (table 9) and it remains true, even when leaving out high inflation countries from the sample.

Reversely, floating exchange rates regimes are associated with a 7% undervaluation over the whole sample and a 5% one with a sample excluding high inflation countries. Intermediate regimes lead to even more undervalued currencies by 11% on the whole sample and 7% leaving out high inflation countries.

Table 8: Real exchange rate overvaluation, by category of exchange rate regimes

	Full sample	Pegged	Intermediate	Floating
Full sample	0.00	0.06	-0.11	-0.07
Without high inflation countries (<40%)	0.00	0.04	-0.07	-0.05
High inflation countries (>40%)	-0.17	0.04	-0.22	-0.20

(1) A positive sign indicates currency overvaluation and a minus sign currency under-valuation

Source: LYS, IMF, World Bank, authors' calculations

Table 9: Tests of comparison of means between two categories of EER: Pegged and intermediate and exchange rate versus floating (1)

	Pegged versus floating	p-value	Intermediate versus floating	p-value
Full sample	6.53	*0.00*	-1.80	*0.05*

Without high inflation countries (<40%)	4.44	*0.00*	-0.65	*0.56*
High inflation countries (>40%)	1.78	*0.06*	-0.22	*0.73*

(1) H_0 = mean of X is equal in two sub-samples of pegged ERR (or intermediate) and floating EER.

5. CONCLUSION

This paper studies the empirical behaviour of the exchange rates across the different exchange rate regimes. We use the LYS classification on a large sample of countries over the period 1973-2000. The results allow drawing several conclusions.

Firstly, floating and intermediate exchange rates are characterized with depreciating currencies on average. This feature occurs in nominal as well as in real terms and remains true, even over a sub-sample including only countries with annual inflation rates smaller than 40%.This occurs for bilateral exchange rates versus dollar as well as for effective exchange rates. This behaviour is shown to be significantly different from the pegged exchange rates.

Secondly, pegged currencies are more stable in nominal terms, which is hardly a surprise, because of their definition. However, their real exchange rates have a tendency to appreciate on average. Here again, this behaviour is observed for bilateral exchange rates as well for effective exchange rates. It is evidenced over the whole sample as well when leaving out high inflation countries from the sample.

Thirdly, an other interesting result is that most devaluations in pegged exchange rate regimes occur when the US dollar is appreciating against other currencies of industrial countries. Reversely, pegged currencies are fairly stable, in periods of dollar depreciation.

Fourthly, misalignment calculations using proxies of Balassa effect show that pegged exchange rates are more prone to overvaluation than other regimes. This result is significant over the sample. It is consistent with the finding that current account deficits are greater for those countries.

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