

# Long Run Macroeconomic Determinants of Remittance Flows to Jamaica 1983 - 1999

by

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## **I. Introduction**

This study is part of a larger programme of research that examines Diasporic flows to the Caribbean.<sup>1</sup> In this paper we examine the macroeconomic determinants of remittance flows to Jamaica using quarterly data over the period 1983.1 to 1999.4. Our objective is to determine the long run relationship between remittances and various factors, in both the home and major host countries. The host countries of interest are the United States, Britain and Canada, which have the largest concentration of Jamaican migrants.

The variables used in the modelling exercise are similar to those used by El-Saaka and McNabb in their 1999 study of the determinants of remittances for Egypt. However, in this analysis, a more robust econometric technique is applied. Initially we employed the Johansen (1988, 1991) co-integration technique to discover a unique co-integrating vector among the variables of interest. Our results produced a negative relationship between per capita remittances and per capita income in the host countries. This is considered to be counter-intuitive, as the growth in foreign income should stimulate higher remittance flows. We concluded that this inverse relationship resulted from the endogeneity of per capita domestic income. Consequently, an instrumental variable technique was employed to estimate the coefficients. In addition, the methodology of Pesaran and Shin (1995) was used to generate long run estimates in order to determine whether the results differed from those obtained in the Johansen procedure. The paper highlights the danger of using co-integration techniques in the face of endogeneity of the domestic income variable, and the superiority of instrumental variables to solve this problem. Our results are broadly in line with the

<sup>1</sup> In our larger study we are interested in all flows that result from transactions and transfers between the Caribbean and its diaspora and not just official cash remittances

existing literature on remittances save that we find evidence for a significant real investment component, whereas much of the literature focuses on consumption.

The paper is divided into seven parts. Part 2 looks at the definition of remittances used in the context of the paper. Part 3 motivates the paper by describing the importance of remittances to the Jamaican economy. Part 4 carries out a review of the macro literature on remittances. Part 5 looks at the model formulation and unit root testing. Part 6 reports the estimation and results, and the final section concludes the paper.

## **II. Remittances: Discussion of applied definition**

Remittances can be broadly defined as “transfers made from earnings and/or accumulated stock of wealth by individuals who are residents in a foreign country on a temporary or permanent basis . . . . to their countries of origin for dependent support, investment or any other purpose” Bascom (1990). It is our intention to assess the determinants of remittances as broadly defined above but we have been constrained by existing data sources. Our model therefore seeks to explain remittance flows as defined by the Bank of Jamaica (BOJ). The BOJ defines remittances to include migrant worker transfers, alimony and other support maintenance, pensions and gifts in cash or kind. The BOJ’s definition does not include funds transferred to bank accounts held by migrants in the home country. These transactions are included in the Financial Account of the balance of payments. Similarly, mortgage and insurance payments are not counted as remittances but are included in the “Other Services” account of the balance of payments. Remittances are generally under-reported and presently, data collection on in-kind remittances is inadequate.

### III. Importance of Remittances to Jamaica since 1983

Remittances are a significant source of foreign exchange to the Jamaican economy. In 1983, total recorded remittances were US\$128.5 million, rising to US\$704.4 million in 1999. In 2002, this figure increased further to US\$1.2 billion. The annual average growth rate of recorded remittances for the period 1983 and 1999 was 11.2 %, while in the sub-periods 1983-1991, 1991 - 1995 and 1995 -1999, the rates were 4.5%, 35.2%, and 3.6% respectively. The average for the period was influenced by the dramatic increase in remittances in the second sub-period. This period saw a number of institutional changes in the economy and among these were the deregulation of the financial sector, the rapid expansion in the number of branches of remittance transfer companies, an increase in the number of license foreign exchange dealers, and the establishment of the right of Jamaicans to hold foreign exchange accounts. These factors may have resulted in the dramatic increase in remittances recorded in the official statistics. Figure 1 shows the recorded remittance per capita over the period 1983 to 1999. In the graph we can observe three distinct periods of growth.

Table 1 examines the share of recorded remittances as a ratio of selected macroeconomic indicators over the period 1983 to 1999. Remittances as share of GDP increased steadily from 3.5% in 1983 to 9.5% in 1999. Remittances as a percentage of export of goods was 17.8% in 1983 and increased considerably to 56.7% in 1999, reflecting the growth in remittances as well as a fall in exports. A similar pattern is obtained for remittances as share of exports of goods and services. Finally, the value of remittances as a share of imported goods and services was 7% in 1983 and rose to 18.3% in 1999.

#### IV. Review of the Literature

The literature on remittances tends to be characterised by both microeconomic and macroeconomic approaches (See Rapoport and Docquier, 2003). At the micro analytic level, the emphasis usually is on an individual's motivation to remit. The general motivations, which have been highlighted are the altruistic motive (Lucas and Stark, 1985), the self-interest motive, and the implicit family contract or loan repayment.<sup>2</sup> (See Piorine, 1997 and Brown, 1997, Glytos, 1988) and the implicit family contract as co-insurance (Massey and Parado, 1998, Solimano, 2003).

The macro economic literature has utilized many of these motivations to hypothesize the relationships that might explain the growth in remittances. The various motives also determine the uses to which remittances are put. As a result, while remittances can have a strong positive impact on the current account of the home country's balance of payments, they may also have adverse economic effects. On the positive side, remittances contribute to household income and may help to alleviate poverty. National income may also be enhanced due to increased foreign exchange inflows and the availability of an increased pool of national savings. It has been suggested that these flow help to lift the balance of payments constraint which many remittance receiving countries face.

On the negative side remittances may lead to inflation through an increase in the money supply and an increase in demand beyond the home country's capacity to meet this

<sup>2</sup> (See Durand et al 1996, Haderi et al 1999, Djajic 1986, Quibaria 1996, Russell 1986, Taylor et al 1996, Alleyne and Francis, 2003).

demand domestically. The balance of payments may also be adversely affected as a result of increased import demand due to the expanded money supply and any demonstration effect, which may impact on those households not in receipt of remittances. Some authors have pointed to problems of the so-called Dutch disease (See Buch et al 2002). The consumption gap between households that receive remittances and those that do not can also be a significant contributor to income inequality. Remittances may create a dependency syndrome among the recipient population, with attendant labour market effects.

Among the studies that have examined the determinants of remittances and or transfers at the macro-economic level are Swami, (1981), El-Saaka and McNaab, (1999), Campbell, 2003 and Haque et al 1994. Typical of most of these analyses are single equation models, which attempt to identify the determinants of remittances. In the El-Saaka and McNaab, 1999 study, it was concluded that the key variables are: economic activity in the host and home countries, domestic prices, the unofficial exchange rate premium, and the differential between home and host countries interest rates. The expectation is that there is a positive relationship between foreign income and remittances. In the case of domestic income, the relationship could be positive or negative. If a more depressed income in the receiving or home country were accompanied by a larger flow of remittances the relationship would be negative. This assumption is in line with the altruistic motive of the remitter, who would be interested in maintaining the welfare of the family back home. But an increase in the income of the home country may be accompanied by an increase in the value of remittances transferred. This may reflect an

real investment motive as rise in income may lead to optimism about the performance of the domestic economy. Both types of relationships have been reported in the literature (See Hysenbegasi and Pozo, 2002).

The relationship between domestic price level and remittance flows is also uncertain. High rates of domestic inflation may signal that domestic economic policy lacks credibility. Remitters who are encouraged by the investment motive may withhold remittances, while remitters who are motivated by altruism may wish to send greater values to maintain the welfare of households in the receiving country.

It is expected that a higher unofficial exchange rate premium will be accompanied by lower values of remittances recorded as remitters may be more inclined to transfer funds through unofficial channels. The difference between the domestic and foreign interest rates is used to capture portfolio effects. In the El-Saaka and McNabb study, this relationship was negative implying that remitters would be better off keeping their funds in the host country.

## **V. Model Formulation and Unit Root Testing**

Our model follows, with modification, the approach used in the El-Saaka and McNabb study. We use a weighted per capita GDP for foreign income whereas they use an unweighted average of foreign wages. In addition we use domestic price level whereas they use inflation rate. Variables are specified in terms of logs as follows:

$$LRP_t = f(LFY_t, LDY_t, LID_t, LEP_t, LDCPI_t) \dots\dots\dots (1)$$

where  $LRP_t$  is the remittances per capita,  $LFY_t$  is foreign per capita income weighted by the average share of remittances from the USA, UK and the Canada.<sup>3</sup> The variable  $LDY_t$  is the domestic per capita income;  $LEP_t$  refers to the unofficial exchange rate premium, which is defined as the difference between the unofficial and official exchange rates.  $LDCPI_t$  is the domestic price level. The variables were tested for unit roots and the results are reported in Table 2. The Augmented Dickey-Fuller tests for both an intercept (I,0) and an intercept and trend (I,T), accept the null hypothesis that the series are all I(1) or have unit roots.

The Johansen procedure was employed to test for a single co-integration vector and the variables that exhibit a long run relationship are the variables set out in equation (2).

$$LRP_t = \alpha_0 + \alpha_1 LFY_t + \alpha_2 LDY_t + \alpha_3 LIRD_t + DUM0 + \varepsilon_t \dots (2)$$

The dummy variable  $DUM0$  is used to capture the increase in recorded remittances after 1991.<sup>4</sup> As noted above, we take the view that there was a significant change in the institutional arrangements and hence the value of remittances recorded.

Table 3 reports the co-integration test using the Johansen procedure. Based on the Trace and Max-Eigenvalue statistics we accept that there is a single vector at the 1 % level of significance. The long run equation, however, gave a negative sign on the coefficient for the foreign income variable and further tests showed that the variable  $LDY_t$  in the

<sup>3</sup> We did not have weights for all years, we therefore used the average weights for the years available 1997-2001.

<sup>4</sup>  $DUM0 = 0$  before 1991 and 1 after.



restricted VAR was not weakly exogenous. This test was conducted by imposing zero restrictions on the Vector Autoregressive model (VAR) for the change in the variables  $LFY_t$  and  $LID_t$ . The null hypothesis was accepted with a computed  $\chi^2_{(2)}$  of 1.45.<sup>5</sup> When  $LDY_t$  was added, the value rose to  $\chi^2_{(3)} = 52.5$  strongly rejecting the hypothesis that this variable is weakly exogenous at the 1% level of significance. This may have led to inconsistent estimates and may account for the negative sign on the coefficient for  $LFY_t$ . As a result, the methods of instrumental variables and the autoregressive distributive lag model (ARDL) procedure suggested by Pesaran and Shin (1995) was then employed to estimate the coefficients.

## VI. Estimation and Results

Instrumental variables were employed to remove the inconsistency caused by the influence of  $LDY_t$  on the residuals, with lagged dependent variables used as instruments. The second strategy was to employ the ARDL suggested by Pesaran and Shin to estimate the long run relationship among a set of variables.<sup>6</sup> In this approach, if the residuals are uncorrelated, the OLS estimators of the short run parameters are  $\sqrt{T}$  – consistent. This

<sup>5</sup> These results can be obtained from the authors on request.

<sup>6</sup> Pesaran and Shin considered the general ARDL(p,q) model as follows:

$$y_t = \lambda_0 + \lambda_1 t + \sum_{i=1}^p \Phi_i y_{t-i} + \beta' x_t + \sum_{i=0}^{q-1} \beta_i' \Delta x_{t-i} + u_t, \text{ where } x_t \text{ is } k \times 1 \text{ vector of } I(1)$$

$$\Delta x_t = L_1 \Delta x_{t-1} + L_2 \Delta x_{t-2} + \dots + L_p \Delta x_{t-p} + \varepsilon_t$$

variables that are not co-integrated,  $u_t$  and  $\varepsilon_t$  are serially uncorrelated disturbances with zero mean and constant variances.  $L_i$  are  $k \times k$  coefficient matrices such that the vector autoregressive process in  $\Delta x$  is stable. The roots of the polynomial  $1 - \sum_{i=1}^p \Phi_i z^i = 0$  are outside the unit circle and there is a stable long run relationship between  $x, y$  and  $t$ .

assumption will be violated in the face of endogeneity of LDY. In addition, the ARDL-based estimators of the long-run coefficients are super-consistent and standard asymptotic theory applies. Pesaran and Shin consider the general ARDL model and provide tables to test for a long run relationship among variables if they are I(1). The procedure is done in two steps. The first is to run an OLS regression in differences, regressing  $LRP_t$  on a constant and  $LRP_{t-i}, LDY_{t-i}, LFY_{t-i}, LID_{t-i}$ , where  $i = 1, \dots, 4$ , where 4 was the maximum lag length employed. The Akaike Information Criterion (AIC) was used to determine the maximum lag length. A variable addition F-test was then employed to determine the significance of the level variables in the regression. The F values for the regression in first difference with  $LRP_t$  and  $LDY_t$ , are 6.71 and 6.13 respectively, well above the critical values of 4.07 needed to reject the long run relationship at the 5 % level. The values for foreign income and interest rate differentials are 0.69 and 3.51, which are below the critical value at the 5% level of significance. These results also reject the weak exogeneity assumption for the variable  $LDY_t$ . In the second stage the ARDL model in levels plus a dummy variable to capture the increase in remittances after 1991, was estimated with optimum lag length and the results are reported in Table 4 along with the instrumental variable results.

The coefficients for the instrumental variables model are all significant except for the interest rate differential. The foreign income has the expected sign while the positive sign on domestic income suggests that remittances may have a real investment component. El-Saaka and McNabb also report positive coefficients for current and lagged domestic income to be positive but the results obtained were insignificant. While

that study did not employ co-integration techniques, the insignificance of domestic income may reflect simultaneous equation bias.<sup>7</sup> The coefficient on the interest rate differential is positive, which is in line with a portfolio investment motive, but this variable is insignificant and approximately equal to zero. In terms of model diagnostics, the  $\overline{GR}^2$  is fairly large. The model passes Sargan's mis-specification test. The errors are normal although there seems to be some heteroscedasticity.

The long run estimate from the ARDL model has a negative sign on foreign income (LFY) and the sign on the interest rate differentials is also negative. We prefer the instrumental variable approach because the estimates are efficient and are in line with a-priori expectations. The interesting result is that remittances seem to have a real investment component relative to domestic income rather than a pure consumption relationship.

## VII. Conclusion

The results of our analysis suggest a number of preliminary conclusions. The first is that in modelling remittance flows there may be endogeneity with respect to domestic per capita income, in which case domestic income may best be modelled explicitly in a simultaneous equation context. Within the single equation framework instrumental variable offers a useful alternative. Secondly, the standard co-integration techniques while finding a single co-integration vector among the I(1) variables of interest, does not seem to provide consistent estimates. The procedure set out by Pesaran and Shin also

<sup>7</sup> Campbell tested for co-integration and found a positive sign on domestic income in both the long run and the error correction model. However, he used the Engle and Granger 2 step procedure, which may exhibit problems in the multivariate case.

appears inadequate, in particular the sign of the coefficient for foreign income becomes negative, very large and significant all going against a priori expectations.

The results of our preferred model suggest that remittances flows involve a real investment element and are not wholly driven by a consumption or altruism. This is manifest in the positive coefficient on domestic income. In contrast the evidence for a portfolio investment motive is weak as the coefficient on the interest differential is not at all significant and approximately equal to zero although positive. The result for foreign income is as expected as is the case for the dummy variable. The latter provides evidence for the view that there were institutional factors at work in the 1990s that caused a greater inflow of remittances into the official system.

In a revised version of this paper we hope actually model these institutional changes possibly by introducing a variable corresponding to the growth in the number of agencies involved in the remittance transfers. We also plan to use a longer data series, refine our use of weights, and consider the use of other variables that have been referred to in the literature.

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**Table 1 - Remittances as a Percentage of Selected Indicators**

	1983	1991	1992	1999
Remit/GDP	3.54	4.54	7.88	9.55
Remit/Exports (g)	17.82	16.99	27.17	56.79
Remit/Export (g/s)	9.46	8.89	12.95	22.75
Remit/Imports (g)	8.73	10.67	17.11	24.24
Remit/Imports (g/s)	7.16	8.69	12.76	18.37

g/s is goods and services

Source: IFS and CARICOM Secretariat

**Table 2. Tests for Unit Roots using the ADF(j)**

Variables	ADF lags and Values	(I,T) intercept and or trend	Minimum Akaike
LRP	ADF(3) -0.6335	(I,0)	74.5
	ADF(3) -2.462	(I,T)	76.0
LFY	ADF(3) -2.551	(I,0)	230.0
	ADF(3) -2.843	(I,T)	225.6
LDY	ADF(3) -1.043	(I,0)	69.8
	ADF(3) -3.049	(I,T)	73.3
LID	ADF(1) -2.524	(I,0)	25.1
	ADF(4) -1.767	(I,T)	21.6
LDCPI	ADF(5) -0.796	(I,0)	151.9
	ADF(5) -1.63	(I,T)	152.1
LEP	ADF(3) -1.79	(I,0)	97.8
	ADF(3) -2.15	(I,T)	97.6

The critical vales for the test for intercept only (I,0)is -2.902 and for Intercept and trend (I,T) is -3.475. Similar findings were made from the Phillips- Perron test.

**Table 3: Johansen Procedure for Co-integration**

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	5 Percent Critical Value	1 Percent Critical Value
None **	0.481081	64.68854	47.21	54.46
At most 1	0.269365	23.36008	29.68	35.65
At most 2	0.049471	3.588115	15.41	20.04
At most 3	0.006198	0.391687	3.76	6.65

\*(\*\*) denotes rejection of the hypothesis at the 5%(1%) level  
Trace test indicates 1 cointegrating equation(s) at both 5% and 1% levels

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	5 Percent Critical Value	1 Percent Critical Value
None **	0.481081	41.32846	27.07	32.24
At most 1	0.269365	19.77197	20.97	25.52
At most 2	0.049471	3.196428	14.07	18.63
At most 3	0.006198	0.391687	3.76	6.65

\*(\*\*) denotes rejection of the hypothesis at the 5%(1%) level  
Max-eigenvalue test indicates 1 cointegrating equation(s) at both 5% and 1% levels

**Table 4 – Results for Instrumental Variables (IV) and Pesaran and Shin (PS) Procedures.**

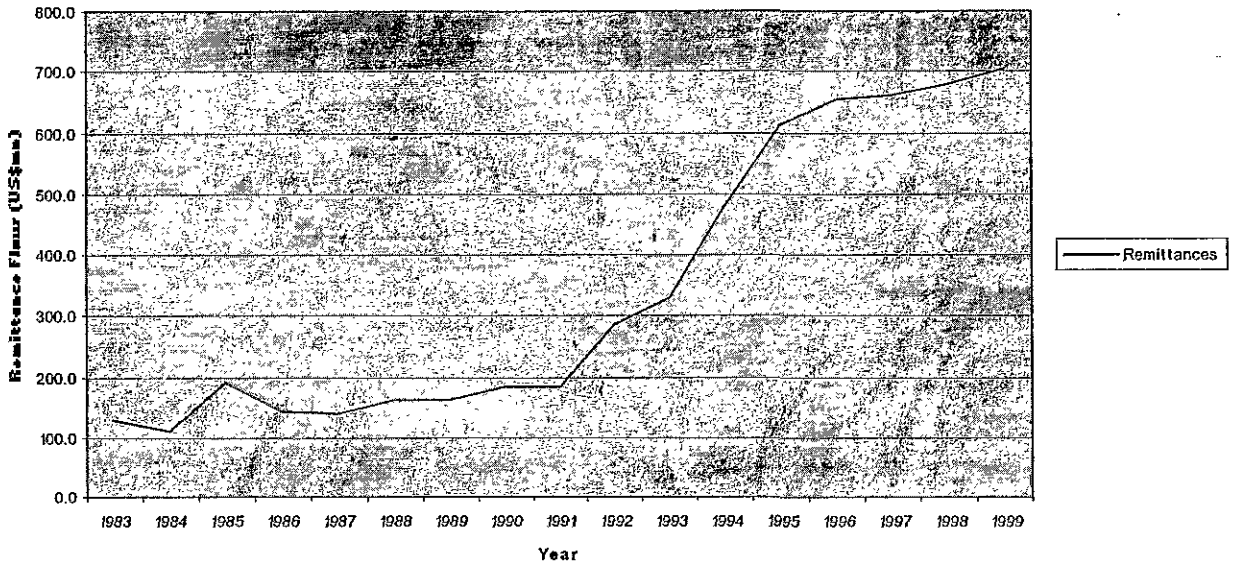
	IV	PS
LFY	0.77 (2.50)	-5.26 (-2.45)
LDY	0.66 (4.79)	3.23 (3.51)
LID	0.01 (0.14)	-0.45 (-0.20)
DUM0	0.48 (7.05)	1.69 (3.85)

The IV diagnostics are as follows :  $\overline{GR}^2 = 0.89$ , Sargan's CHSQ (6) = 8.72, Normal (2) = 2.6, Het (1) = 4.6



**Appendix 1 – Graph Showing Remittances Flows to Jamaica over the period 1983 – 1999.**

**Remittance Flows to Jamaica 1983 - 1999**



## Appendix 2: Data Description

The log of the following variables are used in the modelling exercise:

- Remittances per capita: total recorded cash remittances divided by the population.
- Nominal Per capita domestic income: domestic GDP divided by the population.
- Domestic price level
- Nominal per capita foreign weighted income: nominal foreign income for each of the host countries was divided by their respective population, and was then weighted by the average share of remittances that came from each respective country over the time period for which data was available.
- Exchange rate premium: the difference between the unofficial and official exchange rates.
- Interest rate differential: the difference between the Jamaica's treasury bill rates and the average of the host countries treasury bill rates.

Prior to carrying out the modelling exercise, quarterly data had to be generated for the remittances per capita and domestic income series using the procedure outlined by Goldstein and Chan (1976). A major weakness incorporated by the use of this process is the application of seasonalized with non-seasonal data in the empirical estimation. This may account for the minor heteroscedasticity problem obtained from the modelling exercise.

The International Financial Statistics CD-Rom (July 2001) was used in obtaining quarterly data for GDP for the USA, UK and Canada. In addition, quarterly Treasury Bill rates for Jamaica and the host countries, as well as the domestic price level, the official exchange rates were obtained from the abovementioned source.

Remittances data used in the paper represented recorded cash remittances and are classified according to the Bank of Jamaica's definition. Remittances were obtained from the bank of Jamaica through the CARICOM Secretariat.