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REMITTANCES IN LATIN AMERICA: TRENDS AND PERSISTENCE

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Abstract

This paper analyses remittances in fifteeen Latin American countries (Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Panama, Dominican Republic, Uruguay and Venezuela) by applying fractional integration methods to World Bank annual data. The start year varies from 1970 in Colombia and Venezuela to 2003 in Uruguay, while the end year is 2022 in all cases except Venezuela, for which it is 2016. The chosen approach provides evidence on trends and persistence in the series under investigation. The results indicate that the effects of shocks to remittances are transitory only in Guatemala and Honduras. This might reflect the rather stable employment and wages of migrant workers from these two countries residing in the US, cultural factors, and the relatively small values and/or low volatility of remittances to these two countries.

Keywords: Remittances; time trends; persistence; fractional integration

JEL Classification: C22, G20

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1. Introduction

Remittances have become increasingly important over time for the Latin American economies, having increased twenty-fold from 1980 to 2004, which has made Latin America their main recipient in the world together with East Asia (Acosta et al., 2006). These money transfers have played a key role in supporting investment and improving education, health and quality of life in this part of the world (Beaton et al., 2017).

The present study provides some new evidence on the behaviour of remittances in Latin America by examining World Bank annual data for fifteen countries in this geographical region, specifically Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Panama, Dominican Republic, Uruguay and Venezuela. The analysis uses fractional integration methods which shed light on the possible presence of trends in the series of interest as well as on their degree of persistence; specifically, the results provide evidence on whether shocks to the series have transitory or permanent effects, which represents crucial information to design appropriate policies aimed at maximising the benefits of these financial flows.

The chosen approach is ideally suited to obtaining such evidence since it is more general and flexible than the classical one based on the dichotomy between I(0) stationary and I(1) non-stationary series. By allowing the differencing parameter d to take any real values (fractional as well as integer ones) it encompasses a much wider range of stochastic processes and provides information on whether or not the series are mean-reverting and the effects of shocks are long-lived.

The layout of the paper is as follows: Section 2 briefly reviews the existing literature on remittances and their economic effects; Section 3 outlines the methods used for the analysis; Section 4 describes the data and presents the empirical findings; Section 5 offers some concluding remarks.

2. Literature Review

There are numerous papers analysing remittances and their economic effects. For example, Rodríguez-Caballero et al. (2021) investigated their connection with the Dutch disease in the case of Latin America, Frisancho and Parrado (2021) the impact on them of the Covid-19 pandemic, Acosta et al. (2006) and Tyburski (2023) their relationship with economic growth, and Beaton et al. (2017) their role as a macroeconomic stabiliser.

More specifically, using Balance of Payments as well as Household Survey data Acosta et al. (2006) found that remittances have a positive impact on economic growth but do not significantly reduce inequality, though they help reduce the number of poor people. Beaton et al. (2017) reported that the effects on growth of migration and remittances in Latin America and the Caribbean depend on the policies being adopted, but remittances generally reduce poverty and inequality. Rodríguez-Caballero et al. (2021) estimated heterogeneous panel data models to examine the Dutch disease in Latin America. They concluded that in some cases remittances cause the currency to appreciate, with a negative impact on growth and productivity.

Frisancho and Parrado (2021) investigated the demand for face-to-face and digital international remittance services, and the frequency with which they are used. Their panel data evidence shows that interest in the types of providers changed as a result of the mobility restrictions during the Covid-19 pandemic. In particular, there was a significant increase in the average number of searches for digital services in 2020 compared to 2019; however, this was short-lived and followed by a return to the previous levels. As for remittances as a whole, there was a drop during the pandemic, but they soon recovered thanks to the digital services component.

Tyburski (2023) estimated error-correction models to investigate the effects of remittances on tax revenues and reported that these tend to be more sizeable in the case of countries with right-wing as opposed to left-wing governments. Nevertheless, it is noteworthy that none of the above mentioned papers analyses either trends or persistence in the remittance time series data, which is instead the focus of the present study. In the following section we briefly describe the technique employed here to examine these two important features of the data.

3. Methodology

For our purposes we use methods based on fractional integration. To understand this concept, let us define a covariance stationary process [u(t), t = 0, ±1, …] as being I(0) (also called a short-memory one), if the infinite sum of its autocovariances is finite. More precisely, assuming that E[u(t)] = μ, and defining γ(u) = E[(u(t)- μ)((u(t+u)- μ)], u(t) is I(0) if:

$$\sum_{u=-\infty}^{u=\infty} |\gamma(u)| < \infty. \quad (1)$$

The simplest I(0) process is the white noise one, which has a constant variance and is not correlated over time, but AutoRegressive Moving Average (ARMA) models also belong to the same class.

Given the above definition, a process [x(t), t = 0, ±1, …] can be said to be integrated of order d or I(d) if it can be expressed as:

$$(1 - B)^d x(t) = u(t), \qquad t = 1,2,\ldots, \quad (2)$$

where L stands for the lag operator, i.e. Lx(t) = x(t-1) and d is a non-integer value. In this context, if d is positive, the sum of the autocorrelations becomes unbounded, i.e.,

$$\sum_{u=-\infty}^{u=\infty} |\gamma(u)| = \infty. \quad (3)$$

The fractional differencing parameter d plays a crucial role. In particular, d = 0 implies short memory, while d > 0 indicates the presence of long memory; further, d < 0.50 implies that the series is stationary while values of d above 0.5 produce non-stationarity; finally, d < 1 indicates mean reversion, with the effects of shocks disappearing in the long run, whilst d ≥1 implies lack of mean reversion and permanent effects of the shocks. Note that this framework is very general and includes the unit root case (Dickey and Fuller, 1979; Phillips and Perron, 1988; Kwiatkowski et al., 1992; Elliott et al., 1996; etc) as a special one corresponding to d = 1.

For non-integer values of d as above, one can use a Binomial expansion in the polynomial in L in (2), such that for any real d,

$$(1-L)^d = \sum_{j=0}^{\infty} \binom{d}{j} (-1)^j L^j = 1 - dL + \frac{(d(d-1))}{2} L^2 ,$$

and equation (2) can be expressed as

$$x(t) = d\, x(t-1) - \frac{(d(d-1))}{2} x(t-2) + \ldots + u(t). \qquad (4)$$

In this context, the differencing parameter d can be interpreted as a measure of the degree of persistence of the series. As the value of d increases, so does the degree of of persistence, which results in a stronger linkage between observations, even if they are far apart in time.

Note that the estimation in the following section is conducted using a simple version of the tests of Robinson (1994), whose functional form can be found in the numerous empirical applications using these tests (see, e.g., Gil-Alana & Robinson, 1997).

4. Data and Results

The primary source of the data is the World Bank website (https://datos.bancomundial.org/indicator/BM.TRF.PWKR.CD.DT), which provides the file "*Workers' remittances and employee compensation*", reported in US dollars. The final series were obtained by adding the values of the remuneration and personal transfers of employees; these amounts are published in the Balance of Payments Manual (sixth edition), at the International Monetary Fund (IMF). We focus only on 15 Latin American countries on the basis of the data availability from these sources.

Table 1 displays some descriptive statistics for the remittance series in logs. Colombia has the longest data span (1970-2022), whilst Uruguay has the shortest (2003-2022). The maximum value ranges between 18.27 for Guatemala and 21.54 for Brazil, while the minimum one ranges between 11.65 for El Salvador and 17.80 for Venezuela. Also, Brazil exhibits the highest mean value (20.22), while Guatemala has the lowest one (16.89). The Brazilian series is also the most volatile one, its standard deviation being equal to 20.35, whilst the Guatemalan one is the least volatile, having a standard deviation equal to 16.69.

Table 1. Descriptive statistics for the logged remittance series

Series	Start year	End year	Maximum value	Minimum value	Mean	Stand. Dev.
Argentina	1978	2022	20.85	16.59	19.72	19.67
Bolivia	1976	2022	19.58	14.40	18.14	18.36
Brazil	1975	2022	21.54	15.42	20.22	20.35
Chile	1980	2022	20.40	14.98	18.81	19.22
Colombia	1970	2022	19.85	16.38	18.68	18.58
Costa Rica	1994	2022	20.15	15.78	19.44	18.94
Ecuador	1976	2022	20.30	14.51	18.74	19.00
El Salvador	1976	2022	19.43	11.65	17.61	19.00
Guatemala	1977	2022	18.27	14.98	16.89	16.69
Haiti	2000	2022	20.40	16.21	19.22	19.11
Honduras	1996	2022	19.66	13.09	18.24	18.64

Panama	1980	2022	20.55	16.59	19.36	19.53
Dom. Rep.	1993	2022	20.68	15.76	19.52	19.64
Uruguay	2003	2022	18.66	14.17	17.81	17.77
Venezuela	1970	2016	20.83	17.80	19.74	19.40

The estimated model is the following one:

$$y(t) = \alpha + \beta t + x(t), \quad (1 - L)^d x(t) = u(t), \qquad (5)$$

where y(t) is the observed time series data; α and β are unknown parameters to be estimated; t is a time trend, L stands for the backshift (lag) operator, and d is the required differencing parameter to make x(t) a stationary I(0) process, where x(t) stands for the integrated regression errors of order d or I(d); this implies that the d-differenced process, u(t), exhibits short memory or is I(0); specifically, we assume that it is a white noise process with zero mean and constant variance.

Table 2 : Estimated order of integration d for each series

Country	No regressors	An intercept	A linear time tren
Argentina	0.92 (0.70, 1.23)	**1.17 (0.88, 1.60)**	1.17 (0.89, 1.60)
Bolivia	0.90 (0.70, 1.19)	0.87 (0.78, 1.03)	**0.75 (0.53, 1.02)**
Brazil	0.90 (0.69, 1.20)	**0.98 (0.81, 1.27)**	0.98 (0.78, 1.27)
Chile	0.89 (0.68, 1.21)	**1,02 (0.85, 1.29)**	1.02 (0.83, 1.29)
Colombia	0.93 (0.75, 1.19)	0.89 (0.62, 1.32)	**0.89 (0.57, 1.32)**
Costa Rica	0.96 (0.69, 1.34)	1.22 (1.02, 1.79)	**1.18 (1.75, 1.89)**
Ecuador	0.92 (0.75, 1.18)	**0.88 (0.73, 1.12)**	0.88 (0.72, 1.12)
El Salvador	0.95 (0.74, 1.25)	**0.90 (0.72, 1.28)**	0.90 (0.69, 1.29)
Guatemala	0.91 (0.71, 1.20)	**0.70 (0.55, 0.96)**	0.70 (0.52, 0.96)
Haiti	0.84 (0.51, 1.28)	0.62 (0.41, 1.47)	**1.02 (0.77, 1.32)**

Honduras	0.69 (0.14, 1.15)	0.59 (0.40, 0.96)	**0.17 (-0.24, 0.94)**
Panama	0.88 (0.66, 1.18)	**1.22 (1.06, 1.46)**	1.22 (1.06, 1.46**)**
Dominican Rep.	0.79 (0.47, 1.28)	0.80 (0.66, 1.09)	**0.68 (0.32, 1.09)**
Uruguay	0.71 (0.43, 1.25)	0.84 (0.62, 1.32)	**0.75 (0.31, 1.30)**
Venezuela	0.86 (0.68, 1.13)	**1.01 (0.73, 1.31)**	1.00 (0.72, 1.31)

Note: The reported values are the estimates of the differencing parameter, d, with the 95% confidence bands in parentheses. The coefficients from the selected specification for each series are in bold.

Table 2 reports the estimates of the differencing parameter d along with the 95% confidence bands for three different model specifications, namely i) without deterministic terms, i.e. imposing $\alpha = \beta = 0$ in (5) (these results are displayed in column 2); ii) with a constant only, i.e., setting $\beta = 0$ in (5) (these results are displayed in column 3); and iii) with a constant and a linear time trend (these results are displayed in column 4). The values in bold are those from the model selected in each case on the basis of the statistical significance of the regressors.

Table 3 shows instead the results from our preferred specification. It can be seen that the coefficient on the time trend is significant and positive in 7 out of the 15 cases examined, namely in Colombia (with $\beta = 0.066$) Bolivia (0.116), Dominican Republic (0.172), Haiti (0.191), Costa Rica (0.196), Honduras (0.197) and Uruguay (0.249). The estimates of the differencing parameter, d, are very heterogeneous across countries. Specifically, its estimated value is 0.17 for Honduras, for which the I(0) null hypothesis cannot be rejected. In the other countries, the estimates of d are positive and significant, and provide evidence of long memory. This parameter is smaller than 1 in the case of Guatemala and Honduras, which implies mean reversion. In the other cases, the I(1) hypothesis cannot be rejected, except for Costa Rica and Panama, where d is equal to 1.18 and 1.22 respectively and significantly higher than 1, since all values in the confidence intervals exceed 1. To sum up, mean reversion, which implies that shocks have transitory effects, is only found in the cases of Honduras and Guatemala.

Table 3: Estimated coefficients in the selected models in Table 2

Country	d (95% band)	Intercept (t-value)	Time trend (t-value)
Argentina	1.17 (0.88, 1.60)	16.494 (65.13)	---
Bolivia	0.75 (0.53, 1.02)	14.242 (85.69)	0.116 (10.54)
Brazil	0.98 (0.81, 1.27)	18.46 (30.45)	---
Chile	1.02 (0.85, 1.29)	18.069 (27.00)	---
Colombia	0.89 (0.57, 1.32)	16.311 (43.44)	0.066 (1.80)
Costa Rica	1.18 (1.75, 1.89)	15.362 (53.60)	0.196 (2.14)
Ecuador	0.88 (0.73, 1.12)	18.023 (21.66)	---
El Salvador	0.90 (0.72, 1.28)	15.746 (18.58)	---
Guatemala	0.70 (0.55, 0.96)	15.969 (45.14)	---
Haiti	1.02 (0.77, 1.32)	16.014 (86.36)	0.191 (4.68)
Honduras	0.17 (-0.24, 0.94)	14.197 (24.25)	0.197 (5.61)
Panama	1.22 (1.06, 1.46)	17.455 (75.73)	---
Dominican Rep.	0.68 (0.32, 1.09)	15.733 (38.76)	0.172 (4.23)
Uruguay	0.75 (0.31, 1.30)	13.927 (29.02)	0.249 (4.16)
Venezuela	1.01 (0.73, 1.31)	18.281 (38.73)	---

Note: The values in columns 3 and 4 are the constant and the time trend coefficients respectively, with their t-values reported in parentheses. A t-value higher than 1.64 indicates significance at the 5% level.

5. Conclusions

This paper analyses the stochastic behaviour of remittances in fifteen Latin Amrican countries using fractional integration methods that provide evidence on possible trends and the degree of persistence of the series as well as on the effects (transitory or permanente) of shocks. The results indicate that mean reversion occurs only in Guatemala and Honduras (and at a faster rate in the latter), whilst in all other countries shocks have permanent effects. It is noteworthy that both Guatemala and Honduras heavily depend on remittances and thus one would expect fluctuations in these series to have a greater macroeconomic impact than elsewhere. The finding that they are both mean-reverting might reflect the fact that employment and wages of migrant workers from these two countries residing in the US appear to be relatively stable in comparison to those for other Latin American countries – this could explain why the effects of shocks are not long-lived and thus have a limited wider impact. Other factors that might account for the mean reversion found in these two countries but not in the others are of a cultural nature, reflecting the high percentage in Guatemala and Honduras of indigenous people who tend to have closer family ties. It is also noteworthy that mean reversion is more likely to occur in the case of variables with relatively small values (Smyth, 2013), Honduras and Guatemala displaying the lowest ones for remittances in our sample (see Table 1), and also in the case of less volatile series, (Smyth and Narayan, 2015), Guatemala exhibiting the lowest standard deviation in the sample (see again Table 1).

Our analysis could be extended to other regions of the world, such as Africa or Southeast Asia, where remittances are very important to explain economic growth. Other issues, such as non-linear trends and structural breaks could also be examined. These two issues are very relevant in the context of fractional integration (Granger and Hyung, 2001, Diebold and Inoue, 2001) and will be examined in future papers using Chebyshev polynomials in time (Cuestas and Gil-Alana, 2016), Fourier functions in time (Gil-Alana and Yaya, 2001) or neural networks (Yaya et al., 2001).

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