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Modelling the Macroeconomic Determinants of Workers' Remittances: The Case of Jordan

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ABSTRACT: This paper explores the main macroeconomic factors, in both host and home countries that affect workers' remittances. Several macroeconomic variables are taken into account in a cointegration analysis of the long-run relationship among remittances and their macroeconomic determinants as well as the short-run dynamics. The study employs the ARDL and VECM approaches to find out the main macroeconomic determinants that affect remittances to Jordan. Annual data for the period 1972-2009 are used. The empirical results show that macroeconomic factors of host countries are much more significant than home country macroeconomic factors. This confirms the fact that remittances are most likely to be influenced by external factors rather than internal factors. The bounds test used in the ARDL framework indicates that remittances flow to Jordan is cointegrated with the level of income in Jordan, level of income and exchange rates in the host countries. The findings of the study show that the speed of adjustment in the VECM is significant and relatively slow.

Keywords: Workers' Remittances; Time Series Analysis; Cointegration; ARDL; VECM; Jordan.
JEL Classifications: C22; C32; F24

1 Introduction

Workers' remittances – the portion of migrant workers' earning sent back from the country of employment to the country of origin- are considered a magnificent part of international capital flows between countries especially in the case of labour exporting country such as Jordan. Remittances are becoming an important and stable source of external flows in the Middle East over the last two decades. They play an increasingly important role in international economic relations between poorer, labour exporting, countries and labour scarce richer countries, see Russell (1986). Remittances are also becoming a main source for developing and enhancement of economic stability in the economy through providing an extra income to the families that benefited from these transfers.

In addition, the lack of capital inflows in developing countries, particularly Jordan, makes remittances an important factor, in place of foreign capital. However, remittances also provide an increasingly valuable source of extra saving and capital accumulation. Therefore, economics of remittances has become an area of interest over the last two decades. Many of the studies concerning remittances investigate their impact on various economic variables. In some studies, the emphasis is placed on the determinants of the flows of remittances. They investigate the main factors that influence workers' remittances. However, there is no study in the literature exclusively devoted to the remittances from Jordanian expatriates working abroad. This paper is one of the first that investigates this issue.

The question is why Jordan. Jordan is considered as one of the top ten developing countries with high received remittances as a percentage of GDP. This exceeds 20 % of GDP in various years, where according to the Central Bank of Jordan, these flows are estimated at about 2800 million USD in 2009. Moreover, Jordan is ranked as one of the top recipients countries of remittances in the developing world. The behaviour of remittances from the Jordanian expatriates, working abroad, is expected to be

influenced by different variables in two main countries of the Arabian Gulf. Recorded numbers of the Jordanian expatriates show that more than 75 % work in Saudi Arabia and the United Arab of Emirates (UAE)[1]. These countries are the biggest host countries of the Jordanian expatriates. Therefore, the models used in this paper take into account certain macroeconomic variables in Saudi Arabia and UAE to investigate whether these variables have a significant impact on the flows of remittances to Jordan (see Al-Assaf, 2012).

The study is organised as follows. Next section presents the general trend in remittance flows to Jordan. Section 3 provides a brief background of previous work regarding the topic under investigation, while section 4 presents the methodology and data used in this paper, the empirical results of the cointegration analysis, which include both the ARDL and VECM frameworks are discussed in section 5. Finally, section 6 concludes.

2 Trend in the Jordanian Workers' Remittances

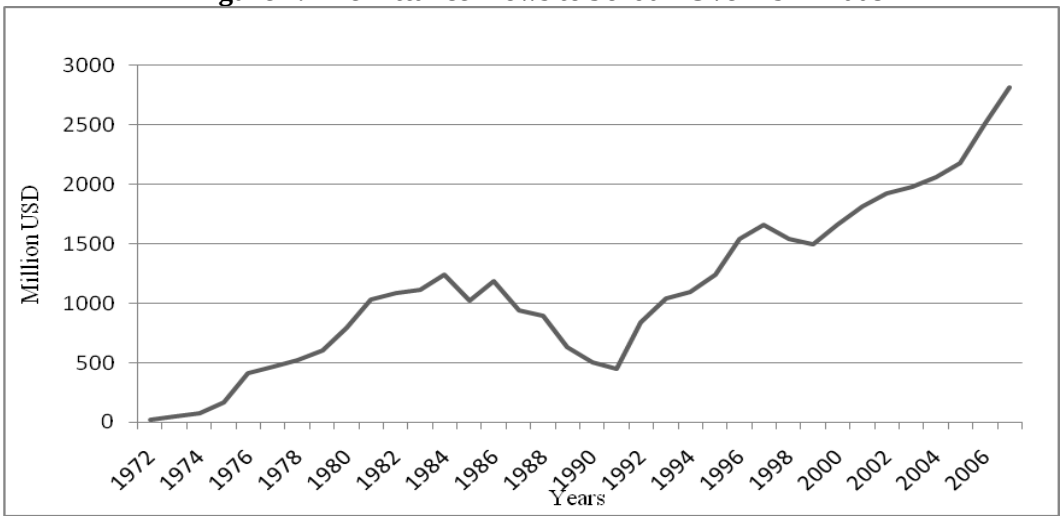
The concept of workers' remittances as defined in the International Monetary Fund (IMF) interpretation refers to the value of monetary transfers sent home from workers residing abroad for more than one year, and it is recorded in different sections of the balance of payments. In this part of the study we present briefly the general trend in workers remittance flows to Jordan

The money that migrants send home, remittances, represent today an important source of external funding for many developing countries, including Jordan. According to the World Bank data on remittances, with about 2800 billion USD in 2009, Jordan ranks at 10th place among all developing countries. Jordan has ranked constantly among the top 20 remittances-recipient countries over the last decade. In addition, the Arab Monetary Fund (AMF) statistics in 2009 indicate that Jordan was the second biggest recipients of remittances among Arab countries after Lebanon. This confirms the fact that remittance flows to Jordan are considered a great area of interest.

The following figure shows the general trend in remittance flows to Jordan over the period 1972-2009. It can be seen that Jordan has reported a spectacular increase in remittance flows over the 1970s and the first half of the 1980s, where remittance flows had increased from 20.7 million USD in 1972 to more than 600 million USD in 1979 and then to about 1237 million USD in 1984 (see figure 1). The main factors for this remarkable increase is that the number of migrants to the Arabian Gulf Countries had grown sharply during that time, where thousands of the Jordanian skilled workers migrated to the Arabian Gulf Countries, especially during the oil boom in the Gulf Countries in 1970s and 1980s.

Over the second half of the 1980s, remittances had dropped gradually as a result of the economic crisis that happened during that period. This was a consequence of the sharp drop in oil prices and its impact on the economic development in the labour-imported countries, where these flows dropped about 30% in 1989 comparing with their level in 1988.

Figure 1. Remittance Flows to Jordan Over 1972-2008



[1] Department of International Cooperation, Ministry of Labour, Amman, Jordan.

After that, the flows of remittance to Jordan had experienced rapid growth rates particularly over the years 1992 and 1993; the growth rate reached 88% in 1992, where Jordan had started again exporting high skilled labour after the Gulf War. This increase had continued steadily over the period 1995-2004, where the average growth rate was 7% for that period. In the last two years, the remittance flows have reached high levels at 2514 and 2835 in 2006 and 2007, respectively. The annual average growth rate of recorded remittances was 14% for these years. It is also seen that remittances in Jordan have started to affect many of the macroeconomic variables in Jordan, especially the financial ones, see Al-Tarawneh and Al-Assaf (2013).

3 Literature Review

Most of previous studies about the determinants of remittances have investigated microeconomic factors that determine the flows of remittances. A few studies have extensively focused on macroeconomic determinates of remittances such as Swamy (1981), Lianos (1997), El-sakka and MacNabb (1999), Glytsos (2002), Gupta (2005), and Shahbaz and Aamir (2009). Some of these studies have argued that macroeconomic variables in the home country have significant effects on the remittances such as level of income, inflation, and exchange rate.

In addition, most of the previous papers have found that remittances respond significantly to the behaviour of macroeconomic variables in the host country rather than the home country, see Huang and Silva (2006) and Elbadawi and Rocha (1992). Therefore, the level of income, the exchange rate, and the inflation of host countries are expected to have a significant impact in our case. However, the main challenging aspect of the study of remittances at macro level is related to data collection as the variables that might affect these flows vary from country to country.

4 The Methodology and Data

4.1 The Methodology

The answer to the question whether macroeconomic variables might affect the flow of remittances to Jordan can be obtained from cointegration analysis. The advantage of testing for cointegration is the identification of a stable long run relationship between remittance flows and these variables, which could be implemented using various cointegration methodologies. The main framework of our analysis is based on Autoregressive Distributed Lag (ARDL) and Vector Error Correction Model (VECM) methodologies. The general specification of the model used in our analysis is based on the following equation:

$$y_t = \beta_1 x_{1t} + \beta_2 x_{2t} + \beta_3 x_{3t} + \cdots + \beta_k x_{kt} + \varepsilon_t \qquad t = 1, \ldots, n \qquad (1)$$

Where: y_t is workers' remittances to Jordan, $x_{1t} \ldots x_{kt}$ are macroeconomic determinants of workers' remittances from four countries, and ε_t is the error term.

The analysis then continues using these two cointegration approaches. First, the ARDL model is used to examine the long-run relationship among the series. Second, the VECM is estimated to explore the short- and long-run dynamics between remittances and its determinants.

4.2 Data and Variables

Despite the highly increased interest in investigating workers' remittances, relatively little work has been done to improve the understanding of the macroeconomic determinants of remittance flows. The main reasons for this are the scarcity and inaccuracy of data. Most previous work has investigated microeconomic determinants of remittances relying on survey data. Alternatively, researchers have used IMF balance of payments data to investigate macroeconomic determinants. In our case we have used data published by the IMF as well as the world development indicators published by the World Bank, and the yearly bulletins of the central banks of Jordan and host countries. The descriptive statistics and matrix correlation of the used variables are reported in table 2 and 3, respectively, in the appendix.

Remittance flows (the independent variable) are assumed to be a function of the following macroeconomic variables (explanatory variables): gross national income per capita in home country, gross national income per capita used as a proxy for migrant's income in host countries, and exchange rates in host countries as well as overall price levels.

For cointegration analysis we use annual data covering the period 1972-2009 for all series. In our estimation we use annual data rather than quarterly data containing more observations over the same period, because it is now well-known that unit root and cointegration tests require a long time span of data rather than merely a large number of observations. There is no gain in switching from low frequency to high frequency data and merely increasing the number of observations, see Campbell and Perron (1991); and Demetriades and Hussein (1996).

5 Empirical Evidence

5.1 Unit root Testing

We start the empirical investigation by performing unit root tests to determine whether the series used in the analysis are stationary in levels. We have applied both Dickey-Fuller (GLS)(DF-GLS) and Phillips and Perron (PP) tests for the variables under investigation. Both tests results indicate that all variables are nonstationary at levels and stationary at first differences (results are reported in Table 1 in appendix). Thus, workers' remittances and other macroeconomic determinants are integrated of the same I(1) order. As these series are integrated, our next step is to investigate whether a long-run relationship exists among the variables. This can be found through using different cointegration techniques such as ARDL and VECM frameworks.

5.2 Autoregressive Distributed Lag (ARDL):

Empirical studies that contain a set of time series may employ spurious regression. The cointegration framework developed by Engle and Granger (1987) overcomes this problem. Nevertheless, their approach becomes invalid if there are more than one cointegration vector in the system. Bounds test approach developed by Pesaran et al. (2001) provides a method for cointegration testing when some series are stationary. The cointegration relationship can be tested among the series, regardless of whether they are I(0) or I(1). Both approaches assume one cointegration relationship.

Here we use the ARDL approach, suggested by Pesaran and Shin (1995), to estimate the long run relationship among a set of variables including workers' remittances and potential macroeconomic determinants. We have also employed the Engle-Granger two-step procedure and the results (not fully reported here) indicate that there is a significant long-run relationship between workers' remittances to Jordan (LREM) and macroeconomic determinants, namely LNPJO, LNPSA, LEXAE, and LGPAE (defined below). [2] We consider the ARDL model to test for a long run relationship among variables. The orders of the lags in the ARDL model are selected by using either the Akaike Information Criterion (AIC) or the Schwarz Bayesian Criterion (SBC), before the selected model is estimated by ordinary least squares. For annual data, Pesaran and Shin (1999) recommended choosing a maximum of 2 lags. From this, the lag length that minimizes SBC is selected, which is one in this context, the optimal lag length selection criteria are presented in Table 4 in the appendix. According to this approach, we first consider the following ARDL (1, 1, 1, 1, and 1) equation:

$$\Delta LREM_t = \beta_0 + \beta_1 LREM_{t-1} + \beta_2 LNPJO_{t-1} + \beta_3 LNPSA_{t-1} + \beta_4 LEXAE_{t-1} + \beta_5 LGPAE_{t-1} + \beta_6 \Delta LREM_{t-1} + \beta_7 \Delta LNPJO_{t-1} + \beta_8 \Delta LNPSA_{t-1} + \beta_9 \Delta LEXAE_{t-1} + \beta_{10} \Delta LGPAE_{t-1} + \varepsilon_t \quad (2)$$

Where: *LREM*: log of remittance flows to Jordan, *LNPJO*: log of GNI per capita for Jordan, *LNPSA*: log of GNI per capita in Saudi Arabia, *LGPAE*: log of GDP per capita in United Arab of Emirates, *LEXAE*: log of exchange rate in UAE, and ε_t: the error term, where these variables include the main significant variables that might affect the flows of remittances to Jordan. Table (1) contains the empirical results of this regression.

[2] Where the stationarity test of the residual obtained from the equilibrium regression indicates that we reject the null hypothesis of no cointegration at 5 % and 10% but not at 1% significance levels as the test statistic -4.978 and the critical values calculated from Engle and Yoo (1987) tables -4.48, -4.881 and -5.712 at 10%, 5% and 1% respectively. The ADF stationarity test for the residual obtained from the equilibrium regression is found stationary, and can be used to estimate the error correction model. This implies that remittances are cointegrated with the potential macroeconomic determinants.

Table 1. ARDL Estimation of the Macroeconomic Determinants of Remittances

Dependent Variable: log of remittance flows to Jordan (Δlrem) in first difference.			
Explanatory Variables	Coefficient	Standard Error	t-statistic
$LREM_{t-1}$	-0.279*	0.101	-2.766
$LNPJO_{t-1}$	-0.526*	0.212	-2.480
$LNPSA_{t-1}$	-0.762*	0.304	-2.506
$LEXAE_{t-1}$	-10.297*	3.289	-3.131
$LGPAE_{t-1}$	1.213*	0.366	3.317
C	18.182*	5.523	3.292
$\Delta LREM_{t-1}$	-0.017	0.184	-0.095
$\Delta LNPJO_{t-1}$	0.831	0.408	2.038
$\Delta LNPSA_{t-1}$	0.322	0.412	0.781
$\Delta LEXAE_{t-1}$	1.690	2.632	0.642
$\Delta LGPAE_{t-1}$	-0.766	0.380	-2.017
R-square: 0.761 **Adjusted R-square: 0.657** **F-stat.: 7.343** **D-W stat. : 2.549**			

- * denotes significant at 5% level.

From Table (1), some of the variables are not significant especially the first difference of income level in Saudi Arabia, exchange rate in the UAE, and remittance flows lagged. We re-specify the ARDL model by dropping the insignificant variables. We estimate the following reduced ARDL model, (parsimonious ARDL (1, 1, 1, 1, and 1)):

$$\Delta LREM_t = \beta_0 + \beta_1 LREM_{t-1} + \beta_2 LNPJO_{t-1} + \beta_3 LNPSA_{t-1} + \beta_4 LEXAE_{t-1} + \beta_5 LGPAE_{t-1} + \beta_7 \Delta LNPJO_{t-1} + \beta_{10} \Delta LGPAE_{t-1} + \varepsilon_t \quad (3)$$

The empirical results are presented in Table (2). These results indicate that income levels in Jordan and Saudi Arabia have significant negative effects on remittances in the long-run. However, the results show a positive impact of the level income in UAE on these remittances. Also, the exchange rate of the Emirates Dirham against the US dollar affects the flows of remittances to Jordan negatively.

Various diagnostic tests have to be applied to confirm the validity of the model. We implement various residual tests, starting with the LM test for serial correlation, which is a general test for serial correlation. The LM test statistic for the null hypothesis of no serial correlation clearly indicates that there is no serial correlation in the residuals. To test for heteroskedasticity, we employ the Breusch-Pagan test. All diagnostic tests are shown at the bottom panel of Table (2).

The results indicate that the growth of remittances over the time can be explained by the level of income or the economic situation expressed by the GNI per capita in Jordan, especially in the short-run. This is consistent with the finding of Gupta (2005); growth in the economy of the home country simulates remittances to Jordan. In particular, it encourages the Jordanian expatriates to transfer their money through official channels, rather than unofficial ones when the economy is improving. This explains the positive sign of the ΔLNPJO coefficient.

In addition, a significant impact of the exchange rate in the UAE on remittances to Jordan is found, where a depreciation of host country's exchange rate stimulates remittance flows. Shahbaz and Amir (2009) found the same effect, but for the home county's exchange rate.

Table 2. ARDL Estimation of the Macroeconomic Determinants of Remittances (The Parsimonious Model)

Dependent Variable: log of remittance flows to Jordan (Δlrem) in first difference.			
Explanatory Variables	Coefficient	Standard Error	t-statistic
$LREM_{t-1}$	-0.261*	0.091	-2.865
$LNPJO_{t-1}$	-0.610*	0.185	-3.300
$LNPSA_{t-1}$	-0.736*	0.295	-2.491
$LEXAE_{t-1}$	-9.832*	3.189	-3.083
$LGPAE_{t-1}$	1.290*	0.349	3.695
C	16.824*	5.278	3.188
$\Delta LNPJO_{t-1}$	0.778*	0.331	2.348
$\Delta LGPAE_{t-1}$	-0.639	0.328	-1.948
R-square: 0.743 **Adjusted R-square: 0.673** **F-stat.: 10.742** **D-W stat. : 2.398**			
Diagnostic Tests: **Autocorrelation, LM test** **Chi-Square = 4.32 [0.115]** **F(2,24)= 1.75 [0.196]** **Normality Test, JB-test** **Chi-Square = 1.24 [0.537]** **Heteroskedasticity, Breusch-Pagan test,** **Chi-Square = 11.93 [0.103]** **F(7,26)= 2.01 [0.093]** **ARCH test** **Chi-Square = 1.001 [0.317]** **F(1,31)=0 .969 [0.332]**			

- Numbers in square brackets are p values.
- * denotes significant at 5% level.

The bounds error correction test is calculated from an estimated unrestricted error-correction model (UECM), the version of the ARDL model, by Ordinary Least Square (OLS) see Pesaran et al. (2001). This test is the Wald test (F-statistic version of the bounds testing approach) for the lagged level variables in the right-hand side of the UECM, Greene (2003). We test the null hypothesis of no cointegration relationship among the variables by conducting a joint significance test on lagged level variables. The null states the coefficients of all lagged level variables in the model are equal to zero. The distribution of this F-statistic is non-standard under the null hypothesis. The basic hypothesis is as follows:

Null H_0: $\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0$ **against** Alternative H_A: At least some are non zero.

We then compare the calculated F statistic with critical bounds values (lower and upper values). A conclusive inference can be made without considering the order of integration of the explanatory variables. If the F-statistic is higher than the upper critical bound, the null hypothesis of no cointegration between series is rejected and hence there is a cointegration relationship between the variables. If the test statistic is below the lower critical bound, we cannot reject the null hypothesis and the conclusion of no cointegration relationship remains. Finally, if the calculated F statistic is between the upper and lower bounds the test cannot give conclusive inference; see Pesaran et al. (2001).

Table 3. Bounds Test for Cointegration

Calculated F-Statistics	**8.689***
Bound Testing Critical Values[3] at 5%	2.62 (Lower) 3.79 (Upper)

* Denotes rejection the null at 5% level of significance.

[3] The critical values are obtained from Pesaran et al. (2001), table CI(iii) p.300, unrestricted intercept and no trend with five regressors.

It can be seen from Table 3 that the calculated F-statistic is 8.689 which is exceed the upper critical bound (3.79) at 5% significance level. It is also exceeds the upper critical bound at 1% significance level (4.68). This implies that the null hypothesis of no cointegration is rejected.

Given a cointegration relationship between remittance flows to Jordan and the considered macroeconomic variables in both home and host countries, a VECM can also be used to determine long and short-term relationships. We explore this in the following section.

5.3 Vector Error Correction Model (VECM):

We continue our analysis to test whether the series under investigation are cointegrated over the time. The Johansen maximum likelihood test (1988) is used to test for the presence of cointegration among variables. The test results are shown in Table (4).

Table 4. Johansen Cointegration Tests Results

Series: LREM LNPJO LNPSA LEXAE LGPAE **VAR lag = 2**				
Null Hypothesis	Alternative Hypothesis	λ_{trace} Statistic	5% Critical Value	1% Critical Value
λ_{trace} tests				
r=0	**r>0 ****	145	68.52	76.07
r≤1	**r>1****	69.32	47.21	54.46
r≤2	**r>2****	41.28	29.68	35.65
r≤3	**r>3***	18.33	15.41	20.04
r≤4	**r>4**	0.77	3.76	6.65
λ_{Max} tests		**λ_{Max} Statistic**		
r=0	**r=1****	75.69	33.46	38.77
r=1	**r=2***	28.04	27.07	32.24
r=2	**r=3***	22.93	20.97	25.52
r=4	**r=4***	17.57	14.07	18.63

- The critical values at 1% level are taken from Osterwald-Lenum. The null hypothesis, H0, refers at most r cointegrating vectors when r is the order of cointegraion.
- * and ** represent significant at 5% and 1% respectively.

Both trace and maximum-eigenvalue tests suggest at least four cointegration vectors[4]. This is evidence that there may be long-run relationships among the series.

Having found at least one cointegration relationship between remittance flows and related macroeconomic variables a VECM model with one cointegrating vector is used[5]. It is useful to consider specific parameterisations that support the analysis of the cointegration structure. The VAR can be constructed in terms of the levels of data or in terms of their differences with the addition of an error correction term (ECT) to capture the long run dynamics. The resulting model is known as a VECM or as it is sometimes called a vector equilibrium correction model, see Banerjee et al. (1993) and Lutkepohl and Kratzig (2004).

As a starting point, we can set a VECM for the macroeconomic determinants of workers' remittances. Since the data are in annual basis, we choose two for the maximum order of lags in the model; therefore the model will be constructed as follows:

$$\Delta y_t = \alpha_0 + \sum_{i=1}^{2} \beta_i \, \Delta y_{t-i} + \sum_{j=1}^{k} \sum_{i=1}^{2} \delta_{ij} \Delta x_{jt-i} + \gamma_0 \, ECT_{t-1} + \varepsilon_t \quad (4)$$

$$\Delta x_{jt} = \alpha_j + \sum_{j=1}^{k} \sum_{i=1}^{2} \theta_{ij} \, \Delta x_{jt-i} + \sum_{i=1}^{2} \rho_i \Delta y_{t-i} + \gamma_j \, ECT_{t-1} + \varepsilon_{jt} \quad (5)$$

j= 1, 2,..., k.

[4] For more details about these tests see: Harris (1995) and Crompbell (1995, pp. 76-80 and pp. 19) respectively.

[5] The present empirical analysis is based on imposing one cointegrating vector. Further analysis imposing two or more cointegrating vectors is not reported here but it is available upon request. However, the four cointegrating equations are presented in Table 5 in the Appendix.

Where y_t represents the flows of remittances to Jordan, and x_{jt} represents macroeconomic determinants that might affect remittances. Δy_t and Δx_{jt} are the differences in the variables that capture short-run dynamics, ε_t and ε_{jt} are serially uncorrelated error terms, and ECT_{t-1} is the error correction term, derived from the long run cointegration relationship and measures the magnitude of the past disequilibrium, where the coefficients of this error correction term (γ_0, γ_j) reflect the deviation of the dependent variables from the long run equilibrium.

Below we only discuss equation (4) of the VECM. It contains four variables including income level for home countries expressed by the log of gross national income per capita (lnpjo), gross national income per capita (lnpsa) and gross domestic product per capita (lgpae) in both Saudi Arabia and UAE respectively which serve as a proxy for the income levels for migrants, and exchange rate in UAE[6]. Our specific error correction model is based on the following equation:

$$\Delta LREM_t = \beta_0 + \beta_1 LREM_{t-1} + \beta_2 LNPJO_{t-1} + \beta_3 LNPSA_{t-1} + \beta_4 LEXAE_{t-1} + \beta_5 LGPAE_{t-1} + \beta_6 \Delta LREM_{t-1} + \beta_7 \Delta LREM_{t-2} + \beta_8 \Delta LNPJO_{t-1} + \beta_9 \Delta LNPJO_{t-2} + \beta_{10} \Delta LNPSA_{t-1} + \beta_{11} \Delta LNPSA_{t-2} + \beta_{12} \Delta LEXAE_{t-1} + \beta_{13} \Delta LEXAE_{t-2} + \beta_{14} \Delta LGPAE_{t-1} + \beta_{15} \Delta LGPAEe_{t-2} + \gamma ECT_{t-1} + \varepsilon_t \quad (6)$$

Where the model contains the main macroeconomic variables that have been found to have a quite significant impact on the flows of remittances to the Jordanian economy. Equation (6) represents a VECM of the determinants of remittances. The results are presented in table (5) and (6) for both long-run and short-run coefficients respectively, with the required diagnostic test below.

Table 5. VECM Estimation of Macroeconomic determinants of Remittances (Long-run Coefficients)

Dependent Variable: log of remittance flows to Jordan (Δlrem) in first difference.			
Explanatory Variables	Coefficient	Standard Error	t-statistic
$LNPJO_{t-1}$	4.603*	0.514	8.958
$LNPSA_{t-1}$	2.983*	0.819	3.641
$LEXAE_{t-1}$	12.493*	5.610	2.227
$LGPAE_{t-1}$	-6.420*	0.837	-7.669
C	-34.646*	0.050	3.486

- * denotes significant at 5% level.

The optimal lag length is selected based on various statistics, including the Akaike Information Criterion (AIC), the Hannan-Quin Criterion (HQ) and Schwarz Criterion (SQ). From these criteria, we conclude that the optimal lag length should be two.

From Table (5), results show that, in the long-run, remittances are positively related to the level of income in Jordan and Saudi Arabia, and the exchange rate of the UAE, while the income level of the Jordanian expatriates, working in the UAE, has a significant negative effect in the long run. The most important point is that we find a significant relationship between remittances and exchange rate in the host country, whereby the exchange rate of the UAE is found to affect remittances positively. Other studies find the opposite, that is the exchange rate of the home country is important, see Lianos (1997), El-sakka and Macnabb (1999), and Shahbaz and Aamir (2009).

In addition, estimation of short run dynamics based on VECM are presented in table (6), giving the short-run fluctuations of remittance flows to Jordan. It is noticed that macroeconomic variables in both host and home country are found to have insignificant effects on remittance flows in the short-run.

[6] However, we have first included macroeconomic factors from Kuwait in the model but they are found insignificant at all levels. Therefore, they are ignored in this model.

Table 6. VECM Estimation of Macroeconomic determinants of Remittances (Short-run Coefficients)
Dependent Variable: log of remittance flows to Jordan (Δlrem) in first difference.

Explanatory Variables	Coefficient	Standard Error	t-statistic
$\Delta LREM_{t-1}$	-0.049	0.255	-0.191
$\Delta LREM_{t-2}$	-0.574*	0.245	-2.346
$\Delta LNPJO_{t-1}$	0.602	0.475	1.269
$\Delta LNPJO_{t-2}$	0.943	0.512	1.842
$\Delta LNPSA_{t-1}$	-0.376	0.556	-0.677
$\Delta LNPSA_{t-2}$	0.293	0.468	0.626
$\Delta LEXAE_{t-1}$	12.919	7.207	1.793
$\Delta LEXAE_{t-2}$	-1.812	3.383	-0.536
$\Delta LGPAE_{t-1}$	-0.222	0.318	-0.698
$\Delta LGPAE_{t-2}$	-0.296	0.362	-0.820
C	0.176*	0.050	3.486
ECT	-0.162*	0.044	-3.681
R-square: 0.749 **Adjusted R-square: 0.618** **Standard error: 0.160** **F-stat.: 5.713** **Log likelihood: 21.053** **Akiake AIC: -0.549** **Schwarz SC: -0.0045**			
Diagnostic Tests: **Autocorrelation, LM test (12) 25.79 [0.42]** **Normality Test, JB-test 19.84 [0.031]** **Heteroskedisticity, White test, 350.4 [0.211]**			

- Numbers in square brackets are p values.
- * denotes significant at 5% level.

The error correction term (ECT) has coefficient -0.162, with a negative significant direction. This coefficient is also called the adjustment coefficient or speed of convergence and it implies that when remittances deviate from long run equilibrium, error correction term has an opposite adjustment effect and the deviation degree is reduced. Thus, the change will move towards stationarity. This also implies that the convergence term is quite slow in our results.

We apply a number of diagnostic tests to the residual of the VECM; they are shown at the bottom of Table (6). The LM test implies that there is no serial correlation problem in the error. Moreover, the normality test suggests evidence of non-normality. Finally, the White test suggests that there is no heteroskedasticity problem in the model. As a result, we can conclude that the vector error correction model, used in our analysis, passes the required diagnostic tests.

6 Conclusion

In this paper, we investigate empirically the long run relationship between remittance flows to Jordan and macroeconomic determinants that might affect these flows. In particular, we have confirmed the fact that remittance flows are caused by income levels of migrants in the host country rather than income level in home country.

The empirical results indicate that there is a stable long run equilibrium relationship among the flows of remittances to Jordan and the macroeconomic variables in host countries, particularly Saudi Arabia and UAE.

In the light of our findings, macroeconomic factors of host countries are much more significant than home country macroeconomic factors, confirming the fact that remittances are most likely to be influenced by external factors. This confirms the finding of Huang and Silva (2006). In contrast to

some previous studies, we find that exchange rates as well as level of income are important factors in affecting remittance flows to Jordan. However, we could not find any significant effects of interest rate and inflation in both home and host countries on the Jordanian remittances. This finding is considered as a very important issue that would open the gate for the Jordanian decision makers to implement more coordination with the host countries.

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APPENDIX

Table 1: Unit Root Tests

Variables	Dickey-Fuller (GLS)				Phillips and Perron (PP)			
	Level		First Difference		Level		First Difference	
	C	C+T	C	C+T	C	C+T	C	C+T
LREM	-0.34	-1.8	-2.34**	-3.28**	-5.16*	-4.88*	-3.45**	-3.33**
LNPJO	-1.04	-2.33	-3.79*	-3.78*	-1.02	-1.61	-3.67*	-3.62**
LNPSA	-0.89	-2.07	-2.08**	-2.45	-3.82*	-3.16	-2.27	-2.33
LGPAE	-0.55	2.02	-2.85*	-3.56**	-3.33**	-3.11	-3.95*	-3.78**
LEXAE	-1.01	-1.7	-2.69*	-3.26**	-2.92***	-1.41	-6.25*	-7.16*
Critical Values	C	C+T			C	C+T		
1%	-2.63	-3.77			-3.63	-4.24		
5%	-1.95	-3.19			-2.95	-3.54		
10%	-1.61	-2.89			-2.61	-3.21		

- *(**), and *** denote reject at 1%(5%), and 10%.
- C: represents test with constant, C+T: represents test with constant and trend.

Table 2: Descriptive Statistics

	LREM	LNPJO	LNPSA	LEXAE	LGPAE
Mean	20.5	7.34	9.03	1.32	9.86
Median	20.78	7.41	9.04	1.30	9.85
Maximum	21.76	7.96	9.77	1.48	10.72
Minimum	16.85	6.11	7.26	1.30	8.47
Std. Dev.	1.09	0.44	0.51	0.04	0.40
Skewness	-1.81	-1.23	-1.83	2.46	-0.99
Kurtosis	6.06	3.99	7.33	9.03	6.42
Jarque-Bera	33.64	10.51	48.08	90.68	23.41
Probability	0.00	0.005	0.000	0.000	0.000
Sum	737.96	264.33	325.07	47.46	355.09
Sum Sq. Dev.	41.79	6.77	9.035	0.054	5.65
Observations	38	38	38	38	38

Table 3: Matrix Correlation

	LREM	LNPJO	LNPSA	LEXAE	LGPAE
LREM	1	0.911	0.831	-0.887	0.709
LNPJO		1	0.843	-0.864	0.699
LNPSA			1	-0.766	0.882
LEXAE				1	-0.579
LGPAE					1

Table 4: Lag Order Selection Criteria for the ARDL

Sample: 1972 2009
Included observations: 35

Lag	LogL	LR	FPE	AIC	SBC	HQ
0	86.91421	NA	5.56e-09	-4.818483	-4.594018	-4.741934
1	283.4618	323.7255	2.35e-13	-15.70952*	-13.56273*	-14.45022
2	323.3149	53.91891*	1.08e-13*	-14.98323	-13.31412	-14.94119*

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error **AIC**: Akaike information criterion

SBC: Schwarz information criterion **HQ**: Hannan-Quinn information criterion

Table 5: Vector Error Correction Estimates with Four Cointegrating Equations

Sample (adjusted): 1975 2009
Included observations: 35 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1	CointEq2	CointEq3	CointEq4	
LREM(-1)	1.000	0.000	0.000	0.000	
LNPJO(-1)	0.000	1.000	0.000000	0.000	
LNPSA(-1)	0.000	0.000	1.000	0.000	
LEXAE(-1)	0.000	0.000	0.000	1.000	
LGPAE(-1)	0.791	-1.066	-0.663	-0.025	
	(0.539)	(0.135)	(0.122)	(0.017)	
	[1.466]	[-7.882]	[-5.419]	[-1.493]	
C	-28.50199	3.175311	-2.535597	-1.056371	
Error Correction:	**D(LREM)**	**D(LNPJO)**	**D(LNPSA)**	**D(LEXAE)**	**D(LGPAE)**
CointEq1	-0.456	-0.06	-0.067	-0.0006	0.063
	(0.099)	(0.052)	(0.036)	(0.001)	(0.067)
	[-4.571]	[-1.139]	[-1.813]	[-0.327]	[0.936]
CointEq2	-1.0635	-0.4846	-0.2464	0.0137	-0.0726
	(0.207)	(0.109)	(0.076)	(0.004)	(0.139)
	[-5.128]	[-4.407]	[-3.21]	[3.357]	[-0.520]
CointEq3	-1.009	-0.5320	-0.5824	-0.0097	-0.6283
	(0.372)	(0.197)	(0.137)	(0.007)	(0.250)
	[-2.711]	[-2.696]	[-4.229]	[-1.327]	[-2.506]
CointEq4	-15.924	-4.4174	-2.2923	-0.2392	0.0636
	(4.118)	(2.183)	(1.524)	(0.081)	(2.774)
	[-3.866]	[-2.022]	[-1.503]	[-2.942]	[0.022]
D(LREM(-1))	-0.145915	-0.171081	-0.154829	0.010276	0.052644
	(0.22939)	(0.12162)	(0.08490)	(0.00453)	(0.15453)
	[-0.63609]	[-1.40666]	[-1.82368]	[2.26971]	[0.34067]
D(LREM(-2))	-0.382410	-0.054113	-0.332192	0.009018	-0.537694
	(0.20974)	(0.11120)	(0.07763)	(0.00414)	(0.14129)
	[-1.82326]	[-0.48662]	[-4.27942]	[2.17848]	[-3.80558]

D(LNPJO(-1))	1.288715	0.610250	0.295871	-0.008495	-0.350346
	(0.47800)	(0.25343)	(0.17691)	(0.00943)	(0.32200)
	[2.69608]	[2.40799]	[1.67245]	[-0.90040]	[-1.08803]
D(LNPJO(-2))	1.503918	0.507834	0.643352	-0.020262	0.895020
	(0.45228)	(0.23979)	(0.16739)	(0.00893)	(0.30468)
	[3.32521]	[2.11782]	[3.84344]	[-2.26988]	[2.93761]
D(LNPSA(-1))	0.263527	0.543835	0.302107	-0.024161	0.531028
	(0.48819)	(0.25883)	(0.18068)	(0.00964)	(0.32887)
	[0.53980]	[2.10109]	[1.67203]	[-2.50745]	[1.61470]
D(LNPSA(-2))	0.125005	-0.033308	0.203489	0.007368	0.495697
	(0.43495)	(0.23060)	(0.16098)	(0.00858)	(0.29300)
	[0.28740]	[-0.14444]	[1.26409]	[0.85831]	[1.69178]
D(LEXAE(-1))	18.57217	3.663173	-1.067160	0.126439	-0.383914
	(6.89851)	(3.65749)	(2.55316)	(0.13616)	(4.64717)
	[2.69220]	[1.00155]	[-0.41798]	[0.92863]	[-0.08261]
D(LEXAE(-2))	2.922943	0.497949	1.333360	-0.204924	-1.464931
	(3.85163)	(2.04208)	(1.42550)	(0.07602)	(2.59464)
	[0.75889]	[0.24384]	[0.93536]	[-2.69567]	[-0.56460]
D(LGPAE(-1))	-0.899398	-0.865553	-0.215624	0.009141	-0.424874
	(0.42156)	(0.22350)	(0.15602)	(0.00832)	(0.28398)
	[-2.13351]	[-3.87264]	[-1.38202]	[1.09865]	[-1.49613]
D(LGPAE(-2))	-0.619446	-0.573469	-0.240047	0.019739	-0.779790
	(0.35999)	(0.19086)	(0.13323)	(0.00711)	(0.24251)
	[-1.72072]	[-3.00460]	[-1.80168]	[2.77808]	[-3.21551]
C	0.163679	0.076246	0.059166	-0.004908	0.063118
	(0.04301)	(0.02280)	(0.01592)	(0.00085)	(0.02897)
	[3.80552]	[3.34356]	[3.71678]	[-5.78110]	[2.17840]
R-squared	0.856	0.797	0.933	0.919	0.719
Adj. R-squared	0.744	0.6406	0.881	0.856	0.501
Sum sq. resids	0.310	0.087	0.042	0.000	0.141
S.E. equation	0.131	0.069	0.048	0.002	0.088
F-statistic	7.632	5.074	17.96	14.66	3.297
Log likelihood	30.16	51.10	62.96	159.7	43.2
Akaike AIC	-0.919	-2.188	-2.90	-8.769	-1.709
Schwarz SC	-0.239	-1.508	-2.226	-8.089	-1.029
Mean dependent	0.109	0.044	0.043	-0.002	0.029
S.D. dependent	0.259	0.116	0.141	0.006	0.125

Determinant resid covariance (dof adj.)	2.60E-15
Determinant resid covariance	1.26E-16
Log likelihood	370.01
Akaike information criterion	-16.66
Schwarz criterion	-12.35