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Bi-directional Causality Between Remittances and Poverty: An Empirical Evidence From Pakistan.

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Abstract
This study explores the two-way causality between poverty and remittances in Pakistan. The empirical evidence is based upon ARDL double bound approach for the long run relationship between remittances and poverty and VECM was used for direction and magnitude of causation. Furthermore, variance decomposition and Impulse response functions were used to capture the standard deviation shocks. Poverty (head count ratio) and remittances to GDP ratio were used from 1973-2006 for analysis purpose. In the study two equations were used interchangeably as dependent variable. It was found by using the Narayan (2005) test criteria for small sample there is co-integration found between poverty and remittances. The relationship is further supported by long run and short run analysis by ECM. Poverty and remittances are inversely and significantly related in the short run and long run by the estimates of ECM. VECM confirms the results by providing the short run and long run significant estimates. The results are also corroborated with variance decomposition and impulse response function. It could be concluded from the results that remittances are playing a vital role after the foreign direct investment. It is also found that due to altruistic behavior, inflow of remittances is increasing due to the poverty and it provides safety nets to poor and ultimately helping to reduces poverty.
Key Words: Remittances, Poverty, ARDL, VECM and co-integration
JEL classification: O11,O15

1. Introduction

Remittances (income sent through labor migration) play pivotal role in developing countries which are characterized by absence or imperfections of financial and capital markets, non- availability of credit and lack of insurance facilities. At household level, remittances are the part of decision making strategy to reduce risk and uncertainty regarding financial needs.(Taylor *et al.*, 1999). In the developing countries, remittances are depicting the altruistic behaviour of the individual in the globalize world (Siddiqui, 2005; Piotrowski, 2009). The earned income sent by the migrants to home-land has multiple effects on their family members, relatives and friends with an intention for future securing. (Kalim and Shehbaz, 2009). For example in Pakistan, the total inflow of remittances between 1990-99 and 2009-10 has amounted to $62.0 billion (GoP, 2009-10).

The empirical evidence pointed toward a negative relationship between poverty and remittances (Lucas, 2005). International migration can put a positive impact on poverty reduction through the generation of migrant remittances (Skeldon, 1997; Kothari, 2002; Wets, 2004; De Haas, 2005 and Adams and Page, 2005; Xenogiani, 2006; and Bracking and Sachikonye, 2007). Similarly in Pakistan, remittances has a positive effect on poverty reduction. (Qayyum *et al.* 2008; Kalim and Shehbaz 2009; Mughal *et al.* 2007).
It is important to study in Pakistan, is there exist a bi-direction causality between remittances and poverty. This study explore the bidirectional relationship between remittances and poverty in Pakistan. To fulfil this objective, we use the time series data from 1977 to 2010 on poverty (head count) and remittances. The study provides the description of data and methodology in next section and that is followed by results and discussion and the last section conclude the study.

2. Data and Methodology

To fulfill the objective of the study, time-series data are used in this study over the period 1973 to 2006. The sample period data for the remittances to GDP ratio are obtained from the various issues of economic survey of Pakistan and world development indicators (2010). The population below the poverty line (head count %) are obtained from (Jamal, 2006), Does Inequality Matter for Poverty Reduction? Evidence from Pakistan's Poverty

Trends.

Table 1. Descriptive Statistics and Correlation Matrix

Variables	Mean	Std. Dev	Minimum	Maximum	$\ln POV_t$	$\ln REM_t$
$\ln POV_t$	3.2929	0.2338	3.0306	3.8231	1.0000	-0.4272
$\ln REM_t$	1.3244	0.7760	-0.6143	2.3608	-0.4272	1.0000

2.1 Model specification

On the basis of theory of correlation between poverty and remittances, the model is developed to check the causality between poverty and remittances.

$LPOV = \alpha_0 - \alpha_1 LREM + \mu_t$ *(1)*

$LREM = \beta_0 - \beta_1 POV + \varepsilon_t$ *(2)*

Where

LPOV = Log of Poverty
LREM = Log of Remittances
μ = Error term

There are different econometric techniques developed in econometric literature to investigate the co-integration relationships among different macroeconomic variables. The present study proposed the technique for model estimation is autoregressive distributed lag (ARDL) for Co-integration (Pesaran and Shin, 1995, 1998; Pesaran *et al*., 1996; Pesaran *et al*., 2001). Recent empirical studies have indicated that the ARDL approach is more appropriate to other conventional co-integration approaches such as Engle and Granger (1987), and Gregory and Hansen (1996). The basic reason to prefer ARDL is that it is applicable irrespective of whether the underlying regressors are purely I(0), purely I(1) or mutually co-integrated. Moreover, it is most suitable technique for small sample size.

3. Empirical Results and Discussion

3.1 Unit Root Analysis

Before the formal analysis the basic descriptive analysis is done which is provided in table 1.The first step in analysis is related to the establishment of order of integration of variables.

Table 2. Unit Root Analysis

	P-P Test at Level		**DF-GLS at Level**
	T-Statistics	Inst-value	**T-Statistics**
POV	2.0097	1.0000	-1.2935
REM	-3.0134	0.1453	-1.8973
	P-P Test at 1st Difference		DF-GLS at 1st Difference
	T-Statistics	Inst-value	**T-Statistics**
POV	-3.5578	0.0517	-6.2099*
REM	-3.8223	0.0297	-3.9574*

Note: * representing significance at 1% level.

The results of P-P and DF-GLS tests are reported in Table-1. It is revealed from the results that both poverty and remittances are non-stationary at I(0) or contain unit root at level. Both were found stationary at first difference, I (1) at 1 percent level of significance by both P-P and DF-GLS statistics. It was concluded that poverty and remittances are integrated of order one. In order to test the co-integration appropriate lag length is required to be determined.

Table 3. Lag Length Criteria

VAR Lag Order Selection Criteria						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	-21.1089	NA	0.0168	1.5937	1.6880	1.6232
1	59.3639	144.2963	8.66e-05	-3.6802	-3.3973	-3.5916
2	185.3735	208.5676*	1.93e-08*	-12.0947*	-11.6232*	-11.9471*

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

Table 2 shows that appropriate lag length by using AIC and FPE. The maximum lag length was found 2 which is depicted by *. This is important for model specification in the study.

3.2 ARDL bounds Testing Analysis

The data used for the analysis was small in size which provided a justification to use Auto-regressive distributed lag model (ARDL) to find out the existence of co-integration between remittances and poverty rather than alternative tests for co-integration.

Table 4. ARDL bounds Testing Analysis

Dependent Variable			Calculated F-Statistic	
$\ln POV_t$ $\ln REM_t$			Lag Order 1 8.3578** 6.4431	
Critical Value	Pesaran et al (2001) [a]		Narayan (2005) [b]	
	Lower Bound Value	Upper Bound Value	Lower Bound Value	Upper Bound Value
1 % 5 % 10 %	8.740 6.560 5.590	9.630 7.300 6.260	10.365 7.210 5.595	11.295 8.055 6.680

Note: ** shows significance at 5% level that confirms cointegration between the variables.

This test is based on *F-statistics* for determination of long run relationship. In ARDL approach, if value of calculated *F statistics* is more than upper bound then it confirms the presence of co-integration. If it is lower than lower critical bound than there is no co-integration. If calculated *F statistics* is between lower and upper bound than no decision can be made.

The present study has provided both critical bounds by Pesaran *et al.* (2001) and Narayan (2005) which are given in Table-3. Our decision is based on Narayan (2005) because critical bounds by Narayan (2005) are much suitable for small data set like in our case**.** Table 4 shows that when poverty is taken as dependent variable, the value of calculated F- statistics is 8.3578 which is lower than upper critical bound at 1 percent level of significance according to Pesaran *et al.* (2001) and Narayan (2005). At 5 percent level of significance value of F statistics is more than upper bound which shows the existence of co-integration or long run relationship between poverty and remittances. Qayyum *et al.* (2008) also reported the same results by rejecting the null hypothesis of no co-integration between both variables under study. It revealed from the study that co-integration exists in the long run between remittances and poverty. The results were inconclusive when we use remittances as dependent variable according to Narayan(2005).

3.3 Long Run Analysis

In order to explore the long run coefficients, series of poverty and remittances were normalized by taking logs. Long run marginal impact of both variables upon each other is explained in Table 5.

Table 5. Long Run Analysis

	Dependent Variable: $\ln POV_t$		Dependent Variable: $\ln REM_t$	
	Coefficient	T-statistic	Coefficient	T-statistic
Constant	0.4133	4.5816*	-2.6344	-2.6305**
$\ln POV_t$	…	…	0.8591	2.9905*
$\ln POV_{t-1}$	0.8847	33.4728*	…	…
$\ln REM_t$	-0.0330	-3.7158*	…	…
$\ln REM_{t-1}$	…	…	0.9187	11.6793*
R^2	0.9784		0.8485	
$Adj-R^2$	0.9768		0.8373	
F-statistic	612.442*		75.6415*	
Prob. (F-stat)	0.0000		0.0000	

Note: * shows significance at 1% level.

The results show that when poverty is taken as dependent variable, remittances are inversely related with poverty. It shows that one percent increase in the remittances reduce the poverty 0.0330 at 1 percent level of significance in the long run. Qayyum *et al*. (2008) also derived the same results in his study. Adams and Page (2003) reported the similar results by analyzing the dataset of 71 countries. IMF (2011) examined the dataset of 101 countries for the period 1970 to 2003 and found negative relationship between poverty and remittances. Jongwanich (2007) also presented same results for Asia-Pacific countries over the period 1993 to 2003. Acosta *et al* (2007) and Fajnzylber and Lopez (2007) also found that rise in remittances led to poverty reduction by conducting a household survey in Latin American and Caribbean countries. These findings are consistent with Anyanwu and Erhijakpor (2010), Mughal *et al(2007)*, Kirru (2010), Brempong and Elizabeth (2009), Brown and Jimenez (2006), Yang and Martinez (2006), Ratha and Sanket (2007). In the second equation when remittances are taken as dependent variable, the relationship was positive and significant in the long run. It implies that with the increase in poverty subsequent increase in remittances taken place. It could be attributed to the altruistic behavior of the migrants to help their family, relatives and friends and also to secure their future when they returned back to their native nation.

3.4 Short Run Analysis

The ECM coefficient explained the speed of adjustment from short run to long run span of time. Its coefficient should be negative and statistically significant (Bannarjee et.al 1998).

Table 6 .Short Run Analysis

	Dependent Variable: $\Delta \ln POV_t$		Dependent Variable: $\Delta \ln REM_t$	
	Coefficient	T-statistic	Coefficient	T-statistic
Constant	0.0047	16.5741	-0.0042	-3.7871*
$\Delta \ln POV_t$	…	…	0.0315	0.0252
$\Delta \ln POV_{t-1}$	1.0474	120.1725*	…	…
$\Delta \ln REM_t$	-0.0034	-4.4074*	…	…
$\Delta \ln REM_{t-1}$	…	…	1.0308	4.2138*
ECM_{t-1}	-0.0754	-5.3732*	-0.1187	-3.7871
R^2	0.9990		0.4445	
$Adj-R^2$	0.9989		0.3779	
F-statistic	8719.378*		6.6697*	
Prob. (F-statistic)	0.0000		0.0018	

Note: * shows significance at 5% level.

Table-5 presents the short run coefficient estimated from the ECM version of ARDL. The results describes that remittances are inversely related to poverty and statistically significant at 1 percent level of significance. In short run, poverty is decreased by 0.0034 percent as remittances are increased by 1 percent. Poverty is also positively affected by its lag. The coefficient of ECM is equal to (-0.0754) for a short run model when poverty was dependent variable which implies that deviation from long term poverty rate is corrected by 7 percent over the period of one year.

Similarly when remittances are taken as dependent variable, the short relationship between remittances and poverty is positive and significant at 1 percent. The lag value of remittances was also positive and significant. The $ECM_{(t-1)}$ is (-0.1187) and statistically significant at 1 percent of level of significance. It implies that any digression from the short run towards long run corrected by 11 percent over each year.

3.5 VECM Granger Causality Analysis

Table 7. VECM Granger Causality Analysis

	Type of Causation				
	Short Run		Long Run	Joint (short- and long-run)	
	$\sum \Delta \ln POV_t$	$\sum \Delta \ln REM_t$	ECM_{t-1}	$\sum \Delta \ln POV_t, ECM_{t-1}$	$\sum \Delta \ln REM_t, ECM_{t-1}$
	F-statistics [p-values]		T-statistics	F-statistics [p-values]	
$\sum \Delta \ln POV_t$	——	9.8756* [0.0007]	-0.0672* [-3.8229]	17.2794* (0.0000)	——
$\sum \Delta \ln REM_t$	0.3155 [0.7324]	——	-0.1495** [-2.3972]	——	9.0734* [0.0003]

Note: * shows significance at 5% level.

Table 6 reports that there is bidirectional causality between poverty and remittances in the long run and short run when poverty was dependent variable. On the other hand long rum relationship exists between remittances and poverty but not in the short run. So there is bidirectional causality in the long run but not in the short run. Joint test significance also confirmed the short and long run bidirectional causality between remittances and poverty.

3.6 Variance Decomposition Approach

The results presented in Table-7 suggest that poverty is explained 71.94 percent by its own innovative shocks while remittances explain poverty 26.08 percent from its shock. The causality runs from remittances to poverty. The response of poverty due to innovative shock of remittances is high. On the other hand remittances explained 78 percent by its own shock while 22 percent explained by poverty. It implies bidirectional causality between poverty and remittances but strong causal relationship is running from remittances to poverty.

Table 8. Variance Decomposition Approach

Variance Decomposition of $\ln POV_t$			
Period	S.E.	$\ln POV_t$	$\ln REM_t$
1	0.0003	100.0000	0.0000
2	0.0008	97.0399	2.9600
3	0.0014	96.0537	3.9462
4	0.0021	95.3995	4.6004
5	0.0029	96.0055	3.9944
6	0.0038	96.8657	3.1342
7	0.0047	97.7065	2.2934
8	0.0055	98.3628	1.6371
9	0.0064	98.6162	1.3838
10	0.0072	98.1630	1.8369
11	0.0079	96.6678	3.3321
12	0.0086	93.7553	6.2446
13	0.0094	89.0819	10.9180
14	0.0101	82.4329	17.5670
15	0.0110	73.9184	26.0815
Variance Decomposition of $\ln REM_t$			
Period	S.E.	$\ln POV_t$	$\ln REM_t$
1	0.2224	2.0882	97.9117
2	0.3019	1.3786	98.6213
3	0.3431	7.5649	92.4350
4	0.3758	9.8829	90.1170
5	0.4251	11.9455	88.0544
6	0.4871	12.1318	87.8681
7	0.5375	13.5062	86.4937
8	0.5830	15.2671	84.7328
9	0.6285	16.5570	83.4429
10	0.6785	17.4922	82.5077
11	0.7278	18.3077	81.6922
12	0.7745	19.3363	80.6636
13	0.8200	20.3149	79.6850
14	0.8657	21.1781	78.8218
15	0.9113	21.9502	78.0497

3.7 Impulse Response Function

The impulse response functions can be used to produce the time path of the dependent variables to analyze the shocks by explanatory variables. If the system of equations is stable any shock should decline to zero, an unstable system would produce an explosive time path.

4. **Conclusions and Suggestions**

In this paper, two equations were used interchangeably as dependent variable. Co-integration was found between poverty and remittances by using Narayan (2005). The relationship is further supported by long run and short run analysis by ECM. Poverty and remittances are inversely and significantly related in the short run and long run by the estimates of ECM. VECM confirms the results by providing the short run and long run significant estimates. The results are also corroborated with variance decomposition and impulse response function. It can be concluded from the results that remittances are playing a vital role after the foreign direct investment. Pakistan is already witnessing its positive impacts on the economy. It seems that extent of benefits depend upon government policies for the labor force who is working abroad and the responsibility of the households who are receiving money in the form of remittances.

Finally, it is to formulate the policies which guarantee for the proper utilization of remittances especially to use

in the production process and entrepreneurship. A proper structure should be made for the investment of remittances which will provide the safety nets to the poor and ultimately reduce the poverty. It is further proposed that the government should make well- structured mechanism for the skill development of the youth especially in the rural area. And also provide them proper legal opportunities to work abroad and send remittances back to home country for the development of poor masses.

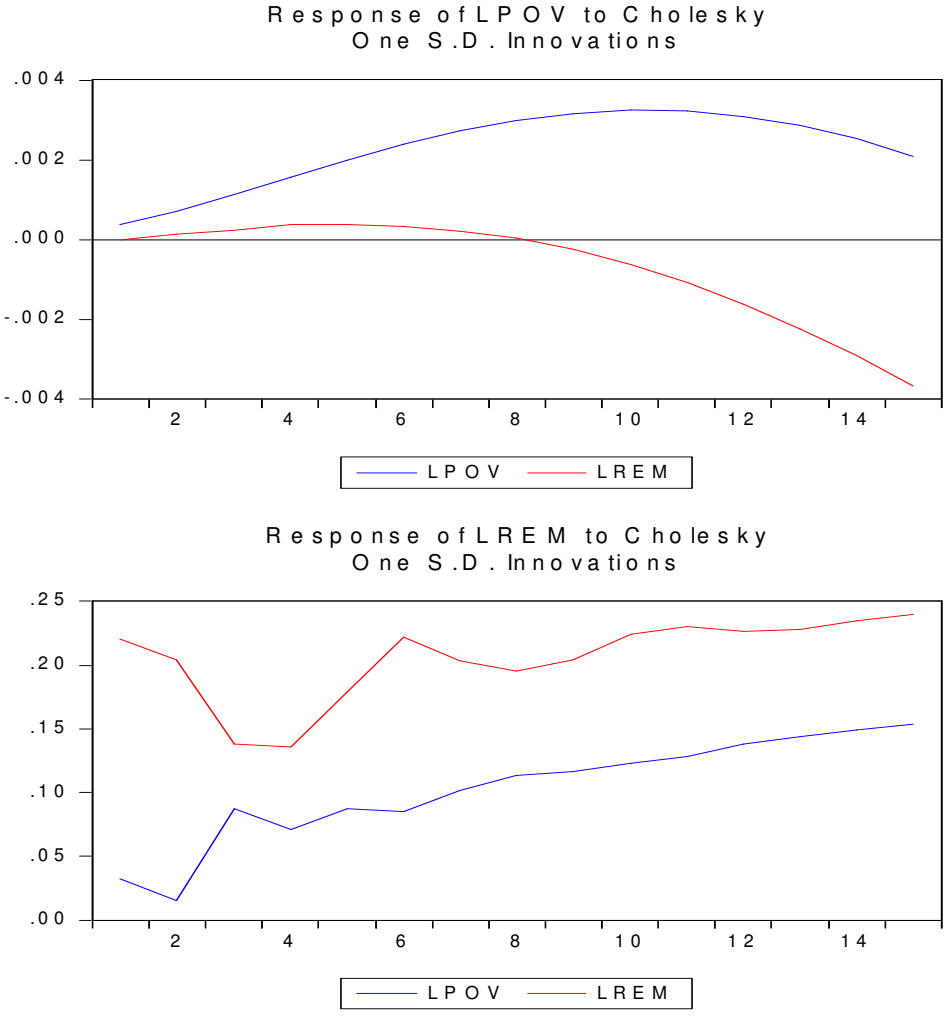

Fig 1. Impulse Response Function

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