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CAUSAL RELATIONSHIP BETWEEN WORKER'S REMITTANCES AND IMPORTS IN PAKISTAN

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Abstract: This paper is an effort to examine the association between remittances and imports. The anticipated import function shows that worker's remittances play a substantial role in the determination of imports in the economy. In this study the researchers used different econometric techniques in order to measure the short-term and long-term relationship between worker's remittances and imports. The ARIMA, Johansen Cointegration test is used to determine the existence of a long-term relationship between the variables of the study. The results showed that the Normalized cointegrating coefficients are statistically significant and showed a stable and positive relationship between the two variables of the study. The analysis of Granger causality indicates the existence of a unidirectional causality from import to worker's remittances. This confirms that worker's remittances have no significant impact on the demand for imported goods rather imports have a positive impact on the worker's remittances of Pakistan.

Keywords: Worker's remittance, Import, ARIMA, Johansen Cointegration, Granger Causality, Unidirectional Causality

INTRODUCTION

The remittances play a significant role for the families of migrants and also for the balance of payment of their home country. As household income of migrant families increases due to receipt of remittance, so they may have propensity to consume more which will increase the demand of goods (Mukit, Shafiullah, and Sajib, 2013).

In present years, remittances from workers have grown swiftly to become one of the leading sources of external finance for developing countries. Remittances of workers are considered an established source of foreign income and stimulate growth in an economy. It is the second largest source of external finance for many developing countries. It tends to accelerate the speed of economic development and domestic savings and increased investment in receiver countries.

McCormick and Wahba (2002) found that remittances from workers increase the level of domestic investment in the countries of origin of migrants. Carlos and Huang (2006) found that remittances from workers tend to increase with improvement in macroeconomic conditions in the host country relative to the country of origin. Catriescu et al. (2006) found that the impact of remittances on growth varies with the strength of the institutional environment in the recipient country. Remittance income is considered as an injection of resources into the economy but imports being an increasing function of income become leakage. It is, therefore worthwhile to analyze its affect on imports. By scanning all available literature it has been observed so far that no attempt has been carried out to use such a methodology of this nature (Mukit, Shafiullah, and Sajib, 2013).

PREVIOUS RESEARCH

Numerous research studies have already shown the relationship between worker's remittances and imported goods. Remittances by migrants increased over time in the Pakistan economy to the growing external demand for its workforce. Remittances contribute to GDP and foreign exchange earnings of developing countries to a greater extent. According to a report by the World Bank, remittances from workers provide valuable financial resources to developing countries, especially the poorest (World Bank, 2006; Byerlee, Diao & Jackson, 2005).

The change in imports due to change in income and remittances affect the value of multiplier negatively being a leakage (Glytsos, 2005). But the value of multiplier itself depends on the values of propensities to consume. It can be inferred here the more the availability of resources, higher will be the value/volume of imports and the economy will be highly dependent on imports (Kandil, & Metwally, 1999).

The main finding is that Human Capital in Pakistan positively influences a gross inflow of FDI. There is evidence that per capita income exerts a negative impact on inward FDI. From a policy point of view, the results suggest that increases in the level of human development and trade openness promote FDI (Ali, Chaudhri, & Tasneem, 2013). Delivery plays a vital role in economic development of a country in particular for developing countries. With remittances, savings can spend more than it produces, importing more than it exports or invest more than it saves, and it might even be more relevant for small economies (Connell & Conway, 2010; Durand & Massey, 1992).

The results from variance decomposition indicate that imports cannot cause the exports but in contrast the exports effectively cause imports (Solimano, 2003). Cointegration stability test confirms that imports cause the exports from the period of 2003 to over the sample size and exports cause the imports from 1994 to 2004 (Hye & Siddiqui, 2010). Remittances play a potentially important role in the functions of import demand in both overall and disaggregated levels, especially where there is a problem of change (Zaman & lmrani, 2005).

Mukit, Shafiullah, & Sajib (2013), also establish the relationship between worker's remittances and imported good in the case of Bangladeshi economy. They have concluded that there is statistically significant and stable positive relationship between worker's remittances and imported good when they implied Normalized Cointegration. They further concluded that there is an existence of unidirectional causality between both variables when they run the Granger causality test through the given data (Ahmed, Meenai & Husain, 2012). Therefore, these results substantiated that the worker's remittances have no statistical significant impact on the demands of imported goods rather this confirms the imported goods applies a positive shocks on worker's remittances. The results from ARDL show that there is co-integration between economic growth and explanatory variables that are real domestic investment, foreign investment, export, remittances and literacy rate. The estimated long run elasticities of economic growth with respect to domestic investment, foreign investment, exports, remittances and literacy rate were found as, 0.121, 0.026, 0.020, 0.065 and 0.224. Further, results depict that the error coefficient term is -0.67 and significant, suggest 67 percent adjustment in a year (Sami, Shah & Khan, 2013).

RESEARCH METHOD

In this research study, the researchers attempt to establish the relationship between two macroeconomic variables i.e. worker's remittances and imported good in the case of Pakistani economy. For this purpose they have taken the two data series. The data is time series and taken monthly pattern over the sample periods from September 2008 to December 2012.

First of all the researchers' check the stationarity of the data, for this purpose they used, most widely used Augmented Dickey Fuller test (Khan, Khattak, Bakhtiar, Nawab, Rahim & Ali, 2007). The following regression is for ADF test purpose:

$$\Delta \mathbf{Y_t = \beta_1 + \beta_2\, t + \delta\, Y_{t-1} + \alpha_i\, \Sigma\Delta\, Y_{t-i} + \varepsilon_t}$$

The researchers used numerous econometric models in order to establish and measure the long-term and short-term relationship between worker's remittances and imported goods. The ARIMA, and Johansen cointegration models are used in order to establish the existence of long-term relationship between two variables in this study (Granger, 1986).

The analysis of Granger causality shows the existence of unidirectional causality from imported goods to the worker's remittances. Since the data series was non-stationary, therefore, in order to maintain the stationarity in the data unit-root test has been applied. ARIMA model has been applied and finally Granger test (Engle & Granger, 1987) and Johansen Co-integration has been applied.

RESULTS AND DISCUSSION

For any Time Series Model, data series should be stationary. The first step was to check the stationarity of the data series. The following ADF test has run and identified the stationarity of the data.

Identification of Stationarity of the data

The following ADF/Unit root test has run and identified the stationarity of the data.

Table 1: Unit Root of Log Series at Level for Imports

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.871793	0.3427
Test critical values:	1% level	-3.562669	
	5% level	-2.918778	
	10% level	-2.597285	

*MacKinnon (1996) one-sided p-values.

Table 2: Augmented Dickey-Fuller Test Equation for Imports

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LIMP(-1)	-0.195996	0.104710	-1.871793	0.0672
D(LIMP(-1))	-0.331859	0.135183	-2.454885	0.0177
C	1.584215	0.845840	1.872948	0.0670

R-squared	0.239543	Mean dependent var	0.001148
Adjusted R-squared	0.208504	S.D. dependent var	0.134537
S.E. of regression	0.119692	Akaike info criterion	-1.351827
Sum squared resid	0.701984	Schwarz criterion	-1.239256
Log likelihood	38.14751	Hannan-Quinn criter.	-1.308670
F-statistic	7.717459	Durbin-Watson stat	1.967846
Prob(F-statistic)	0.001220		

Table 3: Unit Root of Log Series at Level for Remittances

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.413697	0.5686
Test critical values:	1% level	-3.562669	
	5% level	-2.918778	
	10% level	-2.597285	

*MacKinnon (1996) one-sided p-values.

Table 4: Augmented Dickey-Fuller Test Equation for Worker's Remittances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LWR(-1)	-0.091246	0.064544	-1.413697	0.1638
D(LWR(-1))	-0.495554	0.122185	-4.055771	0.0002
C	0.634539	0.436732	1.452926	0.1526

R-squared	0.314697	Mean dependent var	0.012502
Adjusted R-squared	0.286715	S.D. dependent var	0.128675
S.E. of regression	0.108674	Akaike info criterion	-1.544973
Sum squared resid	0.578669	Schwarz criterion	-1.432401
Log likelihood	43.16930	Hannan-Quinn criter.	-1.501816
F-statistic	11.25007	Durbin-Watson stat	2.107846
Prob(F-statistic)	0.000095		

ADF/Unit Root Test shows that both series have unit roots that means Null Hypothesis is accepted which is the indication for non-stationary data.

To make the data series Stationary

Therefore, the next step is to make the data series stationary. To make data stationary now, researchers follow the Unit root test/Dickey-Fuller Test (Ahmed, Husain & Parmar, 2012).

Table 5: Unit Root/ADF of Log Series at 1st Difference for Imports

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.308950	0.0013
Test critical values:	1% level	-3.581152	
	5% level	-2.926622	
	10% level	-2.601424	

*MacKinnon (1996) one-sided p-values.

Table 6: Augmented Dickey-Fuller Test Equation

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LIMP(-1))	-2.923771	0.678534	-4.308950	0.0001
D(LIMP(-1),2)	1.201700	0.596262	2.015390	0.0510
D(LIMP(-2),2)	0.806170	0.472116	1.707567	0.0959
D(LIMP(-3),2)	0.537275	0.368193	1.459220	0.1527
D(LIMP(-4),2)	0.149925	0.299717	0.500221	0.6198
D(LIMP(-5),2)	-0.061352	0.222864	-0.275287	0.7846
D(LIMP(-6),2)	-0.161150	0.121064	-1.331113	0.1911
C	0.024290	0.014773	1.644252	0.1084

R-squared	0.844385	Mean dependent var	0.004193
Adjusted R-squared	0.815719	S.D. dependent var	0.224636
S.E. of regression	0.096432	Akaike info criterion	-1.683195
Sum squared resid	0.353364	Schwarz criterion	-1.365171
Log likelihood	46.71349	Hannan-Quinn criter.	-1.564061
F-statistic	29.45609	Durbin-Watson stat	2.015738
Prob(F-statistic)	0.000000		

Table 7: Unit Root/ADF of Log Series at Level for Worker's Remittance

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-12.83151	0.0000
Test critical values:	1% level	-3.562669	
	5% level	-2.918778	
	10% level	-2.597265	

*MacKinnon (1996) one-sided p-values.

Table 8: Augmented Dickey-Fuller Test Equation

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLWR(-1)	-1.537042	0.119787	-12.83151	0.0000
C	0.017502	0.015261	1.146871	0.2569

R-squared	0.767060	Mean dependent var	0.003192
Adjusted R-squared	0.762401	S.D. dependent var	0.225163
S.E. of regression	0.109753	Akaike info criterion	-1.543456
Sum squared resid	0.602291	Schwarz criterion	-1.468410
Log likelihood	42.12990	Hannan-Quinn criter.	-1.514686
F-statistic	164.6475	Durbin-Watson stat	2.124586
Prob(F-statistic)	0.000000		

Now, it has shown that after testing on 1st difference the data has become stationary for both imports & worker's remittances and, now, we can run ARMA/ARIMA on data series.

Identification of ARMA/ARIMA

- If any data series become stationary at I(0) level, ARMA Model will be used.
- For higher order of integration I(1) and I(2) ARIMA will be used.

Since the data series has become stationary at 1st difference, which has integrating order I(1) this indicates that ARIMA Model will be used for our data series.

ARIMA Model & Imports

Now following are the series wise results of ARIMA Model:

Table 9: ARIMA Model for Imports

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.007666	0.005488	1.396867	0.1731
AR(1)	-0.218333	0.203444	-1.073184	0.2920
AR(4)	-0.052130	0.173408	-0.300623	0.7658
AR(7)	0.186663	0.200866	0.929291	0.3604
AR(8)	-0.195970	0.232960	-0.841218	0.4071
AR(12)	0.109864	0.169984	0.646317	0.5232
MA(7)	-0.090215	0.273000	-0.330458	0.7434
MA(8)	-0.018658	0.316097	-0.059026	0.9533
MA(9)	-0.215397	0.267805	-0.804303	0.4278
MA(10)	-0.227224	0.217357	-1.045395	0.3045

MA(12)	0.384555	0.195017	1.971904	0.0582

R-squared	0.690866	Mean dependent var	0.008057
Adjusted R-squared	0.573608	S.D. dependent var	0.117124
S.E. of regression	0.076480	Akaike info criterion	-2.064478
Sum squared resid	0.169628	Schwarz criterion	-1.562944
Log likelihood	54.32179	Hannan-Quinn criter.	-1.881847
F-statistic	5.891853	Durbin-Watson stat	2.131454
Prob(F-statistic)	0.000061		

Inverted AR Roots	.80	.71-.39i	.71+.39i	.42+.77i
	.42-.77i	-.06+.75i	-.06-.75i	-.38+.79i
	-.38-.79i	-.72	-.84+.41i	-.84-.41i
Inverted MA Roots	.90-.11i	.90+.11i	.77+.64i	.77-.64i
	.29-.92i	.29+.92i	-.24-.90i	-.24+.90i
	-.62+.61i	-.62-.61i	-.85-.25i	-.85+.25i

Table 10: Testing the Rank of Cointegration

	Adjusted R-Square	AIC	SBC
At start – with all variables	0.5736	(2.0644)	(1.5629)
Eliminating MA(8)	0.5917	(2.1228)	(1.6631)
Eliminating AR(4)	0.6267	(2.2454)	(1.8692)
Eliminating MA(10) & AR(7)	0.6330	(2.2993)	(2.0068)
Eliminating AR(1)	0.6538	(2.3775)	(2.1267)

Table 11: Final ARIMA Model for Imports

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.004400	0.002231	1.972468	0.0565
AR(8)	-0.396836	0.106952	-3.710398	0.0007
AR(12)	0.217296	0.103255	2.104445	0.0426
MA(1)	-0.605394	0.067165	-9.013472	0.0000
MA(9)	-0.539921	0.076421	-7.065086	0.0000
MA(12)	0.154440	0.081580	1.893110	0.0666

R-squared	0.697088	Mean dependent var	0.008057
Adjusted R-squared	**0.653815**	S.D. dependent var	0.117124
S.E. of regression	0.068913	Akaike info criterion	**-2.377493**
Sum squared resid	0.166214	Schwarz criterion	**-2.126726**
Log likelihood	54.73861	Hannan-Quinn criter.	-2.286178
F-statistic	16.10900	Durbin-Watson stat	2.469048
Prob(F-statistic)	0.000000		

Inverted AR Roots	.83+.41i	.83-.41i	.79	.41-.83i
	.41+.83i	.00-.79i	-.00+.79i	-.41-.83i
	-.41+.83i	-.79	-.83-.41i	-.83+.41i
Inverted MA Roots	1.00	.79+.61i	.79-.61i	.66
	.25-.92i	.25+.92i	-.35-.58i	-.35+.58i
	-.36+.75i	-.36-.75i	-.86-.30i	-.86+.30i

At this stage, we have maximum variables with Probability value less than 0.05 as well as highest Adjusted R^2 and lowest AIC and SBC.

ARIMA Model & Worker's Remittances

Table 12: ARIMA Model For Worker's Remittances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.010600	0.011731	0.902768	0.3711
AR(1)	-0.414636	0.140052	-2.961198	0.0048
MA(12)	-0.685094	0.103565	6.618472	0.0000
MA(13)	-0.291121	0.116621	-2.496386	0.0160

R-squared	0.010688	Mean dependent var	0.012502
Adjusted R-squared	0.516415	S.D. dependent var	0.128624
S.E. of regression	0.089413	Akaike info criterion	-1.915193
Sum squared resid	0.384214	Schwarz criterion	-1.765826
Log likelihood	53.81861	Hannan-Quinn criter.	-1.858378
F-statistic	19.15900	Durbin-Watson stat	1.838448
Prob(F-statistic)	0.000000		

Inverted AR Roots	-.41	.89-.26	.79	.65-.69
Inverted MA Roots	.89-.261	.22-.94i	-.00+.79i	-.21+.94
	.43	-.79	-.83-.41i	-.83+.41
Inverted MA Roots	1.00	.79+.61i	.79-.61i	.66
	.25-.92i	.25+.92i	-.35-.58i	-.35+.58i
	-.36+.75i	-.36-.75i	-.86-.30i	-.86+.30i

Once again at this stage, we have maximum variables with Probability value less than 0.05 as well as highest Adjusted R^2 and lowest AIC and SBC.

Causality Analysis

Table 13: Granger Causality Test

Pairwise Granger Causality Tests
Date: 06/06/13 Time: 14:41
Sample: 2008M07 2012M12
Lags: 1

Null Hypothesis:	Obs	F-Statistic	Prob.
LWR does not Granger Cause LIMPORT	53	9.34247	0.0036
LIMPORT does not Granger Cause LWR		0.17105	0.6809

The results of the Granger causality clearly depict that the hypothesis of worker's remittances does not any cause or impact on imported goods has rejected. It is further concluded that the hypothesis of imported goods do not Granger cause or impact on worker's remittances has not rejected. So, it is further concluded that the Granger causality runs only one-way from imports to worker's remittances and not the other way around. The analysis suggested by the Granger causality there is an existence of a unidirectional causality only from imported goods to worker's remittances. This analysis also confirms that the worker's remittances have no statistical significant impact on the demands of imported goods rather the analysis proved that there is a positive impact of imports on worker's remittances in Pakistani economy.

Testing Cointegration

Table 14: Trace Statistics
Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.290428	25.43188	29.79707	0.1466
At most 1	0.111169	7.591010	15.49471	0.5101
At most 2	0.027741	1.462921	3.841466	0.2265

Trace test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Table 15: Maximum Eigenvalue Statistics
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.290428	17.84087	21.13162	0.1359
At most 1	0.111169	6.128089	14.26460	0.5968
At most 2	0.027741	1.462921	3.841466	0.2265

Max-eigenvalue test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

The results of trace test indicated that there is no cointegration at 0.05 levels. Therefore, it is further concluded that the results extracted above by trace test, Eigen values and Johansen Cointegration tests clearly shows that there is no sign of cointegration between the worker's remittances and the imported goods. Similarly the Max-Eigen values indicate that there is no cointegration at 0.05 levels between worker's remittances and the imported goods.

The trace statistic and maximum Eigen statistic identified only one cointegration vector between two variables. The presence of Cointegration between worker's remittances and imports implies the existence of stable and long run relationship between the variables. The results of Normalized Cointegration coefficients estimated as above showed a significant sign of coefficient, which also implied that there is a long run and positive relationship between worker's remittances and imported goods.

CONCLUSION

This paper is an effort to examine the association between worker's remittances and imported good in Pakistani economy. The anticipated import function shows that worker's remittances play a substantial role in the determination of imports in the economy. The ARIMA, Johansen Cointegration test is used to determine the existence of a long-term relationship between the variables of the study.

The results of the Granger causality clearly depict that the hypothesis of worker's remittances does not any cause or impact on imported goods has rejected. It is further concluded that the hypothesis of imported goods do not Granger cause or impact on worker's remittances has not rejected. So, it is further concluded that the Granger causality runs only one-way from imports to worker's remittances and not the other way around. The analysis suggested by the Granger causality there is an existence of a unidirectional causality only from imported goods to worker's remittances. This analysis also confirms that the worker's remittances have no statistical significant impact on the demands of imported goods rather the analysis proved that there is a positive impact of imports on worker's remittances in Pakistani economy.

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