

The effect of remittances on the real exchange rate: The case of Jamaica

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Abstract

Economic growth and development is one of the fundamental goals for developing economies. Recent studies have shown that remittances can achieve this; however, it is also seen to be detrimental to the sustainability of the economy due to exertion of pressure on the real exchange rate. This paper investigates the impact that remittances have on the escalating exchange rate in the Jamaican economy over the period 1995-2010, controlling for other fundamental variables such as government spending, official aid and the terms of trade. It empirically verified that remittances depreciated the real exchange rate, contradicting many studies. The results were obtained using the OLS estimation technique along with the traditional IS-MP model.

JEL Classification: C32, E20

Keywords: Remittance, Real Exchange Rate, Time Series, OLS Estimation

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1. Introduction

Remittances² are a source of external financing for many developing economies and have been estimated to exceed other types of external funding such as foreign direct investments (FDIs) and foreign aid over the past two decades. According to the World Bank (2013) remittances generally reduce the level and severity of poverty, thus leading to positive effects such as higher human capital accumulation, improved health and educational spending, improved access to information and communication technologies, enhancing small business investment, better preparedness for adverse shocks such as natural disasters and also contributing to a reduction in child labour. This view is also shared by Solimano (2003) who stated that remittances operate as a positive developmental instrument for receiving economies through its effects on savings, investment, growth and consumption.

Despite the numerous benefits, it is also perceived to pose some macroeconomic challenges for recipient economies (Barajas et al., 2010). There are increasing concerns as to whether remittances, because of the increase in the demand for the local currency and increased spending, result in an appreciation of the real exchange rate (RER). This can have devastating impact on the country's economy especially as it relates to its competitiveness.

These possible effects of remittance inflows on the domestic economy raise an important area for research and have in fact induced the exploration of the relationship between remittances and the real exchange rate³ more closely, especially in a Jamaican context. Remittances are a necessary source of financing to many Jamaicans and are used to supplement household income for necessities such as food, utilities and education (Ramocan, 2010). In 2007, remittances contributed as much as 16.71% of Jamaica's Gross Domestic Product (GDP), exceeding the contributions of foreign direct investments and earnings from tourism.

There have been some studies on the impact of remittances on Latin American and the Caribbean economies in general, as well as specifically, considering the real exchange rate. However, to this researcher's knowledge, there has not been any study that focuses on the relationship between remittances and the real exchange rate for the Jamaican economy using time series data for the period 1995-2010. This paper will argue that remittances increase households' incomes leading to an increase in the demand for goods and services. Depending on the type of goods consumed this will lead to either depreciation or an appreciation of the real exchange rate. Contrary to the conventional view, it is being hypothesized that remittances lead to a depreciation in the Jamaican context.

This issue will be explored applying the traditional IS-MP model for an open economy specifically looking at a floating exchange rate regime as is applicable for this study. This model is an extension of the closed economy model used to determine output, unemployment and inflation in the short run but is extended to analyze fluctuations in international trade, foreign investment and the exchange rate. An empirical analysis will be pursued using an Ordinary Least Square (OLS) estimation technique to assess the short run impact whilst seeking to garner a better understanding of this relationship in order to inform the policy agenda.

² The IMF (2009) defines remittances as household's income from foreign economies arising mainly from the temporary or permanent movement of people to those regions.

³ There is no universally accepted measurement or definition of the real exchange rate. However, theoretically it had been defined as nominal exchange rate amended by internal and external price changes.

Research of this nature is important as the country is faced with the challenge of dealing with what many consider an economic crisis - the continuous daily depreciation of the currency. The conclusion made in this paper is that increase in remittances results in real exchange rate depreciation.

This paper continues with a discussion of the trends in remittances and the exchange rate in section two followed by the literature review in section three. Section four presents the theoretical background and assessment. Section five highlights the methodology and data employed to carry out this analysis. Section six reports the empirical results and section seven concludes and gives policy recommendations.

2. Trends in remittances and the exchange rate

The following is a concise report that highlights the general patterns of remittances in Jamaica over the period 1995-2010. The report provides a descriptive analysis for remittances and gives a brief synopsis of the exchange rate history in Jamaica.

Over the past two decades there has been a considerable increase in the scale of migration from less developed economies to developed economies which has resulted in a significant increase in remittances. Hosein, Franklin and Joseph (2009) pointed out that one reason for this is the wider range of job opportunities that are available in the developed economies. The figures in Table 1 show that most remittances to Jamaica for the period 2000-2008 came from the United States. Over this period, remittances from the United States more than doubled. This is also true for remittances received from the United Kingdom, Canada and the Cayman Islands.

Table 1: Remittances by countries (US\$MN)

	2000	2001	2002	2003	2004	2005	2006	2007
United States	473.7	564.1	678.4	761.7	820.8	924.1	994.4	1050.7
United Kingdom	197.4	235	282.7	317.4	404.6	356.7	417.6	500.8
Canada	39.5	47	56.5	63.5	86.5	105.4	111.5	135.5
Cayman	39.5	47	56.5	63.5	102.6	154.0	155.7	151.2

Source: Bank of Jamaica

Jamaica is the largest remittance recipient in the Caribbean Community followed by Haiti and Guyana (see table 2). Remittances to Jamaica increased more than threefold from US\$653 million in 1995 to US\$2043 million at the end of 2010. This represents an average annual increase of approximately 8.84%. This rapid growth in remittances to Jamaica exceeded FDIs for this entire period of this study. However, it was not until 2003 that remittances surpassed earnings from the export of goods.

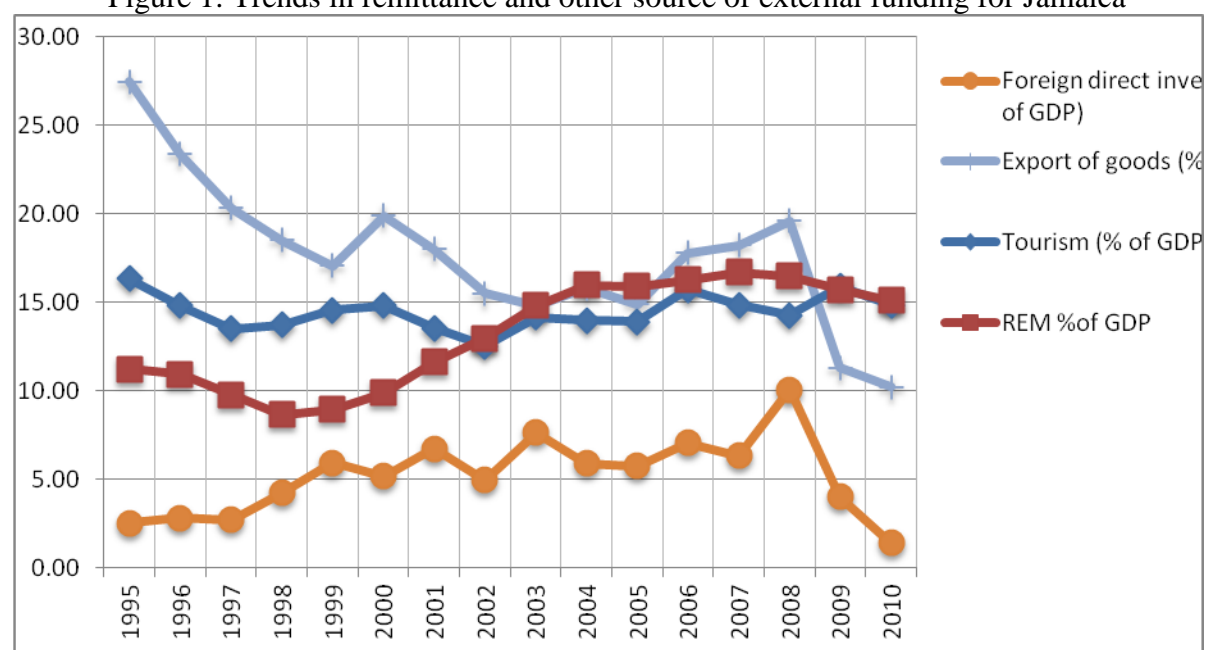
Additionally, since 2002 remittances as a percentage of GDP has surpassed the total earnings from tourism which has been seen as Jamaica's main source of foreign exchange since about 1997. Furthermore, remittances appear to be more stable than other sources of external financing. This is evident even during the period of the world economic crisis (2008-9) where there was a drastic decline in exports and foreign aid, while remittances declined by a much smaller percentage (see figure 1).

Table 2: Remittance flows to CARICOM countries (US\$ mn)

	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Antigua & Barbuda	3.3	20.7	27.0	17.6	19.7	20.9	22.0	23.0	24.5	25.5	24.5	23.9
Barbados	60.9	115.0	131.2	125.1	130.5	130.5	134.8	138.6	141.2	168.0	149.1	81.9
Belize	13.9	26.4	30.5	28.4	33.8	35.0	46.1	65.5	74.8	78.1	80.5	79.5
Dominica	13.4	16.3	17.1	17.4	17.8	23.2	25.0	25.4	25.9	26.1	23.1	26.3
Grenada	37.8	46.4	46.7	47.6	48.6	72.2	51.6	53.9	54.8	55.4	53.7	53.4
Guyana	1.7	27.3	22.3	51.0	99.3	153.0	201.3	218.1	282.7	278.4	253.0	373.1
Haiti	..	578.0	623.6	675.7	811.0	931.5	986.2	1,062.9	1,222.1	1,369.8	1,375.5	1,473.8
Jamaica	653.1	891.7	1,058.3	1,260.3	1,398.4	1,623.2	1,783.8	1,946.5	2,143.6	2,180.5	1,923.6	2,043.6
St. Kitts & Nevis	20.2	27.1	27.8	28.6	29.9	31.3	33.5	36.4	40.3	44.1	40.5	51.8
St. Lucia	23.1	26.4	26.9	26.8	27.4	28.7	29.5	30.3	31.1	31.5	27.6	31.5
St. Vincent & the Grenadines	17.2	22.5	22.7	23.1	23.5	25.5	26.5	29.7	33.1	31.1	29.9	33.3
Suriname	0.3	1.3	0.2	15.1	23.5	9.1	3.9	2.1	139.9	2.2	2.0	4.3
Trinidad & Tobago	31.5	38.1	40.9	79.1	86.8	86.9	92.4	91.2	109.4	109.4	99.3	90.9

Source: Caribbean Centre for Money and Finance Database

Figure 1: Trends in remittance and other source of external funding for Jamaica



Source: Edward Seaga Database

The exchange rate

On the 9 December 1840, the British pound became the official currency of Jamaica. It remained as such until 1969, a few years after independent status was attained. Subsequently, the Jamaican Dollar was adapted. The Jamaican Dollar differed from all other dollars in the British West Indies at the time because it was based on the half-pound sterling, whilst the other dollars were founded on either the US Dollar or the Spanish Dollar.

Considering the English-speaking Caribbean, the Bank of Jamaica (BOJ) has had the most varied experience as it relates to exchange rate alterations. Currently Jamaica has a floating exchange rate regime, however, this was not always the case. Her experience has seen exchange rate pegged to the sterling, the United States Dollar, dual exchange rates, crawling pegs, retained accounts, multiple exchange rates, an auction system and what is termed an “allocation” fixed rate system from 1989-90 (Bullock, 2010).

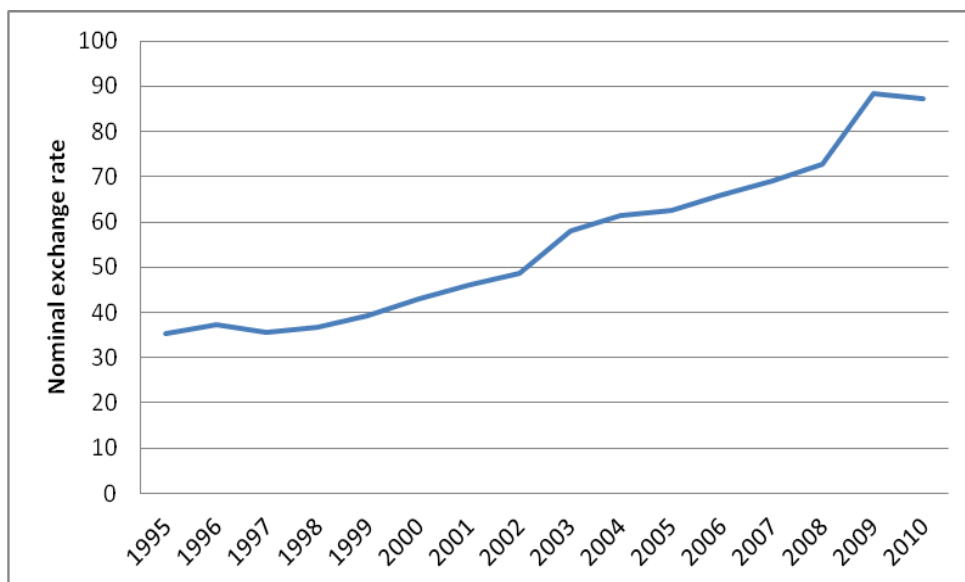
In 1971, there was the suspension of the automatic US dollar convertibility which signaled the looming collapse of the Bretton Woods system⁴ of fixed exchange rate. It is important to note that the Jamaican dollars continued to face pressure as a result of the OPEC oil crisis. In June 1973, Jamaica entered its first IMF agreement which led to devaluation of the Jamaican currency. Additionally, as a criterion for the arrangement the Jamaican currency was made to align with the USD instead of the Pound Sterling.

In 1977, a multiple of exchange rates was introduced, with depreciated rates for particular transactions. As such, BOJ implemented exchange rate crawl. A dual exchange rate system was introduced to stem the deteriorating external accounts. Due to lack of special monetary measures the system was terminated in 1978 with further devaluation occurring. In November 1983, the Government of Jamaica abandoned the fixed exchange rate system and implemented an auction system for exchange rate determination. At the initial auction the rate was \$1US = JM\$3.15. However, by 24 October 1985 the currency had depreciated to \$1US = JM\$6.40.

Eventually, Jamaica adapted a flexible exchange rate system in September 1991. Immediately the rate began to depreciate. Under this floating exchange rate system which still exists today, Jamaica’s exchange rate continues to depreciate against the USD and has currently surpassed J\$100 to US\$1. Examining data for the time period of this analysis it is seen that the nominal exchange rate has continuously depreciated during this time period, with a subtle appreciation towards the end of 2010. Figure 2 shows the depreciable trend of the Jamaica Dollar against the USD over the period 1995-2010. In 1995, the exchange rate in nominal terms was US1\$=JM\$35.35 and by the end of 2010 had drastically depreciated to US1\$=JM\$87.38.

Figure 2: Trends in the nominal exchange rate.

⁴ The IMF Articles of Agreement established the Bretton Woods system for fixed exchange rate. This was an international monetary system which was established from 1945 to 1971 amongst member currencies based on gold and the \$US. This system supported growth in international trade during the 1950’s and 1960’s.



3. Literature Review

The existing literature on the relationship between remittances and real exchange rates from an empirical perspective using time series data is quite limited. However there has been some amount of work, mainly panel studies that have been carried out over the last decade. This may be accredited to the fact that there has been a continuous increase in remittances which has captured not only the attention of researchers but also policy makers, academia, and economists. It is being proposed that an increase in remittance inflows results in a depreciation of the rate in the Jamaican content, all things constant.

Acosta, Lartey and Mandelman (2008) explored the effects of remittances on the real exchange rate with disaggregated sectorial data using an unbalanced panel data set for 109 developing and transitional countries for the period 1990-2003. Analysis done using an OLS country fixed-effects model and generalized method of moments (GMM) revealed that GDP per capita, the terms of trade index, and GDP growth resulted in real exchange rate appreciation and they are statistically significant at the 10% level. On the other hand, it was found that trade openness is statistically insignificant. Importantly, they found that an increase in remittances in developing economies results in increased spending which results in an increase in the price of non-tradables. Consequently, this leads to real exchange rate appreciation. Additionally, the increase in the price of non-tradables also results in resource movement, thus reducing productivity in the manufacturing sector.

In a similar study, Acosta, Baerg and Mandelman (2009) confirm that remittances lead to real exchange rate appreciation. The study suggests that countries with more sophisticated financial markets are better equipped to alleviate the macroeconomic challenge of appreciation of the local currency whilst maintaining a competitive stance. Using the same data, they also postulate that if depreciation occurs, the amount by which the currency depreciates depends on the ability of the domestic economy to channel remittances towards investment.

In another study, Acosta, Lartey and Mandelman (2009) employing a Bayesian methodology⁵ estimates the impact that increases in remittances has on the Salvadorian economy. The results show that remittances lead to macroeconomic instabilities. They argued that an increase in remittances results in an increase in households' incomes and consequently an increase in non-tradable products. The empirics showed that the conventional view of exchange rate appreciation is upheld.

Using a panel co-integration approach, Hassan and Holmes (2012) assessed the long-run relationship between the real exchange rate and remittances for less developed economies. The results revealed that remittances lead to real exchange rate appreciation. Furthermore, a panel error correction model was developed which showed that there is causality from remittances to the real exchange rate in the short run. This finding is also similar to Combes, Kinda and Plane (2011) where the same technique was applied in an analysis of the implications of capital flows and exchange rate flexibility on the real exchange rate in developing economies. The results show that public and private flows are associated with a real exchange rate appreciation.

Barajas et al. (2010), employing a panel co-integrating methodology, found that the effect of remittance flow on the equilibrium real exchange rate is not very robust since the sign and the level of statistical significance of the effect is dependent on the country sample being analyzed and also on the other explanatory variables in the model. The robustness checks provide evidence that those countries with low trade and/or capital account openness would be most likely to display the conventional effect of exchange rate appreciation. It was also found that countries of the Middle-East and North Africa are most likely to experience real exchange rate appreciation due to increases in remittances inflow.

Amuedo-Dorantes and Pozo (2004) test the impact of worker's remittances on the real exchange rate on 13 Latin America and Caribbean economies using fixed-effect OLS taking into consideration the use of instrumental variables to account for the possibility of endogeneity. The results highlighted the fact that remittances have the ability to appreciate the real exchange rate in the recipient economy. It was found that "a doubling of remittances to GDP ratio would lead to a real exchange rate appreciation of above 22%". Foreign aid however, was not statistically significant in this model for exchange rate determination.

Using co-integration techniques and a panel VAR model, Izquierdo and Montiel (2006) focused on six economies from Central America and the Caribbean for the period 1985-2004. Contrary to most findings, it revealed that for Honduras, Jamaica and Nicaragua, remittances have no effects on the real exchange rate. In Dominica it was revealed that remittances led to real exchange rate depreciation, while for El Salvador, it had an appreciating effect.

Evidently, most studies that are highlighted here point to the fact that an increase in remittances results in an appreciation of the real exchange rate with the exception of the study completed by Izquierdo and Montiel (2006).

4. Theoretical Background and Assessment

An overview of literature shows that one measure of the real exchange rate is the ratio of prices of tradable and non-tradable goods, where a RER appreciation occurs when the price of non-tradables increases relative to the price of tradables. However, as it relates to Jamaica, there is no available data where there is a separation of goods and services into categories of tradable

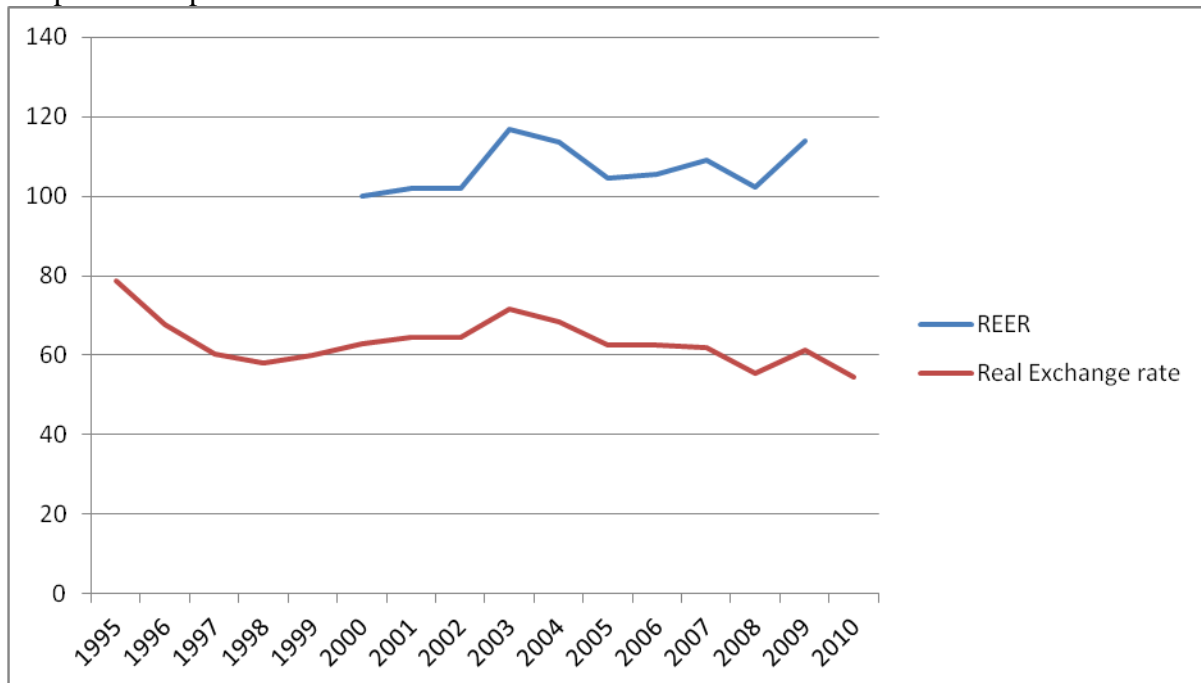
⁵ The Bayesian estimation technique employs a general equilibrium approach that deals with the identification problems of reduced-form models and it is said to outperform Generalized Method of Moment and maximum likelihood methods in small samples (Acosta et al. 2009).

and non-tradable. As such, acquiring such data was difficult. Following Romer (2006), the researcher will employ the following equation where NER is the nominal exchange rate at time t and CPI is the consumer price index of the United States (US) and Jamaica with 2005 as the base year.

$$RER_t = NER_t * \left(\frac{CPI_{US,t}}{CPI_{J,t}} \right)$$

According to some studies the real effective exchange rate (REER) is more suited especially when reference is made to competitiveness; however due to limitations in acquiring the REER data for Jamaica for the period 1995-2010, the aforementioned calculations were employed. The graph below makes comparison between the calculated real exchange rate and available data on the real effective exchange rate. It shows that the calculated RER and the REER fluctuates similarly. As to the interpretation (this is where the main difference lies), an increase in the REER is interpreted as an appreciation and vice versa. It would be interesting to see how the results would be affected given this assertion. However for the scope of this study, the RER will be employed.

Graph 2: Comparison between calculated RER and the REER



Theoretical Model

The theoretical implication of increased remittance inflows on the real exchange rate for the domestic economy requires the use of a macroeconomic model. Surprisingly, there have only been a few analytical works on this topic. The researcher seeks to address this issue employing the IS-MP⁶ framework (Romer, 2006).

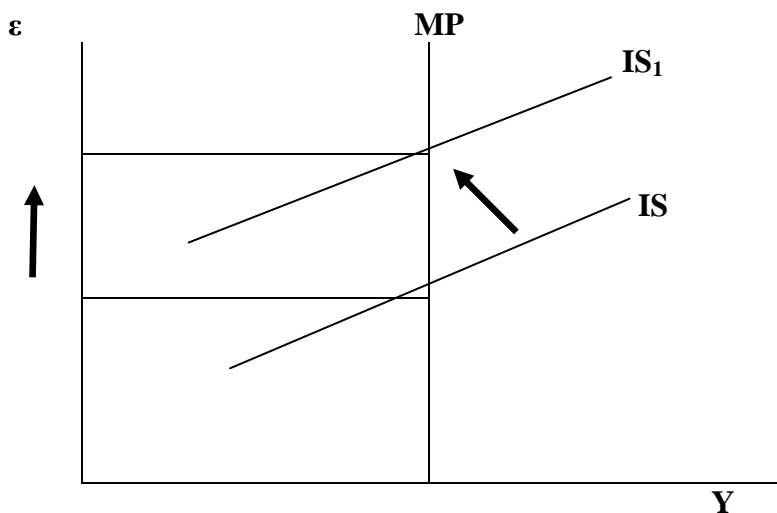
⁶ This model is an extension of the closed economy model used to determine output, unemployment and inflation in the short run but is extended to analyze fluctuations in international trade, foreign investment and the exchange rate.

The effect that remittances will have on the calculated real exchange rate will be dependent on the purposes for which funds are used by recipients. Roberts (2006) showed that a substantial proportion of remittances are used for consumption purposes whilst a smaller percentage is used for investment. Similarly in the Bank of Jamaica survey (Ramocan, 2010), it shows that over 85% of the remittances are used for buying food, education, paying utility bills and basic living expenses. This shows that an increase in remittances definitely leads to an increase in consumption spending. Now, what happens to the real exchange rate depends on the type of goods that are consumed.

If mostly domestic products are consumed then this will result in real exchange rate appreciation. How so? An increase in income through remittances will increase spending on both locally produced and imported goods. Considering a small open economy, an increase in the demand for locally produced products would result in inflation which is a result of what is often termed the ‘spending effect’. As Bussolo, Lopez, Molina (2007) put it, the increase in demand will increase demand for the factors of production by the expanding sector. Consequently, price increases and the movement of resources erode the competitiveness of the export sector. This is due to appreciation of the exchange rate, where local goods are relatively more expensive than foreign ones.

However if we should assess the consumption patterns for Jamaicans, more imported rather than local products are consumed. In recent times the agricultural sector for example has been campaigning on the slogan “grow what we eat and eat what we grow” in a quest to lessen the economy’s dependence on imported food. In such cases where there is high dependence on imports, the effect will be different, that is, it is expected that this will result in real exchange rate depreciation. Drawing back to the IS-MP framework, there is a negative relationship between imports and the expenditure function which results in the IS curve shifting inwards. As depicted in Figure 3, this result in real exchange rate depreciation as is being postulated.

Figure 3: IS-MP Framework



5. Data and Empirical Methodology

Based on the empirical literature the following function was developed to estimate the relationship between remittances and the real exchange rate:

$$(1) RER_t = f(REM_t, GS_t, TOT_t, OPNS_t, AID_t, WIR_t, \varepsilon_t)$$

In this formulation, at time t:

- RER is the real exchange rate expressed in Jamaican dollars per \$US
- REM is remittances as a percentage of GDP
- GS is government spending in J\$ millions
- TOT is the terms of trade⁷
- OPN is Jamaica's openness to trade calculated as exports plus imports as a % of GDP
- AID is official financial aid in US\$ millions
- WIR is the world's interest rate, where the interest rate on the US Treasury Bill is used as a proxy

The following regression model was developed:

$$(2) RER_t = \beta_0 + \beta_1 REM_t + \beta_2 GS_t + \beta_3 TOT_t + \beta_4 OPNS_t + \beta_5 AID_t + \beta_6 WIR_t + \varepsilon_t$$

The study employs annual data for Jamaica that spans the period 1995-2010⁸. There were difficulties in compiling the series, hence the initial intention of having a series of at least 30 years was not possible. The Edward Seaga Database was used to collect data on the nominal exchange rate (*NER*) and government expenditures. The GDP, import and export figures used in the calculation for trade openness were obtained from the Statistical Institute (Statin) of Jamaica Database. Data on the world's interest rate, official aid as well as consumer price index (*CPI*) (2005=100) data for Jamaica and the United States of America (US) were sourced from the World Development Indicators, World Bank.

Before the conduct of any estimation procedures several operations were carried out on the variables. Firstly following from the literature, all variables with the exception of REM and WIR series were transformed into logarithmic form.

$$(3) \lg RER_t = \beta_0 + \beta_1 REM_t + \beta_2 \lg GS_t + \beta_3 \lg TOT_t + \beta_4 \lg OPNS_t + \beta_5 \lg AID_t + \beta_6 WIR_t + \varepsilon_t$$

According to Granger and Newbold (1974), econometric estimations employing time series data encounter the danger of generating spurious results⁹ if the variables are non-stationary, resulting in estimates that are biased and inefficient. It is therefore necessary to test for the presence of any trends or persistence within data that may violate the Classical Linear Model (CLM) assumptions on this model.

The researcher employed the Augmented Dickey-Fuller (ADF) to formally test the transformed variables for stationarity. The results revealed that the real exchange rate, trade openness and financial aid variables do not suffer from a unit root problem, that is, they are stationary¹⁰. On the other hand, remittances, the terms of trade, government spending and the world interest rates became stationary after being differenced once. The first difference of each non-stationary variable was therefore used to re-specify the model as follows:

⁷ These values were obtained directly from the Bank of Jamaica statistics officer.

⁸ See table 3 of the appendix for summary statistics of the variables used in the regression analysis.

⁹ A spurious regression may produce a high R² and test statistics that appears to be significant; however the results may not convey proper economic meaning.

¹⁰ See details of the ADF test for unit roots in table 4 of the appendix.

The Ordinary Least Squares (OLS) technique was then applied to determine the relationship between remittances and the real exchange rate in Jamaica. The regression produced a high R-squared value of 0.7854. Despite this, only two of the variables were significant, that is, the first difference of remittances as a percentage of GDP and the first difference log of government spending. Consequently, this model was re-examined to produce models 2, 3, 4 and 5.

Table 5: OLS Estimation results

Dependent Variable: Real exchange rate		1	2	3	4	5
R-squared		0.7854	0.7693	0.7365	0.6699	0.5988
Adjusted R-squared		0.6014	0.6251	0.6312	0.5799	0.5319
Prof >F		0.0394	0.0188	0.0059	0.0054	0.0042
REM	β_1	0.0826 4.23* (0.0195)	0.0836 4.43* (0.0189)	0.0689 5.14* (0.0134)	0.0655 4.64* (0.0141)	0.0609 4.18* (0.0146)
dlgGS	β_2	0.5907 2.74** (0.2158)	0.5373 2.73** (0.1967)	0.4388 2.82** (0.1556)	0.4238 2.56** (0.1658)	0.3283 2.02*** (0.1622)
dlgTOT	β_3	0.3362 1.49 (0.2255)	0.4101 2.1*** (0.1951)	0.3265 1.87*** (0.1746)	0.2835 1.54 (0.1841)	
lgOPNS	β_4	-0.1392 -0.72 (0.1922)				
lgAID	β_5	0.0196 0.98 (0.0199)	0.0219 1.15 (0.019)			
dWIR	β_6	0.0174 1.55 (0.0112)	0.0196 1.88*** (0.0104)	0.0144 1.59 (0.0091)		
Constant	β_0	4.33 4.42* 0.9791	3.6696 10.61* 0.3459	4.0673 164.2* 0.0248	4.0637 154.35* 0.0263	4.069382 147.87* 0.0275

Significance is indicated by * at the 1% level, **at the 5% level and *** at the 10% level. Standard errors are in parentheses.

Regression two was selected for analysis due to its relatively high R-squared and the significance of most of the variables. It is important to note that the necessary regression diagnoses were carried out to ensure that all the assumptions of the Classical Linear Regression

(CLR) Model were satisfied before any interpretation was carried out. It is noteworthy that failure to verify the assumptions underlying the OLS regression may produce misleading results.

Firstly, the assumption of linearity was evident as all variables were linear in parameter. In other words, the power of all the independent variable was one. Next the model was tested for the presence of multicollinearity. Whenever there is a perfect linear combination amongst the explanatory variables, OLS cannot produce estimates that are unique. The Variance Inflation Factor (VIF) for each explanatory variable suggests that perfect multicollinearity is not present in the model. This was confirmed as the correlation matrix showed that the highest correlation was between the log of the real exchange rate and the remittances as a percentage of GDP (first difference) which was 0.6878. Additionally, the tolerance¹¹ values suggest that each variable could be considered as a linear combination of the other independent variables, and as such this assumption withstands violation.

Another assumption of the OLS model is homoskedasticity, that is, the variance of the residuals should be consistent, or else it will be described as heteroskedastic (non-constant errors). A formal test for heteroskedasticity was conducted using the White test for heteroskedasticity and the Breush Pagan test. The null hypothesis of both tests is that there is constant variance amongst the errors. The results lead to a failure to reject the null hypotheses of homoskedasticity of the residuals for both tests as the p-values for the White and Breush Pagan test were 0.3738 and 0.211 respectively.

Next, the residuals were tested to ascertain if they were serially correlated. This was done formally using the Breush-Godfrey test and the Durbin Watson test statistic. The p-values were 0.2128 and 0.3502 for the Breush-Godfrey and Durbin Watson alternative tests respectively. The Durbin Watson test statistic was 1.51. These results indicate that the errors associated with the observations are not correlated with each other over time.

Upon conducting the Shapiro-Wilk test for normality we fail to reject the null hypothesis that the errors are normally distributed. All the CLR assumptions were satisfied thus resulting in OLS estimators that are the Best Linear Unbiased Estimators (BLUE). Consequently the usual interpretation of the results is valid. Even though all the assumptions for this model have been covered, a model specification was done. The null hypothesis states that there are no omitted variables, and we reject this claim suggesting that this model does not suffer from omitted variable bias.

6. Results

After conducting a number of regressions, regression two as seen in Table 5 was selected for analysis. However, it is noteworthy to mention that in all regressions that were conducted, remittances and government spending were statistically significant at the 1% and 5% levels respectively. Also, they showed the depreciating results that were hypothesized.

Regression two shows that all explanatory variables with the exception of log financial assistance is statistically related to the real exchange rate. The reported R-squared was 0.7693 which suggests that approximately 77% of the variations in the real exchange rate can be explained by the independent variables. As anticipated and contrary to other findings, we find that increases in remittances to Jamaica depreciate the real exchange rate. Specifically, the coefficient of REM is positive and suggests that an increase in remittances as a percentage of GDP leads to a depreciation of the real exchange rate by approximately 8.26%. Similarly, the

¹¹ Tolerance is calculated as $1/VIF$ and it is used to check on the degree of collinearity. A tolerance value higher than 0.1 is ideal.

expected depreciable effect of government spending was confirmed. Surprisingly, official aid has no effect on the real exchange rate. This was not expected as capital inflow in the form of official aid was expected to generate similar results as that of remittance inflows. Interestingly, the empirical results help to confirm findings revealed from the theoretical assessment.

7. Conclusion

External funding is intended to be beneficial to recipient economies. Despite this, previous studies have shown that it has posed some macroeconomic challenges as it has resulted in real exchange rate appreciation which erodes the competitive nature of the economy. This study, however, using the traditional IS-MP model and OLS estimation procedures, shows that capital inflow in the form of remittances results in real exchange rate depreciation. Thereby, it revokes the possible negative effects that were theorized to result in appreciation which would adversely affect the country's competitiveness. Therefore it can be concluded that remittances through their impact on the real exchange rate do not affect Jamaica's competitiveness negatively. This study contradicts most studies on this issue (e.g. Hassan and Holmes, 2012 for example) showing that increase in remittances result in depreciation of the real exchange rate.

In the wake of this finding, an important question arises. This is: why does Jamaica continue to perform poorly on the international market with such continuously depreciating currency? The main policy suggestion from these findings is the need for effective policies to be implemented to channel remittances towards investment purposes especially as it relates to the productivity sector.

The researcher implores for further work in this area and other issues on the importance of remittances to Jamaica that were not highlighted in this paper. Also, considering that many single country analyses have not been completed on this topic, it would be interesting to see how robust the findings are when compared to other estimation techniques. Another important area of research is to ascertain the impact of remittances on labour and productivity within the Jamaican society. This is due to the belief that some individuals become totally dependent on this source of income and become uninterested in gaining employment.

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Appendix

Table 3: Summary statistics for variables included in the regression analysis.

Variable	Mean	Standard Deviation	Min	Max
RER	63.43125	6.050443	54.6	78.82
REM	13.19062	2.977136	8.67	16.71
GS	85938.21	52006.91	22635.1	184835.6
OPN	94.05875	9.293874	80.86	113.56
WIR	3.274375	1.99982	.13	5.84
TOT	83.4975	13.61795	60.43	99.9
AID	6.80e+07	5.16e+07	-2.59e+07	1.46e+08

Table 4: Results for Augment Dickey Fuller test for unit roots

Variables	Test Statistic	Mackinnon p-value	Model Specification	Order of Integration
lgRER	-2.779	0.0079	constant	I(0)
lgREM	-1.079	0.7235	constant	I(1)
lgGS	-1.641	0.4618	constant	I(1)
lgTOT	-0.047	0.9544	constant	I(1)
lgOPN	-2.658	0.0099	constant	I(0)
lgAID	-2.566	0.0117	constant	I(0)
WIR	-1.075	0.7250	constant	I(1)

Table 5: OLS Estimation results

Dependent Variable: Real exchange rate

		1	2	3	4	5
R-squared		0.7854	0.7693	0.7365	0.6699	0.5988
Adjusted R-squared		0.6014	0.6251	0.6312	0.5799	0.5319
Prof >F		0.0394	0.0188	0.0059	0.0054	0.0042
REM	β_1	0.0826 4.23* (0.0195)	0.0836 4.43* (0.0189)	0.0689 5.14* (0.0134)	0.0655 4.64* (0.0141)	0.0609 4.18* (0.0146)
dlgGS	β_2	0.5907 2.74** (0.2158)	0.5373 2.73** (0.1967)	0.4388 2.82** (0.1556)	0.4238 2.56** (0.1658)	0.3283 2.02*** (0.1622)
dlgTOT	β_3	0.3362 1.49 (0.2255)	0.4101 2.1*** (0.1951)	0.3265 1.87*** (0.1746)	0.2835 1.54 (0.1841)	
lgOPNS	β_4	-0.1392				

		-0.72				
lgAID	β_5	0.0196 0.98 (0.0199)	0.0219 1.15 (0.019)			
dWIR	β_6	0.0174 1.55 (0.0112)	0.0196 1.88*** (0.0104)	0.0144 1.59 (0.0091)		
Constant	β_0	4.33 4.42* 0.9791	3.6696 10.61* 0.3459	4.0673 164.2* 0.0248	4.0637 154.35* 0.0263	4.069382 147.87* 0.0275

Significance is indicated by * at the 1% level, **at the 5% level and *** at the 10% level. Standard errors are in parentheses.
