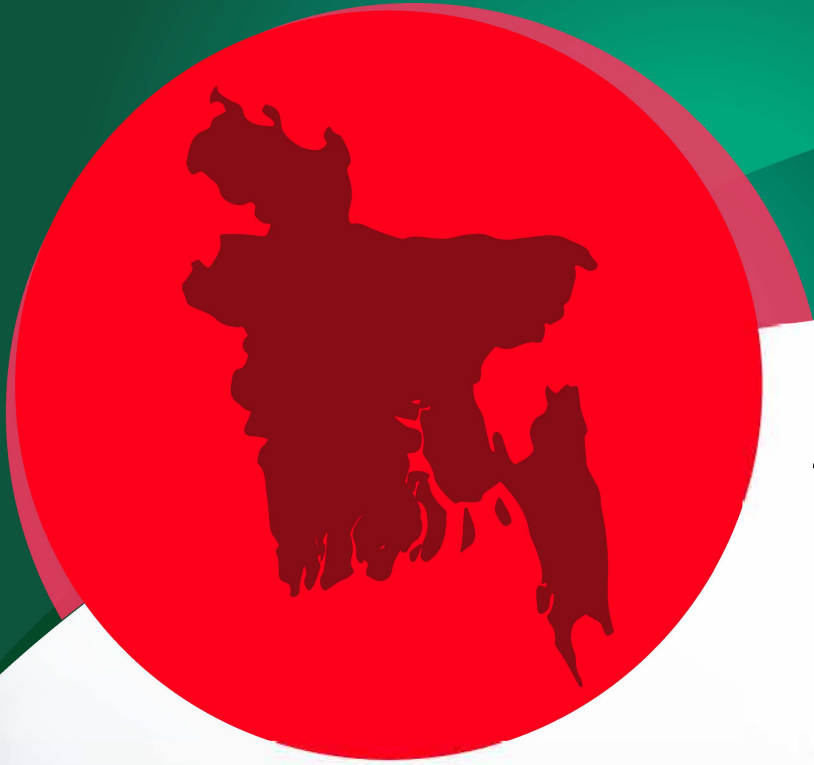


Volume 18
Number 1 & 2
Year 2016
ISSN 1529-0905



Journal of
**BANGLADESH
STUDIES**



CONTENTS

From the Editor	
Syed Saad Andaleeb	vi
The Future of Bangladesh: ICT Strategy and Technological Super-Convergence	
Haider A. Khan	1
Managing Political Violence	
Tazeen M Murshid	13
Dealing with the Local Level Power Structure: Findings from a Qualitative Study of Three Villages in Greater Faridpur District	
David Lewis and Abul Hossain	24
The Looming Non-Traditional Challenges to Security in South Asia: Restoring Ecological Integrity and Security	
Tariq A Karim	34
Are Remittances Utilised for Investment in Bangladesh?: A Cointegration and VECM Analysis	
Sifat I. Ishty and M. Wasiqueer Rahman Khan.	42
Tax Culture: The Bangladesh Perspective	
Sams Uddin Ahmed	56
Borders without Boundaries: Reimagining Asia (Occasional Paper)	
Rehman Sobhan	64

Are Remittances Utilised for Investment in Bangladesh?: A Cointegration and VECM Analysis

Sifat I. Ishty M. Wasiqur Rahman Khan

Department of Economics and Social Sciences, BRAC University

Abstract

This paper utilises a cointegration and vector error-correction model approach to investigate the connection between remittances and investment in Bangladesh. The long run positive association between remittances and investment which was found is in agreement with the literature. However, we also find evidence of a short-run negative relation between remittances and investment which might indicate that, in the short-run, remittances are used for non-investment purposes in the economy, a case reported for the first time in Bangladesh. Given the results we suggest that the authorities of Bangladesh take steps to encourage even further remittance inflows into the economy and in order to mitigate the short-run impact promote steps which may divert remittance into productive investments.

Key words: Bangladesh, Remittances, Investment, Cointegration.

JEL Classification: A10, E22, C32

1 Introduction

Over the past few decades, cross-border movements of individuals in the pursuit of better economic opportunities have become a near-universal phenomenon of the global economy, giving rise to a voluminous international circulation of income repatriation and remittances. As a result, concerned researchers, observers and policy makers have scrutinised the underlying effects and the causal economic consequences associated with such international transmissions of capital. As a key remittance receiving nation Bangladesh has also received attention in this regard (Chowdhury and Rabbi, 2014; Hossain and Hasanuzzaman, 2013). This paper examines a crucial macroeconomic aspect of remittance utilisation, namely its contribution to investment.

From the mid-1980s onwards the circulation of income repatriation and the movement of remittances were recognised as important aspects of globalisation and by 2017 remittance inflows were officially recorded to be as high as \$613 billion (World Bank). However, some studies have revealed that official records can underestimate the actual flow of remittances and report that unofficial remittance flows can be as high as 200% of the officially recorded amounts (Aggarwal et al., 2006).

For many developing countries remittances act as a macroeconomic stabiliser and a vital source of foreign exchange given that these flows are more steady than

portfolio equity and far exceed official development assistances (ODAs) provided to emerging countries (World Bank, 2014). Additionally, for a subset of least developed countries, remittance income has turned out to be a key source of finance for economic expansion. For instance, in 1986 the share of remittances was 2.02% of GDP whereas in 2008 it was 5.08% of GDP for a subset of least developed economies (Hossain and Hasanuzzaman, 2013).

The country of interest, Bangladesh, which is the main focus of this study is one of the world's major remittance receiving nations accounting for about 8% of GDP in 2015 (World Bank Development Indicators). Multiple influential studies have acknowledged the prominence of remittance income in Bangladesh for its role in enhancing household consumption, alleviation of poverty, stabilization of the macroeconomy and the economic expansion of the country (Ratha, 2013; Rao and Hassan, 2012). Alternatively, these same inflows of remittances were also seen to trigger Dutch Disease type effects in the economy of Bangladesh (Chowdhury and Rabbi, 2014). Thus, to be precise, the effect of remittances at the macro level and their contribution to the receiving economy as a whole is in fact reliant on the recipient households' tendency to consume and invest (Kireyev, 2006). As a result, the literature in this area comprises numerous views and has generated vigorous debate on how exactly remittance income is spent and contributes towards the development of recipient economies (Mallick, 2012; Adams and Cuecuecha, 2010).

As the aforementioned debate continues, at least three notable propositions or views from the literature can be mentioned. Firstly, and possibly the most prevalent view suggests that remittance recipient households treat remittance money just like a dollar earned as a wage or as an income from a farm (Adams et al. 2008). The second proposition is constructed on the notion of behavioural changes of the remittance receiving households (Chami et al. 2005). Specifically, it suggests that remittance receiving households are expected to use remittance income on consumption goods and forego investment goods. As a result, remittance income will likely have no positive impact on capital accumulation or investment and therefore on economic expansion. Finally, the third viewpoint is based on the concept of the permanent income hypothesis — wherein it is assumed that individuals base their consumption by determining their future income and not just by their current income — which reasons that households are more inclined to spend on investment goods, for example human and physical capital relative to consumption goods at the margin, as remittance incomes are more likely to be transient. For instance, it was observed empirically that remittance receiving households in El Salvador spend more on education and have higher school retention relative to the households receiving income from other sources (Edwards and Ureta, 2003).

Relatively little consideration has been given to the question of whether there is a possible link between remittances and the level of investment — at least from the viewpoint of Bangladesh. The one contribution we are aware of is by Hossain and Hasanuzzaman (2013) who utilised an ARDL approach and found a positive long-run relationship between remittances and investment in Bangladesh. Our paper, utilising a vector error correction approach confirms the long-run positive relationship found by Hossain and Hasanuzzaman and in addition finds evidence of a short-run negative relationship between the two. As part of their diagnostic tests, Hossain and Hasanuzzaman do examine the short-run effect of remittances on investment (Table 6, Hossain and Hasanuzzaman, 2013) but report statistically insignificant coefficients for the remittance variable. To our knowledge, a statistically significant short-run negative association between remittances and investment has previously not been reported in the literature on Bangladesh.

The nexus between remittances and the level of investment remains complex and hence requires careful investigation and robust analysis to ascertain whether

remittance income truly enhances the investment level of recipient economies. Specifically, from the stand-point of Bangladesh, there is no known research which has employed the techniques of Johansen Co-integration and the Vector Error Correction Model (VECM) in order to detect the long and the short-run associations of these variables. These econometric methodologies have received approval for their stronger ability to produce insightful results and for better forecasting power (Chowdhury and Rabbi, 2014). Therefore, a gap in the literature may be filled by this study which will employ the aforementioned techniques.

The paper is organised as follows. Section 2 will present the trends of remittance inflows along with their corresponding consequences in the economy of Bangladesh. Section 3 will provide a literature review of this issue followed by Section 4 which will provide the econometric methodologies and descriptions of the variables employed in this study. Section 5 will report and discuss the empirical results and Section 6 will provide the concluding remarks.

2 Trends and the Impact of Remittances – The Case of Bangladesh

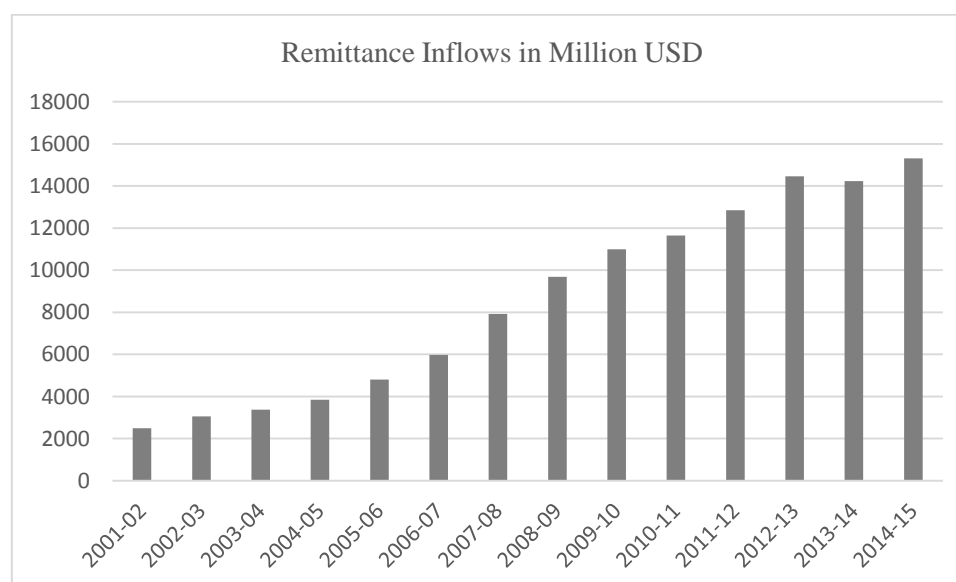
Tables one to four provide a contemporary snapshot of the prevailing remittance scenario of Bangladesh. From Table 1 it can be seen that while remittances as a percentage of GDP peaked in FY13 (9.64%) it dipped in the following two years. The most likely explanation would be political unrest in and restrictions on the import of Bangladeshi labour by a number of middle-eastern countries. The situation will likely improve with a return to stability and easing of such restrictions in the near future. As indicated in Table 4, Saudi Arabia, the United Arab Emirates and the United States account for the bulk of remittances received by Bangladesh. Tables two and three display time series of remittance inflows and the number of migrants leaving Bangladesh to work overseas respectively.

The importance of remittances in the economy of Bangladesh is evident from Chowdhury and Rabbi's finding that remittance inflows were as high as nine times foreign direct investment (FDI) and four times relative to total aid (Chowdhury and Rabbi, 2014). Bangladesh was ranked as the tenth largest recipient of remittances and 19th in terms of remittances as a share of GDP in 2009 (Ratha, et al., 2010).

Table 1: Remittances as a Percentage of GDP, Exports and Imports

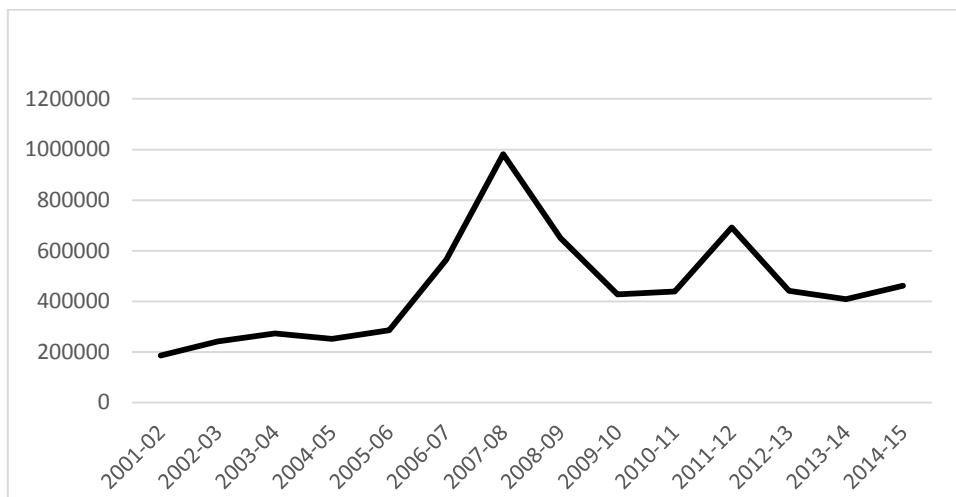
Fiscal Year (FY)	Remittances as a % of GDP	Remittances as a % of Export Earnings (FOB)	Remittances as a % of Import Payments (FOB)
FY 07	7.51	49.6	38.54
FY 08	8.64	55.93	40.62
FY 09	9.44	62.11	47.7
FY 10	9.52	67.8	46.29
FY 11	9.05	50.64	34.61
FY 12	9.63	53.58	38.59
FY 13	9.64	54.43	43.07
FY 14	8.21	47.8	42.38
FY 15	7.87	49.08	37.65

Source: Bangladesh Bank [BB] Quarterly Report- June 2016

Table 2: Remittance inflows to Bangladesh in Million USD

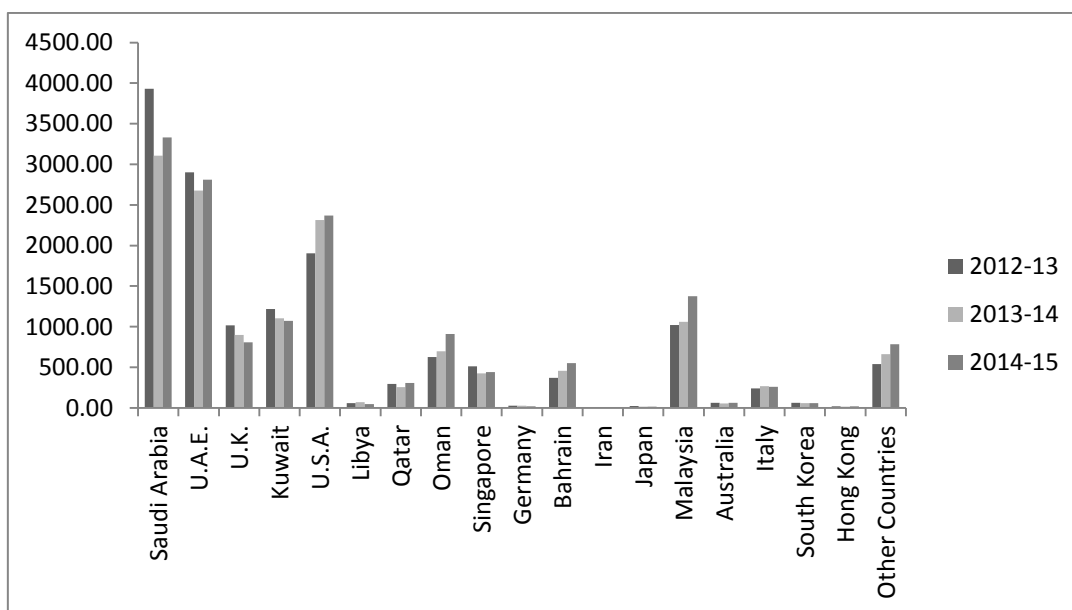
Source: BB

Table 3: Number of Bangladeshi migrants going overseas for employment



Source: BB

Table 4: Selected country-wise remittance inflows to Bangladesh for the period of 2012-13 to 2014-15 in million USD.



Source: BB

During the time of the ongoing global financial crisis in 2009, when other regions were experiencing stagnant growth of remittances, the growth of remittances in Bangladesh increased robustly at the rate of 24% (Azim and Kundu, 2015). Despite the crisis, which hit western financial markets and caused a worldwide economic down-turn, the Bangladesh economy still experienced a

stable flow of remittances. As a result, remittance income became prominent as a source of crucial external finance for the Bangladeshi economy and the Migration Policy Institute (MPI) revealed Bangladesh to be, along with Cape Verde, Pakistan and the Philippines as one of the least affected remittance recipient economies during the global financial crisis. Likewise, the credit worthi-

ness of Bangladesh also improved due to these inflows¹. The Standard and Poor's agency rated Bangladesh as B over the short-term and BB over the long-term, similarly Moody's rated Bangladesh as Ba3 in April 2010 (Chowdhury and Rabbi, 2014; Financial Express, 2010).

Remittance income has both micro and macroeconomic effects. The World Bank estimated the poverty head-count ratio of Bangladesh to have dropped by 6% between the period of 1960-2006 due to the influx of remittances into the economy (World Bank, 2006). Furthermore, remittance income was recognised as an influential source for maintaining the current account surplus and also for supplementing the GDP growth of Bangladesh over the period of 2006-2011 (Chowdhury and Rabbi, 2014). However, there are also adverse effects of remittances which have been reported in the literature. Chowdhury and Rabbi (2014) confirmed that the heavy influx of remittances appreciated the real exchange rate of Bangladesh and consequently weakened the international trade competitiveness of the economy relative to its major trading partners, a Dutch Disease type effect caused by the fact that a major proportion of remittance income was utilised in the consumption of non-tradable goods, which consequently appreciated the real exchange rate of Bangladesh by reducing the relative price of tradable to non-tradable goods.

Needless to say, the contribution and the causal effects of remittances would have been bigger in magnitude if the total remittance flows — both official and unofficial— were included. The aforementioned records of remittances are based on the official flows only and do not include unofficial flows. Reportedly, a substantial part of remittances enter the economy through various informal channels such as the *Hawala* or the *Hundi* system which is a prominent medium of remitting money in South Asia (Chowdhury and Rabbi, 2014). Although constrained to data consisting of official flows of remittances only, this study will still try to shed light on the nexus between remittances and the level of investment.

3 Literature Review

In this section we will note some of the influential studies which link remittances to the level of investment of the receiving economy. Glystos (2002), by employing a simple dynamic simultaneous model, showed that remittances were positively correlated with investment in six out of the seven countries examined in the study. By analysing a household survey of Pakistan, Adams (2003) found that the marginal propensity to save for remittance receiving households was 0.71 relative to a marginal propensity to save of 0.08 in the case of

households with rental incomes. Essentially, the author highlights the significance of remittance income, which he views to be more transient in nature, towards the accumulation of savings which then contributes to investment related activities. Osili (2004) found that a significant proportion of remittance income is invested on housing in Nigeria with a 10% rise in the inflows of remittances leading to a 3% increase in the probability of investing in the housing sector. Adams (2005) also inspected the expenditure patterns of both rural and urban households of Guatemala and found that 58% of marginal income was spent on education by remittance receiving households relative to non-remittance receiving households. In a review of the empirical literature, Lucas (2005) concluded that remittances positively augmented the level of investment in some major developing countries. Likewise, in a study conducted by Mishra (2006), based on the experiences of thirteen Caribbean countries, it was statistically confirmed that a 1% increase in remittances generated a 0.6% increase in the domestic private investment of the Caribbean countries. Ziesemer (2012) hypothesised a possible savings channel relating remittances with economic growth, empirically showing remittances to enhance savings for economies with a GDP per capita below \$1200.

The literature also comprises of studies which have suggested that remittances are primarily utilised for private and unproductive consumption and not used for investment or towards augmenting productive capacity (Chami et al., 2005 and Mallick, 2012). Chami et al. (2005) revealed that remittances trigger a dependency syndrome and create a moral hazard problem in the receiving economy. They argued that the transfer of remittances induced the recipients to use them as a substitute for labour income, which consequently lowered their work effort and increased the volume of unproductive investment and conspicuous consumption. Thus the moral hazard problem created an adverse impact on the economy as the remittances, in contrast to private capital flows, tended to be only compensatory in nature.

Other studies have concluded that remittances instigate an undesired tendency for leisure and trigger demand for reservation wages among the recipient households, subsequently impacting the labour supply of the economy and diminishing the productivity of the labour force (Acosta et al., 2007). An empirical analysis by Kireyev (2006) to determine the macroeconomic impact of remittances in Tajikistan revealed an ambiguous overall economic impact, stating that the overall influence predominantly relied on the structural characteristics of the recipient economy, specifically its investment and consumption patterns. By adopting an error correction model and dynamic ordinary least

squares (DOLS) approach, Mallick (2012) revealed that remittances crowded out private investment in India and hypothesised that excessive private consumption and withdrawal of resources from investment resulted in such a situation. Das (2009) examined the effects of investment and economic growth due to the inflows of remittances and grants in Pakistan and Syria. He suggests a positive relationship between grants and investments but empirically fails to establish a relationship between remittances and investment.

Few studies have attempted to analyse the association of investment and remittances in Bangladesh. In particular, there are no known studies that have adopted and combined the estimation techniques of Johansen cointegration analysis and Vector Error Correction Modeling with the purpose of investigating the long and short-run association between investment and remittances in what is one of the world's largest recipients of remittances. Certainly this gap in the literature needs to be filled. Given that both the theoretical and empirical literature suggests that remittances may have either a positive or negative association with investment, the objective of this study is to vigorously examine the nature of the relationship in the context of Bangladesh by employing robust econometric analysis as discussed in the following sections.

4 Methodology

4.1 Empirical Specification and Variable Description

To analyse the association between investment and remittances in Bangladesh we estimate the following standard dynamic specification:

$$LINV_t = a + \beta_1 LREMIT_t + \sum_{j=1}^n \beta_j X_{jt} + \varepsilon_t \quad (1)$$

Where, $LINV$ and $LREMIT$ are the natural logarithms of investment and remittances respectively and X_{jt} is the vector of explanatory variables, ε_t is the error term and t corresponds to the time subscript which represents the period from 1980 to 2015.

The literature identifies a number of determinants of investment in developing countries. We base our choice of determinants on the papers of McKinnon (1973), Serven and Solimanto (1992), Bjuggren et al., (2008), Balde (2011) and Hossain and Hasanuzzaman (2013). Thus, in addition to remittances we include the real interest rate, domestic savings and GDP per-capita in our set of controls. The relevance of the chosen variables is discussed in section 4.2. We use gross-fixed capital formation as a proxy of the dependent variable investment.

Unit root tests on the variables used in this study indicated that they were all integrated of order one. First-differencing in order to eliminate the non-stationarity would have obscured the long-run effects in which we are interested along with the short-run relationship, a fact pointed out by Aron et al. (1997). Therefore, to be able to assess both the long and short-run effects, we adopt a cointegration approach in our analysis, namely the vector error correction model (VECM). However, the presence of multiple cointegrating vectors in our set of variables precluded us from including them all in a single VECM framework, therefore, following Chowdhury and Rabbi (2014) and Aron et al. (1997) we estimate two different parsimonious versions of equation (1). With investment as the dependent variable and retaining remittances and savings in both models we incorporate the real interest rate in the first model (Model 1) and the real GDP per capita in the second model (Model 2).

The dataset was compiled from the World Development Indicators 2017 of the World Bank Group and the analysis here comprises of the annual data for Bangladesh from the period of 1980 to 2015, so the investigation will be based on a sample size of 36 yearly observations. The dataset compiled for investment (variable name: $LINV$) is based on gross fixed capital formation expressed as a percentage of GDP, data for remittances (variable name: $LREMIT$) and gross domestic savings (variable name: $LSAVINGS$) are also represented as a percentage of GDP and all three are in natural logarithms. The data for real interest rate (variable name: $REALINT$) is based on the country's lending rate adjusted for inflation as measured by the GDP deflator. Finally, the data for real GDP per capita (variable name: $LGDPCAPITA$) is based on constant 2010 US Dollars and expressed in natural logarithms.

This study has adopted the techniques of Johansen and Juselius (1990) and the Vector Error Correction Model (VECM) for empirical analysis due to their stronger ability to estimate both the short-run and potential long run dynamic relation and superior forecasting power (Chowdhury and Rabbi, 2014). In order to conduct a robust analysis and to evade spurious results the testing procedures will include the general diagnostic tests and other prerequisite assessments like stationarity check of the variables.

4.2 A Priori Expectations and Inferences of the Explanatory Variables under Study

The expected sign of the correlation between remittances and the investment level is ambiguous. On the one hand, as documented by Adams (2007), remittance recipient households on average save and invest more in

comparison to non-remittance receiving households. Furthermore, apart from direct investment by recipients or migrants, remittance influxes are also recognised as enhancing consumption which may influence investment demand through multiplier effect (Glytsos, 2002). On the other hand, if remittances are predominantly driven by altruistic motives and act purely as compensatory transfers then it potentially might have an adverse impact. For instance, if such remittances are primarily spent on private consumption rather than on productive investment, there may be a negative or no significant relationship with domestic investment in the recipient economy (Mallick, 2012, Chami et al., 2005).

We expect gross domestic savings to be positively related to investment given that higher savings correspond to greater bank credit, a crucial basis of investment capital financing. Furthermore, a positive relationship between GDP per capita and investment is expected in light of the standard macroeconomic accounting identities.

The expected sign of the relation between the real interest rate and the level of investment is again ambiguous. According to neo-classical theory, the real interest rate is hypothesised to have an expected negative relationship with investment, an idea based on the notion that high interest rates, which correspond to increased debt servicing for borrowers, diminishes the incentive for entrepreneurial activities. However, McKinnon (1973) and Shaw (1973) hypothesise that higher interest rates actually induce greater savings, thereby expanding the availability of domestic credit and resulting in greater investment related activities.

5 Empirical Results and Discussion

5.1 Stationarity Tests

We carried out Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) stationarity tests on all of our variables of interest. For the ADF test, the lag-length was determined using the Schwarz Information Criterion while band selection for the PP test was based on Newey-West. Unit roots, detected at level terms, were found in the time-series of all the variables. The roots were eliminated after first-differencing implying that all the variables were integrated of order 1 i.e. $I(1)$. The full table of results (Table A1) can be found in the statistical appendix.

5.2 Johansen Co-Integration Test

With all the variables being $I(1)$ we employed the Johansen test in order to investigate if there exists a

stable and non-spurious co-integrating association between the variables in the long-run. The test formally uses both Trace and Maximum Eigenvalue statistics in order to establish and determine the number of co-integrating vectors. The results of these tests for both models are shown in the statistical appendix (Table A2) and indicate the presence of a co-integrating vector in each model. This result implies that there indeed exists a stable long-run association between the variables which is brought about by means of an error correction mechanism via some short-run dynamic adjustment process.

5.3 VECM Results

The presence of one co-integrating vector in both models, detected by the co-integration test, essentially indicates the existence of a long-term relationship between investment, remittances, domestic savings, the real interest rate and real per capita GDP of Bangladesh. The results of the normalised co-integrating coefficients, where all the variables are found to be statistically significant, are reported in Table 5 below. As part of standard econometric practice we inspected the data for structural breaks. The presence of such a break was found in the data series of Model 1 for the year 1986, which was confirmed by a multiple structural break test (using Eviews 8). While the structural break was an artefact of the dataset, the year 1986 also corresponds to the formal end of martial law in Bangladesh which was instigated in 1982. We therefore created a dummy variable, *break1986*, and incorporated it in the VECM analysis as an exogenous variable. Clearly, from the co-integrating equations it can be noticed that the results show a positive relationship between remittances and investment in the long-run, which is interpreted as a 1% increase in remittance inflows causing a 0.36% and 0.26% rise in investments in models 1 and 2 respectively. Our findings are in line with the existing literature (Adams, 2003; Hossain and Hasanuzzaman, 2013) which also indicates remittance inflows, coming in the form of capital flows, to positively influence the investment levels of the economy. The signs of the remaining variables, savings and real interest rate in Model 1, and savings and per capita GDP in Model 2, have the expected signs and hence plausible economic interpretations. Certainly savings, which is a major source of capital stock, plays a crucial role in generating investment, and our findings, where we see a positive relation between savings and investment provides evidence for this hypothesis. Our results also corroborate the neo-classical hypothesis of a negative relation between investment and the interest rate. As per a-priori expectations, per capita GDP is also positively associated with investment.

Table 5: VECM Results

Co-integrating Equation (Long-run)				
Model 1	LINV _{t-1}	LREMIT _{t-1}	LSAVINGS _{t-1}	REALINT _{t-1}
	1.000000	0.358165 (0.01263)*	0.757764 (0.03531)*	-0.006644 (0.00166)*
Model 2	LINV _{t-1}	LREMIT _{t-1}	LSAVINGS _{t-1}	LGDPCAPITA _{t-1}
	1.000000	0.257673 (0.06079)*	0.642791 (0.03955)*	0.737931 (0.23086)*

Note: (i) The dependent variable of investment is interpreted as a LHS (Left hand side) variable in the model, therefore the RHS (Right hand side) coefficients are multiplied by -1 (Jauplari, 2013).

(ii) Figures in parenthesis represent the standard errors.

(iii) *, ** and *** represents statistical significance respectively at 1%, 5% and 10% significance level.

Error Correction Model (Short-run)		
	Model 1 $\Delta LINV$	Model 2 $\Delta LINV$
ECT _{t-1} (Speed of Adjustment)	-0.461793 (0.10025)*	-0.162406 (0.07246)*
$\Delta LINV_{t-1}$	-0.038498 (0.16055)	0.076560 (0.19403)
$\Delta LINV_{t-2}$	-0.326209 (0.15045)**	0.106131 (0.16665)
$\Delta LREMIT_{t-1}$	-0.143267 (0.04921)*	-0.012748 (0.03755)
$\Delta LREMIT_{t-2}$	-0.010554 (0.04004)	0.021470 (0.04206)
$\Delta LSAVINGS_{t-1}$	-0.247012 (0.09094)**	0.037061 (0.05990)
$\Delta LSAVINGS_{t-2}$	-0.034567 (0.02481)	0.006266 (0.02486)
$\Delta REALINT_{t-1}$	-0.000225 (0.00103)	-----
$\Delta REALINT_{t-2}$	-0.002321 (0.00091)**	-----
$\Delta LGDPCAPITA_{t-1}$	-----	0.792411 (0.42108)***
$\Delta LGDPCAPITA_{t-2}$	-----	-1.011622 (0.42489)**
C	0.067413 (0.02054)*	0.063466 (0.02033)*
BREAK 1986	0.068765 (0.02299)*	-----

Note: i) Figures in parenthesis represent standard errors.

ii) *, ** and *** represents statistical significance respectively at 1%, 5% and 10% significance level.

iii) Included observations: 33 after adjustments.

Essentially, the outcomes of the parsimonious error correction models, reported in Table 5 above, can be regarded as providing reliable estimations and a fair representation of the case under analysis. This is because the coefficients of the error correction terms, representing the speed of adjustment towards the long-run equilibrium, are seen to have expected negative signs and are also statistically significant at the 1% level. This confirms the stability of the system and suggests a long-run causality running from the explanatory variables to the dependent variable (investment). The error correction terms indicate that approximately 46% and 16% of the deviation of investment from its long-run equilibrium is corrected in the short-run as per models 1 and 2 respectively. Additionally, it is worthwhile to mention that the large absolute values of the coefficients of the error correction terms represent equilibrating agents removing a significant percentage of disequilibrium in each period, indicating a rapid speed of adjustment. Moreover, the coefficients of the first differenced regressors of the error correction models represent the influence of the explanatory variables on investment in the short-run, providing an effective assessment of the short-run properties of the co-integrated variables.

A short-run negative relationship between remittances and investment can be observed under both lags in Model 1, though the coefficient on the second-lag is not statistically significant.

When we turn our attention to Model 2 we still find a negative relationship between remittances and investment under the first lag but a positive relationship under the second with neither being statistically significant.

Focussing on the signs of the lagged remittance coefficients in the error-correction models, we note that three out of four are negative. This pointedly hints at an inverse relationship between remittances and investment in the short-run, a result hitherto unreported in the literature within the context of Bangladesh, though such a crowding out result was reported for India by Mallick (2012). We believe these results should motivate further in-depth analyses of how remittances are actually utilised in the short-run in Bangladesh. As mentioned earlier, it is possible that this is an outcome of remittances being mainly used for private or unproductive consumption in the short-run. Based on a household survey, De Bruyn (2006) found that the bulk of remittances in Bangladesh are used for consumption rather than in business or savings. Our results could be the first empirical evidence pointing to such a phenomenon in Bangladesh's macroeconomy. In any case, this warrants further research.

The coefficients of real interest rate show the expected negative sign in the short-run in Model 1,

however, contrary to the long-run estimates, the coefficient of savings in the same model shows a negative correlation with investment in the short-run which is in contrast to Model 2 which shows a positive relationship, albeit statistically insignificant.

Turning to the coefficients on per-capita GDP in Model 2, we note that per-capita GDP has a positive association with investment in the short-run under the first lag which then becomes negative under the second, a finding consistent with Hossain and Hasanuzzaman (2013). This possibly indicates that in the second period, income is diverted away from expenditure on capital formation.

5.4 Diagnostic Tests

We complement our analysis through employing some supplementary diagnostic tests on both models. Specifically we test the residuals for serial correlation, the presence of heteroscedasticity and whether or not they are normally distributed. In this regard we utilise the VEC LM (Lagrange Multiplier) and Breusch-Godfrey LM tests to detect the presence of serial correlation, Breusch-Pagan-Godfrey's test for heteroscedasticity and the Jarque-Bera test for normality. According to the tests the residuals from both models exhibit no serial correlation, are not heteroscedastic and are normally distributed, all of which are desirable outcomes. Once again the test results are shown in the statistical appendix (Table A3).

6 Concluding Remarks, Policy Recommendations and Suggestions for Future Research

The primary objective of this study was to identify the long-run and short-run relationship, if any, between remittances and investment in Bangladesh using a vector-error correction framework. To the best of our knowledge this is the first time such an approach has been applied within the context of Bangladesh. We find a stable long-run relation between the variables of interest, which is in agreement with the literature. Interestingly, the parsimonious error correction models revealed the presence of a negative association to exist in the short-run between remittances and domestic investment. This latter result is in agreement with the Indian case as reported by Mallick (2012) and may be explained by the non-utilisation of remittances in productive investments in the short-run, a pattern of expenditure observed by DeBruyn (2006). As mentioned earlier, various sources have pointed out that official remittance inflows underestimate true amounts because a significant proportion of remittances enter countries

through unofficial channels, this is the main limitation of the current analysis and any future investigation would have to account for this discrepancy.

The contrasting nature of the long-run and short-run results prompts us to suggest that the Bangladesh authorities take steps to divert remittances into productive investment in the short-run while continuing to maintain and enhance the overall inflow of remittances into the economy in the long run. In order to achieve the latter, the government may take steps to ensure migration of more skilled workers who would be able to earn and therefore remit greater amounts, facilitate and ease the migration of more female workers, explore labour markets outside of the traditional markets of the Middle-East and Southeast Asia such as the Americas and Eastern Europe and persuade expatriate workers to remit money through legal channels by promoting electronic transfers with reasonable surcharge. To encourage migrants to channel their remittance funds into more productive sectors of the economy we echo Wadood and Hossain (2017) who suggest the creation of new savings instruments for that purpose and incentives (like tax breaks) for direct investment in infrastructure and employment generating businesses.

However, truly effective and nuanced policy needs to be based on more comprehensive information which would require further research. As it is important to know the precise nature of the utilisation of remittances it is essential to conduct microeconomic studies of remittance usage behaviour at the household level to complement the macroeconomic studies done so far. A cohort analysis, using panel data gleaned from all available Household Income and Expenditure Surveys (HIES) of Bangladesh, to ascertain the patterns of remittance usage represents a feasible and immediate undertaking (at the time of writing, the newest 2016 Household Income and Expenditure Survey dataset for Bangladesh has not been officially released). In the longer term, a series of narrowly focussed micro-impact surveys, which would provide more precise usage information, could be carried out to inform policy making.

We would like to conclude by mentioning an increasingly important facet of the global dynamic of remittances which we feel the Bangladesh authorities ought to actively take into consideration in formulating comprehensive policies regarding remittance utilisation, namely the gender aspect of remittances. An increasing volume of literature (DeLaet, 1999; Pessar and Mahler, 2003; Piper, 2008; Rahman, 2013) has highlighted the importance of female migrants both as senders of remittances and as influencers of how they are used. The gender aspect of remittances needs to be further researched and the conclusions incorporated into policy design.

Endnote

1. Rating agencies account for flows of remittances and monitor its share as a percentage of GDP before forming rating decisions (Ratha et al. 2010)

References

- Acosta P, Fajnzylber P, Lopez H (2007) "The impact of remittances on poverty and human capital: evidence from Latin American household surveys", *Policy Research Working Paper Series 4247*, the World Bank, Washington DC
- Adams Jr., Richard H. & Cuecuecha, Alfredo (2010). "Remittances, Household Expenditure and Investment in Guatemala", *World Development*, Elsevier, vol. 38(11), pages 1626-1641
- Adams R. H. Jr. (2007) "International Remittances and the Household: Analysis and Review of Global Evidence." *World Bank Policy Research Working Paper* 4116.
- Adams RH (2003) "International migration, remittances, and the brain drain: a study of 24 labor-exporting countries", vol 3069. *World Bank Publications*, Washington, DC
- Adams, Richard H. Jr., Cuecuecha, Alferdo, Pahe, John (2008), "Remittances, Consumption and Investment in Ghana". *Policy Research Working Paper* 4515. The World Bank Development Economics Department & Africa Region February 2008.
- Adams, Richard H. Jr., (2005). "Remittances, household expenditure and investment in Guatemala", *Policy Research Working Paper Series* 3532, The World Bank.
- Aggarwal, R., Demirguc-Kunt, A. and M. Peria, (2006), "Do Workers' Remittances Promote Financial Development?" *World Bank Policy Research Working Paper* No.3957, Washington: World Bank.
- Aron, Janine; Ibrahim Elbadawi; Brian Kahn (1997), "Determinants of the Real Exchange Rate in South Africa", WPS/97-16, Centre for the Study of African Economies, Institute of Economics and Statistics, University of Oxford
- Azim, NHM A. and Kundu, Nobinkhor (2015), "Workers' Remittances of Bangladesh during the Global Financial Crisis and Beyond: A Static Panel Data Analysis" *The Jahangirnagar Journal of Business Studies*, Vol. 5, No.1
- Balde, Y (2011) "The impact of remittances and foreign aid on savings/investment in sub-saharan Africa". *Afr Dev Rev* 23(2):247-262

- Bangladesh Bank Statistics: Central Bank of Bangladesh. Economic Data. Website: <http://www.bangladesh-bank.org/econdata/index.php>.
- Bjuggren et al., (2008), "Remittances and Investment". Department of Economics and Statistics Jönköping University, Sweden and Centre for Labour Market Policy (CAFO) Department of Economics and Statistics Växjö University, Sweden. Available at: <http://www.diva-portal.org/smash/get/diva2:240855/FULLTEXT01.pdf>
- Chami, Ralph; Connel Fullenkamp and Samir Jahjah (2005). "Are Immigrant Remittance Flows a Source of Capital for Development?" *IMF Staff Papers* 52, No. 1:55-81
- Chowdhury, Mamta B and Rabbi, Fazle (2014), "Workers' Remittances and Dutch Disease in Bangladesh". *The Journal of International Trade & Economic Development: An International and Comparative Review*, 23:4, 455-475, DOI:10.1080/09638199.2012.738240
- Das, Anupam (2009). —The Effect of Transfers on Investment and Economic Growth: Do Remittances and Grants Behave Similarly? <https://economics.ca/2009/papers/0134.pdf>
- DeBruyn, Tom (2006), Dynamics of Remittance Utilization in Bangladesh, BASUG (2006),
- Forum on "Remittances and Expatriates: Development in Bangladesh"
- DeLaet, D. L. (1999). Introduction: The Invisibility of Women in Scholarship of International Migration. In G. A. Kelson, & D. L. De Laet (Eds.), *Gender and Migration*. London: Macmillan Press Ltd.
- Dickey, D. and W. Fuller, (1979). Distribution of the estimators for autoregressive time series with a Unit Root. *Journal of the American Statistical Association*, 74(366): 427-431.
- Edwards, Alejandra Cos and Manuelita Ureta. (2003) "International Migration, Remittances, And Schooling: Evidence From El Salvador," *Journal of Development Economics*, 2003, v72 (2, Dec), 429-461.
- Glytsos NP (2002) The role of migrant remittances in development: evidence from Mediterranean countries. *IntMigr* 40(1):5–26
- Hossain A.K.M Nurul and Hasanuzzaman Syed, (2013) "Remittances and investment nexus in Bangladesh: an ARDL bounds testing approach", *Int Rev Econ* (2013) 60:387–407
- IMF (2005) World economic outlook. International Monetary Fund, Washington, DC
- Jaupllari Soana, (2013). An Assessment of Demand for Imports through the VECM Model. Scientific Papers (www.scientificpapers.org) Journal of Knowledge Management, Economics and Information Technology.
- Johansen, S., and Juselius, K., 1990, "Maximum Likelihood Estimation and Inference on Cointegration – with Applications to the Demand for Money," *Oxford Bulletin of Economics and Statistics*, Vol. 52, No. 2, pp. 169–210.
- Kireyev, A. (2006). 'The Macroeconomics of Remittances: The Case of Tajikistan,' *IMF Working Paper*, WP/06/2.
- Lucas, REB (2005) "International migration and economic development: Lessons from low-income countries". Edward Elgar Publishing, London
- Mallick, Hrushikesh (2012). "Inflow of remittances and private investment in India", *Singapore Econ. Rev.*, 57, 1250004 (2012).
- McKinnon RI (1973) "Money and capital in economic development". Brookings Institution Press, Washington, DC
- Mishra, P (2006) "Emigration and Brain Drain: Evidence from the Caribbean", International Monetary Fund WP/06/25
- Osili UO (2004) "Migrants and housing investments: theory and evidence from Nigeria". *Econ Dev Cult Change* 52(4):821–849
- Pessar, Patricia R., Sarah J. Mahler,(2003), "Transnational Migration: Bringing Gender In", *IMR* vol. 37, no.3: 812 – 846
- Phillips, P.C. and P. Perron, (1988). "Testing for a unit root in time series regression". *Biometrika*, 75(2): 335-346
- Piper, Nicola, (2008), "Feminisation of Migration and the Social Dimensions of Development: the Asian Case", *Third World Quarterly*, vol. 29, issue 7: 1287 – 1303
- Rahman, Md. Mizaur,(2013), "Gendering Migrant Remittances: Evidence from Bangladesh and the United Arab Emirates", *International Migration*, vol. 51 (S1): 159 – 178
- Rao, B. and Gazi Hassan, (2012), "Are the Direct and Indirect Growth Effects of Remittances Significant?" *The World Economy*, 2012, vol. 35, issue 3, 351-372
- Ratha, D., (2013), "The Impact of Remittances on Economic Growth and Poverty Reduction". Migration Policy Institute Policy Brief. Available at: <http://www.migrationpolicy.org/research/impact-remittances-economic-growth-and-poverty-reduction>

- Ratha, D., Mohapata, S., and A. Silwal, (2010), "Outlook for Remittance Flows 2010-11" Migration and Development Brief 12, Development Prospects Group, World Bank.
- Serven L, Solimano A (1992) "Private investment and macroeconomic adjustment: a survey". World Bank Res Obs 7(1):95–114.
- Shaw E (1973) "Financial Deepening in Economic Development". Oxford University Press, New York
- The Financial Express (2010) "S&P Gives Bangladesh 'BB-' Long-Term Rating" available on the internet at: <http://www.thefinancialexpress.bd.com/more.php?newsid=9708587&date=2010-04-07>
- Wadood, S.N., Hossain, A. (2017). "Microeconomic impact of remittances on household welfare: Evidence from Bangladesh", *Business and Economic Horizons*, 13(1), 10-29, <http://dx.doi.org/10.15208/beh.2017.02>
- Woodruff C, Zenteno R (2007) "Migration networks and microenterprises in Mexico". *J Dev Econ* 82(2):509–528.
- World Bank, (2014) <http://siteresources.worldbank.org/INTPROSPECTS/Resources/334934-1288990760745/MigrationandDevelopmentBrief22.pdf>
- Ziesemer, Thomas (2012). "Worker remittances, migration, accumulation and growth in poor developing countries: Survey and analysis of direct and indirect effects". *Economic Modelling*, Elsevier, vol. 29(2), pages 103-118.

Statistical Appendix

Table A1: Stationarity Tests

Test		LINV	LREMIT	LSAVINGS	REALINT	LGDPCAPITA
Augmented Dickey Fuller (ADF) Test Statistic	Level	-3.096961	-1.511619	1.569718	-0.999552	0.666782
	First Difference	-7.720077*	-4.799738*	-19.09717*	-9.071186*	-7.498411*
	Order of Integration	I(1)	I(1)	I(1)	I(1)	I(1)
Phillips Peron Test Statistic	Level	-1.992597	-1.509502	2.768116	-1.603503	0.713118
	First Difference	-7.697291*	-4.698637*	-14.90204*	-12.22975*	-7.281362
	Order of Integration	I(1)	I(1)	I(1)	I(1)	I(1)

Note: *, ** and *** represents No Unit Root respectively at 1%, 5% and 10% significance level

From the table it can be seen that the null hypothesis of a unit root for all the time series at level terms could not be rejected by either test, since the test statistic values in absolute terms are significantly less than the critical values at all 1%, 5% and 10% levels of significance. Therefore, in order to eliminate the non-stationarity of the variables the technique of differencing was

applied and the stationarity tests were repeated on the first differences of the all the variables. After doing so, the null hypothesis of a unit root was rejected at the critical values of 1%, 5% and 10% for both tests. Thus, all the variables in this study are integrated of order 1 i.e. I(1).

Table A2: Johansen Co-integration Test

Model 1					
Variables: LINV, LREMIT, LSAVINGS, REALINT					
Trace Test					
Null Hypothesis	Alternative Hypothesis	Eigen-Value	Trace Statistic	0.05 Critical Value	P-values
r=0*	r=1	0.638053	56.84958	47.85613	0.0057
r≤1	r=2	0.440834	23.31309	29.79707	0.2310
r≤2	r=3	0.091725	4.129878	15.49471	0.8928
r≤3	r=4	0.028525	0.955025	3.841466	0.3284

Note: i) Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
 ii)*denotes rejection of the null hypothesis at the 0.05 level
 iii) MacKinnon-Haug-Michelis (1999) p-values

Maximum Eigenvalue Test					
Null Hypothesis	Alternative Hypothesis	Eigen-Value	Max-Eigen Statistic	0.05 Critical Value	P-values
r=0*	r=1	0.638053	33.53650	27.58434	0.0076
r≤1	r=2	0.440834	19.18321	21.13162	0.0917
r≤2	r=3	0.091725	3.174853	14.26460	0.9344
r≤3	r=4	0.028525	0.955025	3.841466	0.3284

Note: i) Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
 ii) denotes rejection of the null hypothesis at the 0.05 level
 iii) MacKinnon-Haug-Michelis (1999) p-values

Model 2					
Variables: LINV, LREMIT, LSAVINGS, LGDPCAPITA					
Trace Test					
Null Hypothesis	Alternative Hypothesis	Eigen-Value	Trace Statistic	0.05 Critical Value	P-values
r=0*	r=1	0.817227	83.49660	47.85613	0.0000
r≤1	r=2	0.426034	27.41284	29.79707	0.0919
r≤2	r=3	0.235861	9.091763	15.49471	0.3570
r≤3	r=4	0.006481	0.214567	3.841466	0.6432

Note: i) Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
 ii)*denotes rejection of the null hypothesis at the 0.05 level
 iii) MacKinnon-Haug-Michelis (1999) p-values

Maximum Eigenvalue Test					
Null Hypothesis	Alternative Hypothesis	Eigen-Value	Max-Eigen Statistic	0.05 Critical Value	P-values
r=0*	r=1	0.817227	56.08376	27.58434	0.0000
r≤1	r=2	0.426034	18.32108	21.13162	0.1183
r≤2	r=3	0.235861	8.877196	14.26460	0.2965
r≤3	r=4	0.006481	0.214567	3.841466	0.6432

Note: i) Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
 ii) denotes rejection of the null hypothesis at the 0.05 level
 iii) MacKinnon-Haug-Michelis (1999) p-values

The Johansen co-integration test formally uses both the Trace and the Maximum Eigenvalue test statistics in order to establish and determine the number of co-integrating vectors. It can be observed that the null hypothesis of no co-integrating vector ($H_0 : r = 0$) is rejected by both the tests and indicate the presence of one co-integrating vector in both the models given that the large values of the respective test statistics are higher

than the corresponding critical values. The presence of one-cointegrating vector (rank equal to one) at a 5% level of significance is indicated in both models based on the Maximum Eigenvalue and Trace tests. The Eigenvalue statistics reported in the Table drop sharply for the last alternative hypothesis which validates the model as a fair representation of the case under consideration (Chowdhury and Rabbi, 2014).

Table A3: Diagnostic Tests

Model 1			
VEC Residual Serial Correlation LM Tests:			
	Lags	LM-Stat	Probability
H_0 : No serial correlation	1	10.00961	0.8661
	2	7.255610	0.9680
	3	22.09966	0.1400
	4	9.733358	0.8802
	5	16.67398	0.4070
Breusch-Godfrey Serial Correlation LM Test:			
H_0 : No serial correlation	Obs R-squared	Probability Chi-Square	
	0.941324	0.6246	
Breusch-Pagan-Godfrey Heteroskedasticity Test:			
H_0 : Residuals are homoscedastic	Obs R-squared	Probability Chi-Square	
	9.444082	0.7386	
Normality Test:			
H_0 : Residual are normally distributed	Jarque-Bera Statistics	Probability	
	2.165302	0.338696	
Model 2			
VEC Residual Serial Correlation LM Tests:			
	Lags	LM-Stat	Probability
H_0 : No serial correlation	1	10.31113	0.8499
	2	14.72724	0.5447
	3	27.21020	0.0392
	4	15.42590	0.4937
	5	16.35535	0.4284
Breusch-Godfrey Serial Correlation LM Test:			
H_0 : No serial correlation	Obs R-squared	Probability Chi-Square	
	1.210557	0.5459	
Breusch-Pagan-Godfrey Heteroskedasticity Test:			
H_0 : Residuals are homoscedastic	Obs R-squared	Probability Chi-Square	
	17.83947	0.1207	
Normality Test:			
H_0 : Residual are normally distributed	Jarque-Bera Statistics	Probability	
	4.439005	0.108663	

Based on the results of the VEC LM test we do not reject the null hypothesis of no serial correlation at the 5% level of significance for any period in either model. As an additional serial correlation check we adopt the Breusch-Godfrey Serial Correlation LM Test which also indicates the presence of no serial correlation, since the null hypotheses could not be rejected as the p-values obtained were significantly greater than 0.05. Similarly,

the Breusch-Pagan-Godfrey tests indicate the absence of heteroscedasticity, as again the null hypotheses of homoscedasticity could not be rejected given the large p-values. Likewise, the Jarque-Bera normality tests indicate the residuals to be normally distributed as yet again the null hypotheses could not be rejected due to the sufficiently large p-values.