The Impact of Remittances on the Real Exchange Rate: Empirical Evidence from Ghana

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This paper presents an empirical analysis of the impact of remittances on the real exchange rate in the Ghanaian economy using an error correction model approach. Disaggregating capital flows into other capital (CAP) and remittances, the paper found that increasing levels of all forms of capital leads to real exchange rate appreciation in the long run. However a Granger causality test fails to establish a short run causality between remittances and the Real Exchange Rate. The analysis further suggests that, in the long run, a change in the real exchange rate is generally related to movement in economic fundamentals.

1. Introduction

Capital inflows play a very significant role in the economies of many less developed countries. Major components of private capital inflows include foreign direct investment (FDI), official development assistance (ODA), worker's remittances, and portfolio investment. These flows have increased tremendously over the past decade and the composition and magnitude of the various types of capital flows have also undergone significant changes over the years.

The study of the dynamics of remittances, one of the components of capital flows, is gaining prominence in the economic literature and economic research. These studies address a wide variety of issues, ranging from its microeconomic impact on recipient households to its effect on major macroeconomic variables. More specifically, issues of research interest include: its role as a source of foreign exchange; welfare effects; and some concerns regarding its effect on inflation and the real exchange rate (RER). Bearing in mind the significant attention

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RER has gained over the last several decades as a policy variable, this paper seeks to carry out an in-depth analysis of the role remittances play in the real exchange rate dynamics in Ghana.

The size of remittances in the developing world is three times that of official development assistance and it is comparatively more stable than other financial inflows (Ratha, 2007). In 2010 for instance, the total amount of remittances received by developing countries was estimated to be $320.8 billion, an increase of more than 400% over the 2000 value (World Bank, 2011). The pattern of remittance flows is diverse but the regions where recipients of remittances (relative to total output) were greatest were South Asia, the Middle East and North Africa. There has been a consistent increase in the level of remittances to these parts of the world. Available data confirms that Ghana, also as a developing country, has had its fair share of the increase in the flow of remittances. Inflows of remittances to the Ghanaian economy have increased tremendously averaging about $54.5 million over the last decade compared to $20.3 million in the previous decade reaching about $135 million in the year 2010 (and rising). The level of remittance as a share of Ghana's GDP followed a similar trend. It increased from about 0.2% of GDP in 2000 to about 1.5% of GDP in the year 2010 (World Bank, 2011).

However, with the increasing flow of remittances, there are growing concerns about potential negative effects. Though it is generally expected that remittances should have a positive impact on the overall economy, very large volumes of remittances relative to the size of the economy could have detrimental effects such as high inflation, inefficient resource reallocation and/or exchange rate appreciation etc. Studies on Pakistan by Hamma (2009), with respect to the effect of remittance inflows on the exchange rate confirmed the experience of Dutch disease. High capital inflows led to the real appreciation of the domestic currency that made the export sector less competitive, adversely affecting the economy.

2. Literature Review

2.1 Remittances and Exchange Rate

Studies on remittances, especially in developing countries, have pointed to significant positive macroeconomic impact on these economies. There

is evidence suggesting that large flows of remittances to developing countries are sometimes associated with lower levels of poverty at the individual level and an increased pace of growth as well as better health and education indicators (Fajnzylber and Lopez, 2005).

Remittance flows to most developing countries are found to be countercyclical in the recipient economies as they serve as supplements to household income in periods of low economic activity (Ratha, 2007). Periods of general economic hardships arising from natural disasters or conflict usually witness high inflows of remittances that stabilize as economic conditions improve. Ratha (2007) documents evidence of high remittance flows to the Mexican economy during the financial crisis of 1995 and Indonesia and Thailand in 1998. The aftermath of 2010 earthquake in Haiti also witnessed a surge in remittances to partly reduce the financial strain that occurred as a result of the disaster[2]. This pattern of inflows can help smoothen aggregate demand and contribute to economic growth.

The developmental role of remittances is well recognised and there is an increasing volume of research in that regard. Not only is this recognised at the research level, the issue of remittances as a developmental tool, as well as its potential negative consequences, has engaged policy makers and the attention of major financial institutions such as the World Bank and IMF (see for instance IMF's *World Economic Outlook 2005* and the *World Bank's Global Economic Prospects 2006*). This has resulted in an increase in discussion and research in an attempt to maximise the potential benefits of remittances to developing countries.

In Ghana there is evidence that support the development and welfare effects of remittances. Remittances have been shown to improve individual welfare substantially and help minimize the negative economic shocks to recipient households (Quartey, 2006). Addison (2004) also documents the potential role remittances can play in the macroeconomic development of Ghana.

However, many developing countries that are high recipients of capital flows (where remittance is a major component) have to grapple with the impact of these flows on the real exchange rate and the international

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[2] Author's own calculation with Data from WDI

competitiveness of their exports. Exchange rate stability is seen as a major developmental tool, especially in countries with highly volatile exchange rate, and has become a key policy issue (Gala, 2008). Most developing countries detail exchange rate target policies each fiscal year to maintain a stable currency and improve their competitiveness. In Ghana, this is reflected every year in the budget statement of the country.

With the developmental impact of a stable exchange rate in mind, much theoretical and empirical research has emerged with the major determinants of the real exchange rate and the factors that contribute to its volatility being of particular interest. The discussions that follow will give a rundown of some theoretical models and empirical studies that directly inform this study.

2.2 Theoretical Approaches to Exchange Rate

Many theories over the years have shaped today's empirical investigation of the dynamics of the real exchange rate. Some economists have used the Purchasing Power Parity (PPP) based approach in trying to model the long run RER dynamics but these theories typically fail to explain the persistent deviation of the RER from its long run PPP value both in developed and developing countries (Mussa, 1986).

There are, however, two broad strands of RER models in the literature (the fundamental equilibrium RER (FEER) and the behavioral equilibrium RER (BEER)) that appear to fit the evidence relatively well (Elbadawi and Soto, 2005). Models based on the FEER often specify the path of RER needed to achieve both internal and external balance. Thus, in these models the RER is specified as a function of optimum domestic output and sustained capital flows.

However, the FEER approach loses sight of other potentially important economic fundamentals such as the terms of trade (TOT), openness, trade policy, foreign aid and remittances that also affect the RER. The alternative approach (BEER), which originated with Clark and MacDonald (1999), uses a single equation reduced form behavioral model with emphasis on variables that affect the relative prices of traded to non-traded goods in the domestic and foreign markets. These

variables include medium to long term economic fundamentals such as the terms of trade, openness, government spending and capital inflows that are believed to exert a considerable influence on the RER (Elbadawi and Soto, 2005). This approach takes into account both external and internal factors that play a significant role in RER movement.

2.3 Empirical Studies on Capital Flows and Exchange Rates-General

Empirical studies on capital flows mostly drawing on the FEER and BEER approach are numerous; they range from the dynamics of capital movement from developed countries (to developing countries) in the form of Aid and Foreign Direct investment (FDI) to the development impact and growth implication of these flows.

Edwards (1989), in a bid to explain exchange rate volatility, built a theoretical model to capture the long run and short run fluctuations of exchange rate in developing countries. He presented a dynamic small open economy model that sought to explain the effect of both nominal and real variables on the RER. The model argued that equilibrium RER is determined by real variables and that only changes in these variables can affect the long equilibrium RER. His theoretical model was tested using 12 developing countries with data from 1962 to 1985. His results asserted that nominal variables affect the real exchange rate only in the short run while in the long run only real variables affect the RER. His findings are consistent with the theoretical presumptions of the BEER approach which asserts that in the long run only fundamentals such as the terms of trade (TOT), capital inflows, technological progress etc affect the real exchange rate (see for instance studies by Engel, Mark and West, 2007). His results also supported the view that excessively expansionary monetary policy can lead to RER appreciation.

More specifically, Ahmed (2009) confirmed the Dutch disease hypothesis in Pakistan by estimating a linear regression model that included the TOT, government spending, degree of openness, workers' remittances, FDI and foreign economic assistance as explanatory variables for movement in RER. The argument put forward for the inclusion of these variables is that the RER is a function of a set of exogenous and policy induced fundamentals (in line with BEER). His model included worker's remittances as a separate explanatory variable due to its importance in the Pakistani economy. He found that increases

in all the various forms of capital inflows led to a RER appreciation. His analysis raised important questions regarding the stationary nature of data and the need to resort to alternative approaches in cases where the data is observed to be non-stationary.

In terms of the impact of remittances (specifically) on the RER, studies by Lopez, Molina, and Bussolo (2007) on selected Latin American countries also suggested that high flows of remittances to these countries caused a significant appreciation of the RER. A similar study by Ameudo-Dorantes (2004) of Latin American countries obtained results consistent with the previous studies and noted that the appreciation of the RER in these countries, as a result of the increased level of remittances, reduced their competitiveness and may have led to a reallocation of resources to the non-tradable sector. Both studies derived their theoretical basis on the single equation reduced form behavioral model developed by Clark and MacDonald (1999).

Though most of the empirical studies available strongly support the idea that large flows of capital (and remittances) lead to RER appreciation, some studies are more equivocal in their conclusion. For instance, while studies by Lartey, Manelman, and Acosta (2008), Holzner (2006) and those mentioned above found strong evidence in support of Dutch disease in their empirical studies, Barajas (2010) and Fayads (2010) indicate that remittances tend to appreciate the RER but only under certain country specific economic circumstances. More specifically, Barajas concluded that only countries with more open capital accounts and low levels of trade are likely to experience RER appreciation associated with increased levels of remittances. The most striking revelation of Fayads's analysis, in relation to those previously mentioned, is that any empirical study on the RER and remittances must take into account the degree of openness of the country's capital account and its level of trade with the rest of the world.

2.4 Empirical Studies on Capital Flows and Exchange Rates-Ghana

Various studies in Ghana in the area of capital flows and RER also differ in their conclusion. Young (1992), for instance, pointed out in his studies that abundant foreign aid in the Ghanaian economy during the period of SAPs led to apparent RER appreciation (reflected by domestic inflation and continuous devaluation of the currency) and the crowding

out of the private sector due to government's increased demand for domestic goods and services. Young's analysis was a comprehensive study that observed the pattern of aid flow before and after SAPs and the economic indicators between the two periods to draw his conclusion. Studies by Opoku-Afari et al (2004) on Ghana also confirmed that, indeed, capital inflows to Ghanaian economy tend to cause an appreciation of the real exchange rate. They used the Vector Autoregressive approach to analyse the relationship between a set of variables that included the degree of openness, TOT, total factor productivity and aid as explanatory variables. This study is particularly important because of the exposition on the important economic variables that affect the RER in Ghana and is therefore used to inform the regression analysis to follow.

However, Sackey's (2001) empirical studies on the effect of foreign aid on the RER in Ghana found that, contrary to theoretical predictions, inflows of foreign aid to the Ghanaian economy actually depreciated the RER. This study was done using a co-integration approach and the key variables included in the model are, TOT, Aid, Government expenditure on non-tradable (measured by the share of government spending in GDP), Technological progress (proxied by the index of agricultural production), Government's expansionary monetary policy, parallel market premium and change in the nominal exchange rate. This analysis differs from that of Opoku-Afari et al in two ways; it does not include the effect of structural breaks and uses the bilateral nominal exchange rate to compute the RER instead of the nominal effective exchange rate used by Opoku-Afari et al.

3. The Ghanaian Economy: An Overview

The period immediately after Ghana's independence witnessed a surge in investment activities by the government mainly on improving the infrastructure of the country. With the availability of funds from the relatively high price of exports during this period (mainly cocoa), the country appeared poised for growth and development. However, high levels of corruption and numerous military interventions from 1966 through to the early 1980's coupled with drought and the low export prices of its main primary exports (cocoa and gold) resulted in the fading of the country's fortunes.

With the abysmal performance of the economy following this period it was not surprising that the country earnestly welcomed the IMF and World Bank sponsored structural adjustment, under the economic recovery program (ERP) of 1983, to secure funds and developmental aid in the hope of repositioning the country towards a trajectory of sustained growth and development. Since the implementation of the SAP the country has made significant strides in promoting development both economically and on the political front.

GDP growth rate has been steady over the past several decades. Growth averaged about 4.8% in the period 1987-1991. However, its growth rate has increased steadily since 1992 reaching an average of about 5% between 2002 and 2006 as indicated in the table below. In 2011, the country recorded an unprecedented growth rate of 11%. This growth rate witnessed in the country is likely the result of major policy initiatives undertaken by government to promote the private sector and improve the business environment that are beginning to yield positive results.

Table: 1: Average value of GDP, ODA and FDI

Period	GDP Growth Rate (%)	ODA ($'000'000) (Annual average)	FDI ($'000'000) (Annual average)
1987-1991	4.8	1,011.872	11.9
1992-1996	4.1	819.11	121.4
1997-2001	4.2	861.124	149.62
2002-2006	5.5	1,304.47	233.18

Source: Author's own calculation with data from WDI.

Ghana is highly dependent on foreign aid for most of its developmental projects and also for financing its budget. Average inflow of official development assistance (ODA) to the country in the period 1987-1991 was over $1 billion but fell below this value in the decade that followed. However, during the period 2002-2006 (i.e the period of debt reduction under HIPC) the flow of ODA picked up attaining an average value of over $1.3 billion. For foreign direct investment (FDI) the trend is slightly different. Average FDI in the country has been growing steadily since 1987 from about $11.9 million in the second half of 1980's to as much as $233.18 million annually since the year 2001. This trend is

expected to continue as the economy continuous to exhibit signs of prosperity attractive to foreign investors.

In terms of monetary policy, the Bank of Ghana is doing considerably well in pursuing sound monetary policies and this is manifested in the steady decline in inflation and the improved macroeconomic environment that has boosted investor confidence and attracted substantial amount of foreign direct investment into the country (Yvonne, 2010). Some economists have questioned the over restrictive inflation targeting policy pursued by the Bank of Ghana and recommend monetary policies that are geared towards promoting growth and employment along with maintaining moderate levels of inflation (Epstein and Heintz, 2006). This highlights the fact that the central bank still has an important role to play in the success of the economy.

3.1 Remittance Flows to Ghana

Ghana's receipt of remittances compared to other sub Saharan African countries such as Cameroon, Gambia and Liberia is quite substantial. Total volume of remittances to the country has been increasing since 1987. Remittances flow to the country in 1988 was about $6 million representing about 0.12% of total GDP. However, it rose steadily over the years and has exceeded $100 million annually since 2006. These flows only capture remittance flow to the country through official sources such as bank transfers and money transfer outlets. Some estimates have put remittance figures in Ghana close to $1 billion annually[3]. This increase in remittances over the years has played a significant role in improving the livelihood of many recipient households.

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[3] See Addision (2004)

Figure 1: Remittance Inflows to Ghana
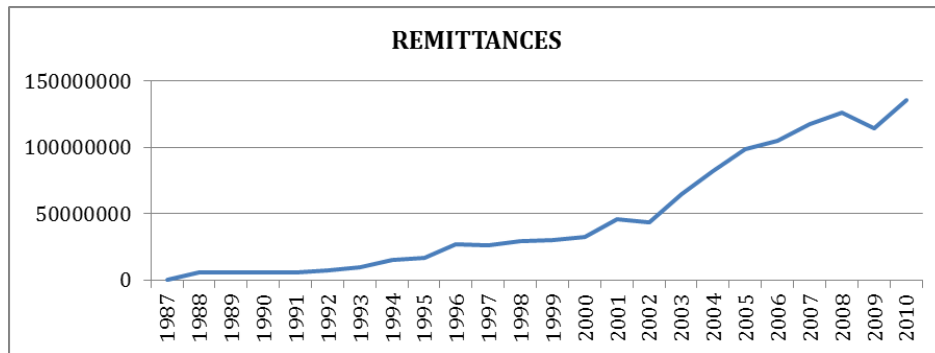
As the figure above indicates, remittances have been growing since 1987 and only in 2009 did we witness a significant dip from the previous year's value (i.e a decrease of about 9.2%). This can be attributed to the financial crisis that hit the world in 2008 and resulted in a reduction in private transfers. However as global financial conditions continue to improve, remittance inflow to the country has increased quite significantly from its 2009 value.

3.2 Real Exchange Rate (RER) Trend in Ghana

Theoretically, there are several ways of measuring the RER. One commonly used measure is the relative price of tradable to non-tradable goods. Another measure of the RER uses the ratio of a unit cost of labour in the foreign country to that in the home country expressed in a common denominator (using the nominal exchange rate) as a measure of the RER. However, these are usually difficult to estimate over time because of limited data availability. A more practical approach is to use the nominal exchange rate adjusted for the relative price differences between the relevant country and the rest of the world (Ahmed, 2009). Thus here we use the US wholesale price index (WPI) relative to the consumer price index (CPI) of Ghana as the measure of RER as indicated by the following

$$RER = \frac{ER*WPI}{CPI}$$ where ER is the nominal exchange rate.

In the formulation above an increase in the ratio represents RER depreciation whilst a decrease indicates an appreciation. We use the above equation to construct the RER for Ghana from 1987-2007.

Figure 2: Real Exchange Rate For Ghana
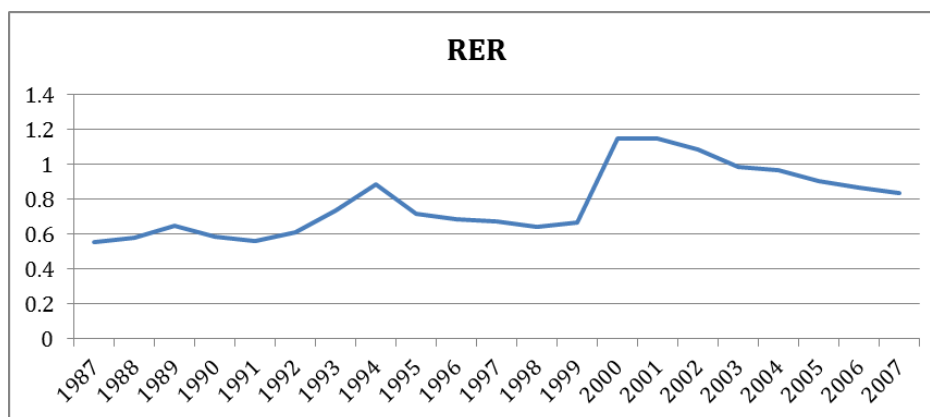
As Fig.2 above indicates, the RER (based on the above measure) was fairly stable from 1987 to 1991 after which it depreciated against the dollar and peaked in 1994. It again appreciated in 1995 and remained stable till 1999. It then depreciated by over 72% in the year 2000, the highest within the sample period. It has, however, steadily appreciated from 2001 with little deviation from that trend.

4. Methodology and Data

4.1 Real Exchange Rate and Fundamentals

Following the earlier discussion on the theoretical approaches to RER, we use the BEER approach because of its wide usage and relative ease of applicability in empirical studies of the RER; especially in developing countries (See for instance Elbadawi and Soto (1997) and Amuedo-Dorantes and Pozo (2004)). According to this model there are several fundamentals that determine the movement of real exchange rate across countries. Opoku-Afari (2004) provides details of the important macroeconomic variables that determine the real exchange rate of Ghana. Here we give a brief description of these variables and how they affect the real exchange rate.

Terms of Trade (TOT): Measured as the relative price of exports to imports the terms of trade measures, in a specific manner, the effect of external demand and supply on the tradable sector of an economy. Movements in the TOT result in two effects (i.e the substitution and

income effect) and these have different impacts on the RER. The income effect of an improvement in the TOT is that more money is being spent on both tradable and non-tradable goods in the economy. This results in an increase in the price level in the non-tradable sector and lead to RER appreciation. The substitution effect is that more imports would be consumed to the detriment of domestic goods which causes a drop in demand of non-tradable goods resulting in a decline of their prices and RER depreciation. Thus, *a prior*, it is difficult to determine which of the two effects on the RER dominates the other.

Government Consumption (GC): Government expenditure is particularly important in countries where the ratio of government expenditure to GDP is quite large. The effect of government spending on the RER is captured through its effect on the prices of the non-tradable goods sector. Increased spending by the government would put upward pressure on the prices of non-tradable goods and result in RER appreciation. It is usually difficult to specifically distinguish between government spending on tradable and non-tradable goods but it is generally assumed that non-tradable goods dominate government consumption. Therefore, we use the ratio of government expenditure to GDP as a proxy in this analysis, similar with other studies (Edwards 1989).

Liberalization Index (LIB): The level of openness of an economy also has a significant effect on the movement of the RER. It usually measures the degree to which an economy engages in international transactions. Trade restrictions through policies such as quotas and tariffs usually result in an increase in the prices of both imports and non-tradable goods leading to an appreciation of the currency. A more liberalised economy benefits from international competitiveness and technological transfer which lead to lower prices in the non-tradable sector and result in RER depreciation. Owing to the unavailability of data specifically on trade restriction and international openness, one popular measure used in the literature (see Ahmed, 2009) as a proxy for the degree of liberalization is the ratio of imports plus exports to GDP.

Capital Flows: Theoretically, all forms of capital inflows are expected to result in RER appreciation. However, empirical estimates suggest that the impact of the various types of capital inflows on the RER depends on the degree of reversibility of that particular component which varies from one economy to the other. For the purpose of this study we

disaggregate the flows of capital into two main components; Other Capital flows (CAP) (i.e Official development Assistance (ODA) plus Foreign Direct Investment (FDI)) and Remittances (REMIT). In analysing the model we use the CAP to GDP ratio and the REMIT to GDP ratio since these correctly reflect the size of these flows to the country as the economy changes over time.

Using the above variables, noted to have a significant influence on the RER, we proceed to estimate the following regression equation directly in line with that specified by Ahmed (2009).

$$RER_t = f(TOT_t, REMIT_t, CAP_t, LIB_t, GC_t)$$

It is expected that increases in all forms of capital inflows (ODA, FDI and REMIT) as well as Government expenditure would result in RER appreciation. Whilst it is expected that more liberalised trade would lead to the depreciation of the RER, an improvement in the terms of trade has an ambiguous effect on the RER for reasons mentioned earlier.

Tests of the data on the variables in the model specified above using the Augmented Dickey-Fuller test indicate that the levels of the data are non-stationary (see Table 2.) implying that the conventional method of ordinary least square cannot be used. This necessitates the use of the error correction model.

Table2: Unit root test for variables in the model

Variable	Dickey-Fuller	Dickey-Fuller(1st Difference)
RER	-1.45	-6.331
TOT	-2.511	-6.133
GC	-2.066	-4.199
LIB	-1.423	-4.915
REM	1.236	-5.327
CAP	-2.158	-6.571
Critical value 1%	-3.716	-3.723
Critical value 5%	-2.986	-2.989

* For each of the variables, the test statistic falls below both the 1% and 5% critical values of the Dickey-Fuller test thus the failure to reject the hypothesis of unit root. However, for the test in first difference the test statistics are all greater than the critical values. This indicates first difference stationarity of the variables.

4.2 Error Correction Model

Since it has been established in the analysis above that there is the presence of unit root in the data, the appropriate method of analysis to be used is the error correction approach. Thus we proceed by estimating the following error correction model.

$$\Delta Y_t = \alpha + \phi(Y_{t-1} - \curlyvee X_{t-1}) + B\Delta X_t + \varepsilon$$

Where Y_t, is our dependent variable and X_t, the set of explanatory variables.

The idea behind the error correction approach is that, different macroeconomic variables may trend up and down overtime, however, a linear combination of a group of them may be found to drift together in a similar direction. This method provides two significant insights. It enables us to estimate the long run relationship among time series economic variables and helps us figure out short term disequilibrium among the variables.

To achieve the above we first use the method of cointegration to determine if there exist any long run relationship between the RER and the explanatory variables (in particular remittances) using data from 1980 to 2010. In fact, the error-correction equation above can only be estimated if such a cointegrating relationship exists. The next step would involve estimating the short run relationship among the variables in the error correction model specified above. This is done by introducing the lagged error term from the long run equation as an explanatory variable in a first difference equation. This approach helps us determine the short run behaviour of the variables as they move towards their equilibrium values.

The results obtained using the data can then be used to compare results from similar studies undertaken by Sackey (2001) and Opoku-Afari (2004). Where there exist differences we point out the underlying reasons that would likely account for that. Most importantly, the studies mentioned above did not take into account remittances as a separate independent variable and thus our comparison would only be with

respect to the direction of influence (not the magnitude) of the coefficients of the other variables included in these studies.

5. Analysis and Results

5.1. Cointegration

The method of cointegration to be used here is the Johansen Cointegration Test. This method is generally preferred because of the number of variables involved in this study, unlike the Engle-Granger approach which is preferred in cases involving two or three variables. Though this approach is sometimes complex, it is less restrictive because it allows for more than one cointegrating equation.

Thus we proceed to estimate the long run relationship of the model specified above using the Johansen test for cointegration. Below are the results from the Johansen test for cointegration

Table 3: Long Run Equation (Normalise on lnRER)

Variable	Coefficient	Standard Error
lnTOT	-2.7637	0.4598
lnGC	-1.4716	0.3197
lnCAP	-0.0943	0.0274
lnREM	-0.0080	0.1188
Trend	0.1983	0.0271

As expected from our analysis, all the variables are consistent in terms of their sign (impact) on the real exchange rate. In the case of the terms of trade, Ghana is a price taker in the international market and does not have control over the prices of its exports. The long run analysis implies that an improvement in the TOT is related to an appreciation of the RER in the Ghanaian economy which suggests that the income effect outweighs the substitution effect. The nominal coefficient of -2.76 on the TOT indicates that a change in the TOT exerts a significant influence on the RER in the long run compared to the other variables in the model. This finding is not only consistent with theory but it also confirms the results from a similar study done in Ghana by Opoku-Afari et al (2004). They found that in a model where long term capital flows are included, the terms of trade has an appreciating effect on the real

exchange rate in the long run. Sackey's 2006 analysis, however, found that an improvement in the TOT leads to RER depreciation. This is not surprising because his model did not include any form of long term capital flow as an explanatory variable. A possible explanation for this, which was alluded to by Opoku-Afari et al (2004) is that, when long term capital flows such ODA and FDI are not included in a model for RER determination, it introduces omitted variable bias that makes the substitution effect of an improvement in the TOT outweigh the income effect and lead to RER depreciation.

It is important to note that, even though the liberalisation index (level of economic openness) is an important economic variable in the determination of the RER, it was not included in the long run conintegration relationship. This is because, when included, the variable enters with the wrong sign and also results in non-stationary residuals (which indicate the absence of cointegration).

Government consumption (GC) has an appreciating effect on the RER, which is consistent with theory. It suggests that government spending generally tends to be biased towards the non-tradable sector which leads to increased prices in this sector and subsequently RER appreciation. Studies by Sackey (2006) also confirms this, which is not surprising because the governments of most developing countries tend to be very active in the economy purchasing mostly non-tradable goods such as labour and services and thus increases the prices in the non-tradable sector.

Capital inflows generally, according to theory, result in the appreciation of the RER of the domestic economy. Our analysis confirms that, indeed, capital inflows (both other capital and Remittances) into the Ghanaian economy lead to RER appreciation in the long run. This corroborates similar analysis undertaken by Opoku-Afari et al (2006) which shows that Dutch disease is present in the Ghanaian economy. Thus even though capital inflows (and recently remittances) play an important role in the development agenda of Ghana, the other side of the Ghanaian economy (exports) maybe taking a hard hit from RER appreciation resulting from the increasing capital inflows, thus necessitating attention. A surprising observation however, is the small magnitude of the coefficients on the CAP and REM variables (-0.0943 and -0.008 respectively) i.e small than that of GC and TOT.

5.2 Short Run Equation

The short run dynamics of the RER may be different in some way from the long run relationship that exist between the RER and its fundamentals as established above because of the deviation in the short run from this equilibrium path due to the effect of transitory factors. In order to determine this short run relationship, we resort to the use of the error correction model. The idea is that even though short run relationship between the RER and its fundamentals may be different from its long run path there is always the tendency for it to move towards its long run path. Therefore, we proceed to estimate the following regression equation:

$$\Delta Y_t = \alpha + \phi \mathcal{E}_{t-1} + B \Delta X_t + \varepsilon$$

Where $\mathcal{E}_{t-1}$ represent lagged values of the residuals from the long run equilibrium equation estimated earlier with the rest of the variables in first difference. To accurately estimate the short run relationship among the variables and further ascertain the existence of long run equilibrium, it is important the residuals from the cointegration equation be stationary. To determine this, we implement a graphical test and Augmented Dickey-Fuller (ADF) and Phillip-Perron (PP) tests on the residuals.

Graph 3: Plot of Residuals
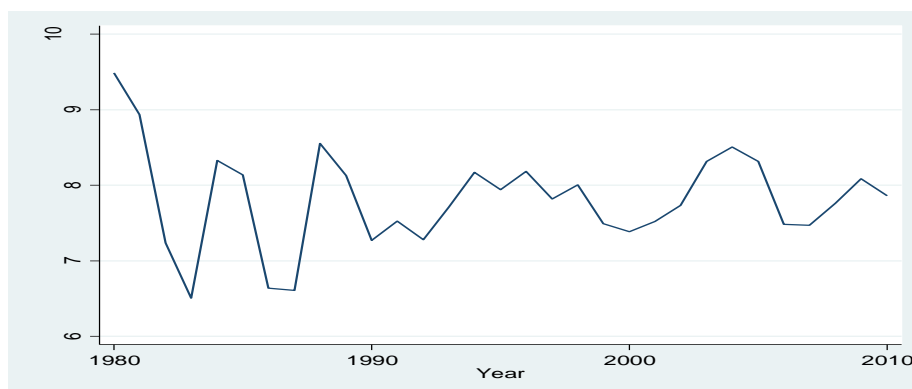
*This graph plots the residuals from the cointegration relationship established in the previous section.

The Impact of Remittances on the Real Exchange Rate:
                            Empirical Evidence from Ghana

Table 4: Test of Residuals

Augmented Dickey-Fuller test on residuals	-4.782
Phillips-Perron Test on residuals	-5.149
ADF and PP 1% critical value	-3.716
ADF and PP 5% critical value	-2.986

In the diagram above, the absence of any systematic pattern in the residuals means that the residuals are stationary in level (i.e the plot of the residuals do not have a consistently rising or declining trend). This is further affirmed by both ADF and PP test on the residuals indicated in the table above. The 5% and 10% critical values for ADF and PP tests are such that we reject the null hypothesis that there exist unit root in the residuals, thus, buttressing the graphical analysis that there is indeed cointegration.

With stationary residuals confirmed by the above analysis, we proceed to estimate the error correction model indicated above. Below are the results from the estimation of the error correction model.

Table 5: Short Run Equation (Error Correction Model)

Dependent variable: lnRER	Method: Least Squares (first difference)	Sample: 1980-2010	Number of Observation: 30	
Variable	Coefficient	Standard Error	t-statistic	Prob(Tail)
l.Res	-.6275649	.1737318	-3.61	0.001
Cons	4.906793	1.369968	3.58	0.002
lnTOT	-2.957273	.7671627	-3.85	0.001
lnGC	-.8532484	.6615627	-1.29	0.209
lnREM	.6903433	.2792514	2.47	0.021
lnCAP	-.0316214	.0407198	-0.78	0.445
R-squared	= 0.5719			
Adj R-squared	= 0.4827			
Root MSE	= 0.51803			

The estimation results in the table above indicate that overall, 57% of the short run movement in the RER can be explained by the above specified model. Again the above results fits considerably well with theory. The coefficient on the error term is negative and below one, indicating that though RER may diverge from its equilibrium path in the short run it tends to automatically correct itself towards the long run equilibrium path (about 60% correction towards equilibrium in the first period). Two of the variables indicated above are not significant at the 5% significance level, i.e government spending on non-tradable goods and other capital inflows. Thus, even though GC and CAP influence the RER in the long run their effect is not established in the short run analysis possibly because it takes several lags before these variables eventually affect the RER. TOT is seen to have a negative effect on the RER in the short run indicating that the income effect, even in the short run, still dominates the substitution effect of an improvement in the terms of trade. Surprisingly, remittances in this model is captured as having a positive effect on the RER in the short run which runs contrary to its appreciating effect on the RER in the long run revealed earlier in the Johansen cointegration test. To establish the reason for this contradictory result we perform a Granger causality test to determine the direction of causality between the RER and remittances in the short run.

Table 6: Granger Causality Test

Null Hypothesis:	lags	F-statistic	Probabilty
REM does not Granger cause RER	2	0.09	0.9153
RER does not Granger cause REM	2	1.46	0.2524

The Granger causality test results noted in the table above failed to establish any causal relationship between the RER and REM. Thus, even at the 10% significance level we fail to reject both null hypothesis that REM does not Granger cause RER and neither does RER Granger cause REM. The probable reason for the inability of the Granger causality test to establish any short run causal relationship is that the short run dynamics may be occurring at a rather high frequency (monthly or quarterly). However, because the Granger test involves lagged annual data, the test lacks the ability to pickup this short term effect. It could also well be the case that, there is some other variable that influences both variables in the short run, hence the failure of the Granger test to establish a short run causation.

6. Conclusion

Migrants send money back home for the benefit of their families and in some cases to finance business projects left behind. Remittances serve as a source of livelihood for many families in Ghana. What is least thought about is that the increasing flows of remittances into the country, even though beneficial, may have negative consequences on the economy as a whole.

This paper employed an error correction model approach to empirically test the relationship between real exchange rate (RER) and remittances in the Ghanaian economy. In the analysis above, it has been established that remittance inflows to Ghana, like most other capital inflows, is coincidence with an appreciation of the RER. This has the potential of making the export sector less competitive and this negatively affects production in the sector thus leading to Dutch disease.

While the inflows of remittances to the Ghanaian economy were found to be related to an appreciation of the RER in the long run, the short run analysis showed that an increase in remittance flows was correlated with real exchange rate appreciation. However, a short run causal relationship between the real exchange rate and remittance inflows could not be established. The long run analysis results obtained in the study above are in tandem with previous studies by Opoku-Afari et al (2006) whose focus generally was on total capital flows as opposed to remittances specifically.

The paper further revealed that, terms of trade (TOT), government spending (GC) and capital inflows (CAP) in the long run, result in the appreciation of the RER in the Ghanaian economy. The short run analysis, however, failed to provide significant results for CAP and GC but still affirmed the long run prediction that an improvement in the terms of trade was related to an appreciation of the RER suggesting that the income effect outweighs the substitution effect. The paper further revealed that, TOT, GC and CAP in the long run, result in the appreciation of the RER in the Ghanaian economy.

The analysis raises several important issues: the need to clearly understand the economic importance of remittances in the Ghanaian economy and in particular, the need for a careful study of the

consequences on the export sector as a result of RER appreciation resulting from the increasing flows of remittances. The level of remittances to Ghana has increased quite considerably in the last decade and this presents new opportunities as well as challenges. Though the intentions of most migrant remittances may be altruistic, large flows of remittances may have unintended consequences on the whole economy.

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