LONG MEMORY AND MEAN REVERSION IN REAL EXCHANGE RATES IN LATIN AMERICA

by

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For and to You, Lord.
Thank You for giving me the time
and health to complete this work.

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Abstract: This paper examines the long-run PPP hypothesis for twelve Latin American real exchange rates (REERs) using fractional integration techniques. The empirical results, applying parametric approaches, provide evidence of mean reversion in the REERs in the cases of Nicaragua, Belize, Costa Rica, Guyana and Paraguay, and lack of it for the remaining seven countries. Employing semiparametric methods the evidence of mean reversion covers the following countries: Belize, Dominican Republic, Ecuador and Mexico. Thus, only for Belize and Guyana we obtain consistent evidence of mean reversion in the real exchange rates. On the other extreme, lack of mean reversion, and thus, lack of PPP is obtained with the two methods in Bolivia, Brazil, Colombia and Venezuela. For the remaining six countries, the results are ambiguous. The results for the PPP theory in Belize and Guyana may show the importance of promoting policies based on exchange rate flexibility and economic liberalization to reach a long-run stability scenario that lead to a greater international competitiveness and a lower external vulnerability.

Key words: Real Exchange Rates, Purchasing Power Parity, Fractional Integration, Long Memory; Mean Reversion.
JEL classification: C12, C22, F31.

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MEMORIA LARGA Y REVERSIÓN A LA MEDIA EN LOS TIPOS DE CAMBIO REAL EN AMÉRICA LATINA

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por

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Resumen: Este trabajo examina la hipótesis de la PPA a largo plazo para doce tipos de cambio reales latinoamericanos (REERs) utilizando técnicas de integración fraccional. Los resultados empíricos, aplicando enfoques paramétricos, evidencian reversión a la media de los REERs en los casos de Nicaragua, Belice, Costa Rica, Guyana y Paraguay, y la falta de ésta para los siete países restantes. Empleando métodos semiparamétricos, la evidencia de reversión a la media abarca los siguientes países: Belice, República Dominicana, Ecuador y México. Así, sólo para Belice y Guyana obtenemos evidencia consistente de reversión a la media en los tipos de cambio reales. En el otro extremo, la falta de reversión a la media, y por lo tanto, la falta de PPA es obtenida con los dos métodos en Bolivia, Brasil, Colombia y Venezuela. Para los seis países restantes, los resultados son ambiguos. Los resultados de la teoría de la PPA en Belice y Guyana pueden mostrar la importancia de promover políticas basadas en la flexibilidad cambiaria y la liberalización económica para alcanzar un escenario de estabilidad a largo plazo que conduzca a una mayor competitividad internacional y a una menor vulnerabilidad externa.

Palabras Clave: Tipos de cambio reales, Paridad del Poder Adquisitivo, Integración fraccional, Memoria larga; Reversión a la media.

Clasificación JEL: C12, C22, F31.

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1. Introduction

The validity of the Purchasing Power Parity (PPP) hypothesis has been one of the issue more debated in the area of international economics not only for its relevance in the determination of the exchange rate (Dornbusch, 1987; Dornbusch and Frankel, 1988; Fraser et al., 1991) but also for its policy implications (Liu, 1992). Initially introduced by M. De Azpilcueta in 1556 and, later, by the contributions of economists like Thornton (1802), Wheatley (1807) and Cassel (1918), the PPP theory suggests that the equilibrium exchange rate between two currencies is given by the ratio of the two countries' relative price levels, domestic and foreign prices, (absolute PPP) or, in a relative version of the PPP, by the countries' relative inflation rates.

Nowadays, it seems to be a widespread consensus that PPP holds in the long run but not in the short-run (Frenkel, 1981; McNown and Wallace, 1989) in spite of the existence of short-run deviations from PPP. Moreover, this hypothesis is considered controversial due to the lack of consistent results, even though, in the last decades, there has been further expansion in this regard. According to Froot and Rogoff (1995), before the decade of 80s, the majority of empirical studies (the stage-one tests) were subject to a little theoretical and econometric development that prevented to distinguish between temporary disturbances to PPP and the long-run real effects, not showing a strong support in favour of this theory (Corbae and Ouliaris, 1988; Enders, 1988). Under the null hypothesis of simple PPP, only were found evidence for a long-run PPP equilibrium in tests based on data from hyperinflationary economies (e.g. Frenkel, 1978). From the 80s, the credibility of these previous works was questioned. The stage-two tests (e.g. Hakkio, 1984, Meese and Rogoff 1988) assume as null that the real exchange rate is non-stationarity (follows a random-walk) against the alternative of PPP

holds in the long-run. Testing the stationarity of individual series is, thus, the first step to examine the validity of the PPP hypothesis and thus, avoid possible spurious results. Nevertheless, this null hypothesis was also questioned (Roll, 1979) as well as the power of the unit root tests respect to the data sets. Finally, Froot and Rogoff (1995) suggest a set of stage-three tests based on cointegration techniques that, despite its growing development in the last years, it seems to offer, again, inconclusive results as in the stage-two tests (Kim, 1990; Fisher and Park, 1991). Focusing on standard cointegration techniques (Engle and Granger, 1987; Johansen, 1988, 1991, 1996; Johansen and Juselius, 1990), and applied on nominal and real exchange rates, we can find different results depending on the econometric methods employed, the frequency of data or the income level of countries, being more scarce the investigations devoted to the least developed countries (LDCs). For these countries and, in particular, for Latin America, we find evidence supporting the PPP hypothesis in Holmes (2008), Divino et al. (2009) and Bahmani-Oskooee et al. (2013) and against it in Bahmani-Oskooee (1993, 1995), Holmes (2001), Breitung and Candelon (2005) and Alba and Papell (2007).

Concerning fractional differentiation, the evidence is even more scarce. Only few studies show long memory properties in Latin America's exchange rates such as Soofi (1998), Alves et al. (2001), Holmes (2002) and Gil-Alana (2008) among others. In connection to these previous works, and applying fractional integration techniques, the present paper tests the REERs in twelve Latin American countries in order to provide empirical evidence for the PPP hypothesis. The contribution of this work is double: On the one hand, we pretend to shed some light about this hypothesis from a fractional integration approach and, on the other hand, fill the gap existing in the literature given that the majority of studies are focused on developed countries.

The remainder of this paper is structured as follows. Section 2 presents a brief review of the PPP literature in Latin American countries. Section 3 describes the methodology employed and Section 4 reports and discusses the empirical results. Lastly, Section 5 concludes the paper.

2. Purchasing Power Parity in Latin America

The empirical studies on the PPP hypothesis in Latin American countries have offered mixed results. On the one hand, we can distinguish a first set of works based on conventional unit root and cointegration tests such as the Dickey and Fuller -ADF- (1979) or Johansen (1988) tests that provide evidence both, supporting the PPP (Mikkelsen´s, 1989; McNown and Wallace's, 1989; Liu, 1992; Mahdavi and Zhou, 1994; Conejo and Shields, 1993) and rejecting it (Bahmani-Oskooee, 1993, 1995). In this sense, Zhou (1997) re-examines Bahmani-Oskooe (1993) and Mahdavi and Zhou's (1994) works, and concludes that the ADFs tests used in these previous investigations are not adequate to identify the order of integration of variables affected by break points, as suggested by Perron (1989), Christiano (1992), Banerjee et al. (1992) and Zivot and Andrews (1992). Nowadays, the findings for the PPP hypothesis seem to be more robust due to the advance in econometrics techniques for panel data. However, these results should be analyzed with caution (Taylor and Sarno, 1998). For instance, in a recent paper, Alba and Papell (2007) examine a sample of 84 developed and developing countries comparing the results of the ADF test with those using the panel data unit root tests suggested by Levin, Lin, and Chu (2002) and Im, Pesaran and Shin (2003). Their results show that tests based on the whole panel do not provide conclusive results about PPP, whereas if the sample is grouped by regions, PPP holds for panels of European and Latin American countries, which confirms Holmes' (2001) results.

However, taking into account possible structural breaks, Breitung and Candelon (2005) find absence of PPP for South and Latin American countries. Recently, Bahmani-Oskooee et al. (2013) test the validity of PPP in fifteen Latin American countries. Using a sequential panel selection method (Chortareas and Kapetanios, 2009) and the panel KSS unit root tests with a Fourier function (Ucar and Omay, 2009) which allows for structural breaks, the authors find strong support in favor of the PPP in the majority of the Latin American countries considered. Similar results are obtained by He et al. (2014) -except for Honduras-, which is, in turn, consistent with Cheng et al. (2008) and Divino et al. (2009), in contrast with Bahmani-Oskooee et al. (2008, 2009) and Lu et al. (2010).

On the other hand, the analysis of the long-run PPP hypothesis from a fractional framework has not been widely addressed in the literature. Most of studies focus on a small sample of developed countries (Cheung, 1993; Cheung and Lai, 1993; Pan and Liu, 1999; Gil-Alana, 2000; Caporale and Gil-Alana, 2004), so it is more difficult to find evidence for LCDs and, in particular, for Latin American countries. Focusing on LDCs, we can point out, for instance, the studies of Masih and Masih (1995) for Taiwan; Chou and Shih (1997) for Asian newly industrialized countries; Soofi (1998) for a selected member of OPEC; Choudhry (1999) for Eastern Europe, or more recently, Caporale and Gil-Alana (2015) for South Africa. Specifically for Latin American countries, we find the work of Alves et al. (2001) that test the PPP in Brazil for historical period 1855-1996. Comparing both fractional and conventional cointegration approaches, their results only provide evidence for the relative PPP in the long-run. Moreover, Holmes (2002) evaluates a sample of thirty LDCs in which it is found that eight countries show mean-reverting real exchange rates (of which three are Latin

American countries -Guatemala, Suriname and Venezuela). Finally, in another paper on fractional integration, Caporale and Gil-Alana (2010) investigate the PPP in seventeen Latin American countries during the monthly period 1970:01 - 2008:05. Using the least-squares I(d) procedure proposed by Gil-Alana (2008) which takes into account possible structural breaks in the series, they do not find support for PPP in the majority of the cases. Only Argentina shows evidence of mean reversion when a single structural break is included. In this paper, we attempt to follow this last work in order to analyze the real exchange rates of twelve Latin American economies from a fractional integrated approach.

3. Econometric Methodology

In this section, we introduce the statistical model of fractional integration on which this article is based on. A general specification for this model is given by the following expression:

$$y_t = \alpha + \beta t + x_t\,; \qquad (1 - L)^d x_t = u_t\,, \quad t = 1, 2, \ldots\,, \tag{1}$$

where y_t is the observed time series, that is, the Latin American REERs, in logs; α and β are the coefficients corresponiding to the intercept and a linear time trend, respectively; x_t is assumed to be a fractional *I(d)* process, being *d* the order of integration which can take any real value*; L* is the standard lag operator; and u_t is the regression residuals, which can be specified under different I(0) modeling assumptions. Regarding this point, we can use both parametric and semiparametric methodologies. When applying parametric methods, we consider first the case of: (i) a white noise process, (and the corresponding results are reported in Table 1); then, we allow for weak autocorrelation, imposing (ii) a seasonal AR(1) model (in Table 2), and (iii) a more general non-parametric form, which is an approximation to ARMA models, using the Bloomfìeld

(1973) exponential spectral model. Using semiparametric methods, we do not need to impose any specific form for the error term u_t in (1), though in this case we need to establish the bandwidth numbers to be used in the estimation (see Table 4).

More in detail, when estimating d with parametric methods, we use the Whittle function in the frequency domain (Dahlhaus, 1989), applying also a Lagrange Multiplier (LM) test developed by Robinson (1994) that is valid for any real value of *d*, including thus nonstationary regions ($d \geq 0.5$). For the semiparametric method, we use a "local" Whittle method, also in the frequency domain (Robinson, 1995). This method requires d to be in the stationary region. Because of this, the estimation results are carried out based on the first differenced data, adding then 1 to the estimated values.

Taking into account that we allow for fractional differentiation, the series not only may be stationary, if $d = 0$ or non-stationary, if $d = 1$, according to a "narrow" definition of stationarity, but also, covariance stationary with long memory and mean reverting behavior, if *d* is any real value belonging to the interval (0, 0.5), or non-stationary but mean reverting, if *d* is a real value on the interval [0.5, 1). Thus, the fractional approach will allow us to expand the conventional analysis, uncovering the long memory and mean-reverting properties of each time series.

4. Data and Empirical Results.

The dataset used for this study are REERs of twelve Latin American economies (Belize, Bolivia, Brazil, Colombia, Costa Rica, Dominican Republic, Ecuador, Guyana, Mexico, Nicaragua, Paraguay, and Venezuela) over the period 1990Q1-2016Q1, quarterly. REER data is based on Consumer Price Index (CPI) and are extracted from the International Financial Statistics (IFS) -International Monetary Fund (IMF)-. In its own

dataset portal, REER is defined as '*the nominal effective exchange rate (a measure of the value of a currency against a weighted average of several foreign currencies) divided by a price deflator or index of costs. An increase in REER implies that exports become more exp*ensive and imports *become cheaper; therefore, an increase indicates a loss in trade competitiveness*'.

The results of fractional integration using parametric techniques are reported across Tables 1-3. For all of them we consider the following cases: i) no deterministic terms, ii) an intercept, and iii) an intercept with a linear time trend.[1]

Table 1: Estimates of *d* and 95% bands for the case of white noise errors

	No Regressors	An intercept	A linear time trend
Belize	0.97 (0.86, 1.14)	**0.99 (0.78, 1.31)**	0.99 (0.77, 1.31)
Bolivia	1.02 (0.92, 1.17)	**1.25 (1.11, 1.45)**	1.25 (1.11, 1.45)
Brazil	0.90 (0.75, 1.13)	**1.03 (0.90, 1.24)**	1.03 (0.90, 1.24)
Colombia	0.90 (0.77, 1.08)	**1.13 (1.00, 1.29)**	1.13 (1.00, 1.29)
Costa Rica	0.97 (0.85, 1.14)	**1.07 (0.93, 1.30)**	1.07 (0.92, 1.31)
Dominican Rep.	0.96 (0.83, 1.14)	**1.46 (1.22, 1.73)**	1.46 (1.22, 1.74)
Ecuador	1.06 (0.94, 1.23)	**1.33 (1.14, 1.57)**	1.33 (1.14, 1.57)
Guyana	0.79 (0.68, 0.95)	**1.03 (0.77, 1.32)**	1.03 (0.83, 1.30)
Mexico	0.94 (0.82, 1.10)	**0.98 (0.83, 1.16)**	0.98 (0.83, 1.16)
Nicaragua	0.89 (0.80, 1.01)	**0.79 (0.44, 0.96)**	0.82 (0.67, 0.96)
Paraguay	1.06 (0.93, 1.26)	**1.04 (0.87, 1.30)**	1.04 (0.88, 1.30)
Venezuela	1.78 (1.69, 1.90)	**1.83 (1.72, 1.97)**	1.83 (1.72, 1.97)

Note*:* In bold, the most appropriate models for the deterministic components

[1] In other words, we impose $\alpha = \beta = 0$ in (1) in case i); α unknown and $\beta = 0$ in (1) in case ii), and both α, β unknown in case iii).

Table 1 refers to the case of white noise errors. Along with the estimates of d we also report the confidence intervals of the non-rejection values of d using Robinson's (1994) parametric approach. The model with an intercept seems to be the most adequate in all cases (marked in bold in the table), that is, there is no need of a time trend in any single case. Focusing on the estimation of *d*, we observe that Nicaragua is the only country showing evidence of mean reversion (*d* is statistically significantly smaller than 1, in the sense that the upper bound in the interval is smaller than 1); for Belize, Brazil, Costa Rica, Guyana, Mexico and Paraguay, the unit root null (*d = 1*) cannot be rejected, while for Bolivia, Colombia, Dominican Republic, Ecuador and Venezuela it is found statistical evidence of *d* significantly above 1.

Table 2: Estimates of d and 95% bands for the case of seasonal AR(1) errors

	No Regressors	An intercept	A linear time trend
Belize	0.95 (0.65, 1.14)	**0.99 (0.78, 1.29)**	0.99 (0.77, 1.29)
Bolivia	0.96 (0.77, 1.14)	**1.25 (1.11, 1.46)**	1.25 (1.11, 1.46)
Brazil	0.91 (0.76, 1.11)	**1.04 (0.89, 1.24)**	1.04 (0.89, 1.24)
Colombia	0.90 (0.73, 1.08)	**1.11 (0.97, 1.29)**	1.11 (0.97, 1.29)
Costa Rica	0.99 (0.85, 1.15)	**1.08 (0.95, 1.29)**	1.08 (0.95, 1.29)
Dominican Rep.	0.98 (0.83, 1.15)	**1.41 (1.22, 1.67)**	1.41 (1.22, 1.68)
Ecuador	1.05 (0.91, 1.22)	**1.33 (1.15, 1.57)**	1.33 (1.15, 1.58)
Guyana	0.77 (0.60, 0.94)	**1.03 (0.77, 1.32)**	1.03 (0.85, 1.30)
Mexico	0.93 (0.77, 1.10)	**0.98 (0.83, 1.16)**	0.98 (0.83, 1.17)
Nicaragua	0.87 (0.63, 1.03)	0.57 (0.44, 0.96)	**0.66 (0.41, 0.95)**
Paraguay	1.07 (0.91, 1.26)	**1.03 (0.87, 1.30)**	1.03 (0.87, 1.28)
Venezuela	1.74 (1.62, 1.87)	**1.80 (1.72, 1.97)**	1.80 (1.67, 1.96)

Note*:* In bold, the most appropriate models for the deterministic components

Table 2 presents the results for seasonal AR(1) errors.[2] A time trend is only required for Nicaragua, country that also presents some evidence of mean reversion (d < 1). (Note that the interval excludes the unit root case, $d = 1$). For Belize and Mexico, though the estimates of d are smaller than 1, the unit root null hypothesis ($d = 1$) cannot be rejected. This hypothesis cannot be either rejected for Brazil, Colombia, Costa Rica, Guyana and Paraguay. For the remaining countries (Bolivia, Dominican Rep., Ecuador and Venezuela) the results are very similar to those reported in Table 1.

Table 3: Estimates of d and 95% for the case of autocorrelated (Bloomfield) errors

	No Regressors	An intercept	A linear time trend
Belize	0.91 (0.71, 1.16)	0.50 (0.37, 0.67)	**0.34 (0.12, 0.63)**
Bolivia	1.03 (0.85, 1.24)	1.00 (0.79, 1.26)	**1.00 (0.80, 1.25)**
Brazil	0.62 (0.42, 0.90)	**0.73 (0.48, 1.01)**	0.75 (0.53, 1.01)
Colombia	0.73 (0.51, 0.98)	**1.00 (0.73, 1.27)**	1.00 (0.74, 1.27)
Costa Rica	0.89 (0.70, 1.15)	0.78 (0.64, 0.96)	**0.75 (0.58, 0.95)**
Dominican Rep.	0.87 (0.63, 1.22)	0.67 (0.33, 1.41)	**0.68 (0.27, 1.43)**
Ecuador	0.97 (0.74, 1.25)	0.69 (0.31, 1.17)	**0.72 (0.37, 1.17)**
Guyana	0.78 (0.57, 1.06)	0.57 (0.38, 0.97)	**0.67 (0.45, 0.99)**
Mexico	0.87 (0.60, 1.17)	**0.72 (0.39, 1.19)**	0.72 (0.39, 1.20)
Nicaragua	**1.18 (0.94, 1.47)**	1.08 (0.77, 1.43)	1.08 (0.76, 1.42)
Paraguay	0.87 (0.69, 1.12)	0.77 (0.62, 1.00)	**0.76 (0.61, 0.99)**
Venezuela	2.04 (1.72, 2.21)	**1.86 (1.47, 2.12)**	1.86 (1.39, 2.12)

Note*:* In bold, the most appropriate models for the deterministic components

[2] Though the data are seasonally adjusted, based on its quarterly nature we allow for the model: $u_t = \delta u_{t-1} + \varepsilon_t$, with white noise ε_t.

In Table 3, the errors are assumed to follow the Bloomfield (1973) exponential spectral model. This approach is interesting in that it does not impose a specified model on u_t but approximate highly parameterized ARMA structures The empirical results show that the time trend is now required in many cases (Belize, Bolivia, Costa Rica, Dominican Rep., Ecuador, Guyana and Paraguay). For the remaining countries (Brazil, Colombia, Mexico and Venezuela), an intercept seems to be sufficient. It is found evidence of mean reversion and thus, transitory shocks ($d < 1$) in the cases of Belize, Costa Rica, Guyana and Paraguay. On the other hand, evidence of unit roots ($d = 1$) is obtained for Bolivia, Brazil, Colombia, Dominican Republic, Ecuador, Mexico and Nicaragua; finally, evidence of $d > 1$ is obtained only for Venezuela. Thus, we observe that the results are very sensitive to the specification of the error term, and mean reversion is found in the case of Nicaragua with white noise and seasonal AR errors, and for Belize, Costa Rica, Guyana and Paraguay with Bloomfield-type autocorrelated disturbances.

Due to the disparity of the results depending on the specification of the error term, u_t, we also conduct a semiparametric approach, in Table 4 for different bandwidth values. The choice of the bandwidth is still an unresolved issue in most of the semiparametric methods of fractional integration. We have presented values for m = 5, 6, 7, … 15. This table shows evidence of mean reversion in the cases of Belize, Dominican Rep., Ecuador, Guyana and Mexico.

Table 4: Estimates of *d* based on a semiparametric approach

m	5	6	7	8	9	10	11	12	13	14	15
Belize	0.840	0.683	**0.645**	**0.589**	**0.605**	**0.647**	**0.659**	**0.690**	**0.744**	**0.768**	**0.705**
Bolivia	1.283	1.500	1.427	1.119	1.192	1.284	1.311	1.080	1.142	1.163	1.176
Brazil	1.500	1.238	1.402	1.286	1.410	1.318	1.217	1.275	1.171	1.075	1.064
Colombia	1.469	1.500	1.500	1.272	1.304	1.132	1.207	1.135	1.180	1.194	1.198
Costa Rica	1.500	1.196	1.118	1.143	0.961	0.894	0.890	0.911	0.928	0.966	0.994
Dom. Rep.	**0.244**	**0.132**	**0.177**	**0.184**	**0.292**	**0.312**	**0.388**	**0.421**	**0.492**	**0.500**	**0.500**
Ecuador	**0.600**	**0.536**	**0.500**	**0.624**	**0.693**	0.762	0.802	0.841	0.927	0.978	1.059
Guyana	1.104	0.741	**0.680**	**0.641**	**0.667**	**0.721**	0.785	0.795	0.804	0.827	0.803
Mexico	**0.161**	**0.181**	**0.355**	**0.433**	**0.464**	**0.587**	**0.655**	**0.757**	0.835	0.868	0.920
Nicaragua	1.133	1.167	1.179	1.319	1.332	1.250	1.323	1.378	1.418	1.469	1.500
Paraguay	1.134	1.105	1.155	0.992	0.951	0.932	0.928	0.894	0.897	0.937	0.866
Venezuela	1.099	1.188	1.182	1.215	1.217	1.279	1.322	1.380	1.384	1.338	1.329
Lower 5%	0.632	0.664	0.689	0.709	0.725	0.739	0.752	0.762	0.771	0.780	0.787
Upper 5%	1.367	1.335	1.310	1.290	1.274	1.260	1,247	1.237	1.228	1,219	1.212

Note: In bold, evidence of mean reversion at the 5% level.

5. Summary and Conclusions

The long memory and mean-reverting properties of twelve Latin American real exchange rate series has been examined in this paper using both parametric and semiparametric fractional integration techniques. From a parametric approach, and modelling the errors as a white noise or a seasonal AR(1) process, evidence of mean reversion is found only for the case of Nicaragua ($d < 1$). However, allowing for a more general non-parametric autocorrelated structure, using the exponential spectral approach of Bloomfield (1973), the results reveal: i) mean reversion in Belize, Costa Rica, Guyana and Paraguay; ii) unit roots ($d = 1$) in Bolivia, Brazil, Colombia, Dominican Republic., Ecuador, Mexico and Nicaragua; and iii) an order of integration higher than 1 ($d > 1$) for Venezuela. Due to the disparity of the results with the parametric methods,

we also employ a semiparametric approach (Robinson, 1995), and signs of mean reversion were obtained in the cases of Belize and Guyana -which is consistent with results obtained by applying Bloomfield (1973) errors-, as well as, in Dominican Republic, Ecuador and Mexico.

Thus, as an overall conclusion, we can say that only for Belize and Guyana we obtain consistent evidence of mean reversion in the real exchange rates using all parametric, semiparametric and even non-parametric techniques, and, on the other extreme, lack of mean reversion, and thus, lack of PPP is confirmed for Bolivia, Brazil, Colombia and Venezuela. For the remaining six countries (Costa Rica, Dominican Republic, Ecuador, Mexico, Nicaragua and Paraguay), the results are ambiguous.

The application of policies geared towards exchange rate flexibility in Guyana may have mitigated the vulnerability of this country to the possible external shocks caused recently by the global financial crisis. Despite all of this, its economy remains being strongly dependent on the oil imports and the prices of a few commodities on which are based its exports, as has pointed out the recent IMF report.[3] In the case of Belize, the real effective exchange rate experimented a gradual depreciation process until 2007 that enabled it to approximate to its equilibrium level. Nevertheless, the application of unsustainable policy mix during crisis period has lead to a moderately overvalued[4], which suggests the needs of promote policies boosting its economic liberalization and the competitiveness.

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