Dynamic Impact of Workers' Remittances on Financial Development in Sri Lanka

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Article Information

Abstract

The objective of this study is to examine the dynamic impact of workers' remittances on financial development in Sri Lanka using the annual time series data over the period of 1975-2017. In order to attain the objective, the Augmented Dickey-Fuller (ADF), and Phillips and Perron (PP) unit root tests, and the autoregressive distributed lag (ARDL) bound cointegration technique are employed. The unit root test results indicate that the variables used in this study are stationary at 1st difference. The test result of ARDL reveals that workers' remittances in Sri Lanka have a long-run relationship with the financial sector but not in the short-run. The coefficient of the error correction term indicates that 18.6 percent of error is corrected each year and further it is explained that the response variable of the financial development moves towards the long-run equilibrium path. The diagnostic test results confirm that the estimated model is robust. Therefore, this study recommends that policymakers should consider the findings of this study when they form financial development policies.

Introduction

Workers' remittances are an important source of external finance in many emerging economies (Maimbo, & Ratha, 2005; Ratha, 2005; Brown, Carmignani, & Fayad, 2013; Inoue, & Hamori, 2016). However, there is no general agreement in policy debates on the impact of workers' remittances on financial development. The World Bank (2019) stated that the injection of workers' remittances to the developing countries reached US$583 billion in 2017 and US$624.5 billion in 2018. Workers' remittances sent home by migrants have maintained a steady and marked upward trend between 1980 and 2018, reaching US$424.2 billion in 2018 compared to US$12.0 billion in 1980. Recorded workers' remittances are more than twice as large as official aid and nearly two-thirds of foreign direct investment flows to developing countries. Workers' remittances are the largest source of external financing in many poor countries. Workers' remittances have become the second most important type of private external finance to developing countries after FDI (Adams, 1991; Aggarwal, Demirguc-Kunt & Martinez Peria, 2006). Workers' remittances in developing countries help to solve many development issues: foreign reserve, current account deficit, fluctuation of the exchange rate, and financial development (Ojeda, & Center, 2003; Shahbaz & Islam, 2011; Shahzad, Adnan, Sajid, & Naveed 2014). In contrast, Rao & Hassan (2011) states that a proportion of workers' remittances are used to deposit in a financial institution by migrants' houses.

Banking and non-banking financial institutions are called formal financial intermediaries for workers' remittances (Burgess & Pande, 2005; Nyamongo, Misati, Kipyegon & Ndirangu, 2012). They collect the workers' remittances from households as savings and channel them to productive sectors in an economy (Sehrawat & Giri, 2015). Nevertheless, Liang & Reichert (2006) states that the financial development of a country is a powerful tool to promote economic growth and reducing poverty.

Motelle (2011) and Masuduzzaman, (2014) stated that workers' remittances are a potential factor for upgrading financial development. Most literature assume that a significant amount of migrant houses deposit their rest of the income stimulated by the workers' remittances in financial institutions as savings (Rao & Hassan, 2011). The financial institutions, as stated above, channel the collected savings from migrants' houses to the productive sector through credit creation (Reinke, 2007; Acosta, Baerg & Mandelman, 2009, Chowdhury, 2011 and 2016).

Sri Lanka is one of the countries in South Asia, whereas workers' remittances are an important external source of finance for economic development in South Asia. Most of the South Asian countries follow the labour exporting policy to reduce their economic development issues. Accordingly, Sri Lanka follows the labour exporting policy since the later part of the 1970s. Sri Lankan labourers are spread out almost all over the world. Workers' remittances sending through the official channels in Sri Lanka are recorded as a remarkable source of finance under secondary income in the balance of payment. However, a large portion of workers' remittances enter into Sri Lanka by informal channels, yet they are not recorded in the balance of payment. Mundaca (2009) stated that the final destination of the workers' remittances is migrants' houses even though the workers' remittances are sent through both formal and informal channels.

The World Bank (2017) stated that the contribution of workers' remittances to financial development in Sri Lanka is an important factor since the year 1975 as it shows an increasing trend with some fluctuation. However, none of the researchers in Sri Lanka studied the relationship between workers' remittances and financial development in-depth. Hence, the main motivation of this study is to find the answer to the research question of whether workers' remittances promote financial development in Sri Lanka. To answer this research question, this study establishes the following objective. The objective of this study is to investigate the relationship between workers' remittances and financial development in Sri Lanka.

In this study, section 2 presents the literature review, section 3 explains the methodology, the results and discussion are given in section 4, section 5 concludes the study with recommendations.

Literature review

Although there is no clear theoretical conceptualization of the relationships between workers' remittances and financial development, it has been evidenced that the empirical studies have widely focused on this relationship using single and cross- country data. Aggarwal, et.al. (2006) examined the relationship between workers' remittances and financial development based on the annual time series data of 99 developing countries for the period of 1975 to 2003. In this study, the panel regression technique was employed and found that workers' remittances have a positive relationship with financial development. As well, Giuliano, & Ruiz-Arranz (2009) investigated the relationship between workers' remittances and financial development using the annual time series data of 100 developing countries over the period 1975 - 2002. This study also employed the panel regression technique and found that workers' remittances stimulate financial development. In addition, Bettin & Zazzaro (2012) studied the financial development effect of workers' remittances using the annual time series data of selected 66 developing countries during the period of 1970 – 2005. This study also employed the penal regression technique and concluded that workers' remittances motivate financial development. Furthermore, Cooray (2012) investigated the relationship between workers' remittances and financial development using panel data of 94 OECD countries over the period of 1990 to 2010. They employed panel regression techniques and found that workers' remittances encourage financial development in selected OECD countries. Ojapinwa & Bashorun (2014) examined the impact of workers' remittances on financial development using the annual time series data of 32 Sub – Sahara African countries for the period 1966 to 2010. In the study, the Generalized Moment Method (GMM) was used to find the results. This study summarized that workers' remittances have a positive relationship with financial development. Shahzad, Adnan, Sajid, & Naveed (2014) studied the impact of workers' remittances on financial development in some selected South Asian countries over the period of 1989 to 2011. They employed both panel regression and the generalized movement method techniques. This study found that workers' remittances have a positive relationship with financial development (Ranasinghe & Cheng 2020). Likewise, Gupta, Pattillo, & Wagh (2009) studied the effect of workers' remittances on financial development by using annual time series data of 24 Sub – Saharan African countries for the period of 1980 to 2000. This study used the 3SLS technique and found that workers' remittances promote financial development.

Apart from the cross-country studies, some literature examined the relationship between workers' remittances and financial development using single country data. In view of that, Chowdhury (2011) examined the impact of workers' remittances on financial development in Bangladesh using the annual time series data over the period of 1971-2008. In this study, the Johansen and Juselius cointegration technique was employed. This study concluded that workers' remittances have a long-run relationship with financial development. As well, Masuduzzaman (2014) investigated the long-run relationship between workers' remittances and financial development in Bangladesh using the annual time series data during the period of 1981 to 2013. This study employed the Johansen and Juselius cointegration technique and Granger Causality test. This study found that the workers' remittances have a long-run relationship with financial development. Furthermore, this study instituted that there was unidirectional causality from workers' remittances to financial development. In addition, Sibindi (2014) examined the relationship between workers' remittances and financial development using Lesotho's time series data over the period of 1975 to 2010. They used the Johansen and Juselius cointegration and Granger Causality tests and found that workers' remittances have a long-run relationship with the financial development and there was unidirectional causality from workers' remittances to financial development. Oke (2011) examined the relationship between workers' remittances and financial development in Nigeria using annual time series data for the period of 1977 to 2009. This study employed the Generalized Movement Method (GMM) and concluded that workers' remittances stimulate financial development.

It can be concluded from the above review of literature that most of the studies agree that workers' remittances have a positive relationship with financial development, the country-based literature used the Johansen and Juselius cointegration technique even though the sample observations is too small, yet the Johansen and Juselius cointegration technique is inappropriate to a small sample, there is no evidence that the relationship between workers' remittances

and financial development had been studied in Sri Lanka. Therefore, it is hoped that this study will full fill these gaps.

Methodology

Data and Model Specification

This study used the annual time series data for the variable of financial development, workers' remittances, inflation and gross domestic product, over the period of 1975 to 2017. All data except the inflation were gathered from the official database of the World Bank. The data for the inflation were collected from annual reports of the Central Bank of Sri Lanka published in various years. Further, all data series used in this study were transformed into the natural logarithmic to have normality and linearity.

The empirical model of Aggarwal, et. al. (2006) was considered to investigate the objective of this study. Thus, the mathematic function of this study can be written as:

$$FD_t = f(Y_t, INF_t) \qquad (1)$$

Where Fd_t is financial development which indicates the broad money supply, Y_t is gross national income INF_t is inflation

Glytsos (2002 and 2005) argued that the gross national income consists of gross domestic product and workers' remittances. Therefore, the mathematical function given above can be extended as:

$$FD_t = f(WRE_t, INF_t, GDP_t) \qquad (2)$$

where GDP_t is gross domestic product, and WRE_t is workers' remittances.

Let's write the mathematical function (2) as the following econometric equation:

$$FD_t = \beta_0 + \beta_1 WRE_t + \beta_2 INF_t + \beta_3 GDP_t + e_t \qquad (3)$$

Where, FD_t is financial development, WRE_t is the workers' remittances, INF_t is Inflation and GDP_t is Gross Domestic Product, t refers to the time period from 1975 to 2017, e_t is error term, β_0 is the constant term, and β_1, β_2 and β_3 are coefficients of workers' remittances, inflation and gross domestic product, respectively.

Analytical technique

Exploratory data analysis technique, unit root test, ARDL bounds test, diagnostic tests, Granger's causality test, and impulse response analysis were used to analyse the data used in this study.

The scatter plot, confidence ellipse, and kernel fit were used to find novel and useful information that might otherwise remain unknown. These techniques may uncover the underlying structure of the relationship between the variables (Tukey, 1980).

It is necessary to confirm whether the variables are stationarity or not as this study uses the time series data. Therefore, the Augmented Dickey-Fuller (ADF) and Philips and Perron (PP) unit root tests were employed to test the stationary of the series.

The ADF test equation is:

$$\Delta y_t = \alpha + \beta_t + \gamma y_{t-1} + \delta_t \Delta y_{t-1} + \ldots + \delta_{p-1} \Delta y_{t-p+1} + \varepsilon_t \qquad (4)$$

where α is constant, β_t is the coefficient on a time trend and p is the lag order of the autoregressive process and ε_t is error term.

The PP test equation is:

$$\Delta y_t = (p-1)y_{t-1} + \varepsilon_t \qquad (5)$$

where Δ is first difference operator, $p-1$ is coefficient of y_{t-1} and ε_t is error term.

Having confirmed the stationary of the variables, this study concluded which technique is suitable for testing the long-run relationship between workers' remittances and financial development as there are a number of cointegration techniques that have been used in the empirical literature. However, this study employed the ARDL bound cointegration technique based on the Akaike Information Criterion (AIC) to test the long-run relationship between workers'remittances and financial development in Sri Lanka as the sample observations of this study are small.

The ARDL bound technique has some benefits compared to other cointegration techniques (Pesaran, Shin, & Smith, 2001). Accordingly, it allows mixed order variables for testing the long-run relationship but does not accept $I(2)$ or high – order variables (Ozturk & Karagoz, 2012).The ARDL cointegration technique can be applied for small and finite sample (N<50). This technique accommodates different time lags for different variables in the model, while the conventional cointegration techniques require that all the variables should be in the same order of integration. The ARDL technique takes care of omitted variables and serial correlation issues and addresses any endogeneity problem since it provides unbiased estimates in the long-run model. This technique estimates both long-run and short-run dynamics simultaneously in a single reduced form of the equation (Harris & Sollis, 2003). The ARDL model specification of this study can be written as:

$$\Delta LFD_t = \beta_0 + \sum_{i=1}^{p} \beta_{1i} \Delta LFD_{t-i} + \sum_{i=0}^{p_1} \beta_{2i} \Delta LINF_{t-i} + \sum_{i=0}^{p_2} \beta_{3i} \Delta LGDP_{t-i} + \sum_{i=0}^{p_3} \beta_{4i} \Delta LWRE_{t-i} + \delta_5 LFD_{t-1} + \delta_6 LINF_{t-1} + \delta_7 LGDP_{t-1} + \delta_8 LWRE_{t-1} + \varepsilon_t \qquad (6)$$

Where Δ indicates the first difference operator; $p, p_1, p_2,$ and p_3 are the optimal lag length; ε_t is random error term; β_0 is constant; $\beta_{1i} - \beta_{4i}$ are the short –run coefficients of the variables; and $\delta_5 - \delta_8$ are the long – run coefficients of the variables.

In terms of the unrestricted error correction model (ECM) given by the equation (6), the joint null hypothesis is to be tested, which indicates the absence of a long-run relationship between financial development and the explanatory variables, is null hypothesis of $[H_0: \delta_5 = \delta_6 = \delta_7 = \delta_8 = 0]$ against the alternative hypothesis of $[H_1: \delta_5 \neq \delta_6 \neq \delta_7 \neq \delta_8 \neq 0]$. The F test is done by comparing the F- test statistic with the critical values proposed by Pesaran et.al. (2001).

Pesaran et.al. (2001) proposed two sets of alternative critical values at each level of significance to test the long-run relationship between the variables. One set of critical values represents the lower bound values assuming that all repressors are I(0) and other sets give the upper bound critical values assuming that all the repressors are I(1). Therefore, if the calculated F- statistic was greater than the upper bound critical value (UBC), (F>FUBC), the null hypothesis will be rejected, it can be therefore concluded that the variables are cointegrated. On the other hand, if the calculated F- statistic was less than the lower bound critical value (LBC), (F<FLBC), the null hypothesis cannot be rejected. It can be therefore noted that the variables were not cointegrated. In addition, if the calculated F- statistic was located between the upper and lower bounds critical values, (FLBC<F<FUBC) it cannot come to the conclusion about the cointegration.

Having confirmed the long-run relationship between the variables, the short-run dynamics of variables were estimated by using Equation (7). The short-run model including the error correction term can be written as:

$$\Delta LFD_t = \beta_0 + \sum_{i=1}^{p} \beta_{1i} \Delta LFD_{t-i} + \sum_{i=0}^{p_1} \beta_{2i} \Delta LINF_{t-i} + \sum_{i=0}^{p_2} \beta_{3i} \Delta LGDP_{t-i} + \sum_{i=0}^{p_3} \beta_{4i} \Delta LWRE_{t-i} + \lambda ECT_{t-1} + \varepsilon_t \qquad (7)$$

where: λ represents the coefficient of error correction term, it should be in negative, less than one and statistically significant, ECT_{t-1} is the error correction term.

Diagnostics test

This study employed the Brush –Frey serial correlation LM test, heteroskedasticity ARCH test and the Jarque-Bera normality tests to check the robustness of the estimated ARDL model. In addition to that, the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of square recursive residuals (CUSUMSQ) tests were used to test the stability of the models.

Results and discussion

This section presents the findings of this study based on the tools of exploratory data analysis and inferential data analysis tools.

Fig. 1 shows the relationship between workers'remittances and financial development over the period of 1975-2017 in Sri Lanka which confirms that there is a positive relationship between workers' remittances and financial development in Sri Lanka at 95% confidence level.

Figure 1 The relationship between WRE and FD in Sri Lanka
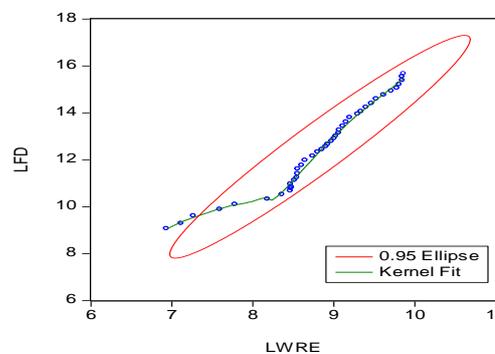
Source: Authors' derivation

Unit root tests result are presented in Table 1. Both tests confirm that all the variables used in this study are stationary at 1st difference. Further, it is noted that none of the variables followed $I(2)$ or higher order.

Table 1. Unit root test result

Variable	Augmented Dickey – Fuller Test		Phillips – Perron Test		order
	Level	1st Difference	Level	1st Difference	
LFD_t	-0.946	-2.966	-1.555	-2.838	$I(1)$
	(0.762)	(0.046)	(0.496)	(0.042)	
$LINF_t$	-0.722	-8.984	-0.932	-11.096	$I(1)$
	(0.397)	(0.000)	(0.030)	(0.000)	
$LWRE_t$	-2.556	-2.942	2.756	-2.325	$I(1)$
	(0.110)	(0.049)	(0.998)	(0.021)	
$LGDP_t$	-1.630	-7.325	-2.662	-7.302	$I(1)$
	(0.762)	(0.000)	(0.256)	(0.004)	

Note: parenthesis indicates p – value at 5% significance level

Source: Authors' calculation

Next to the stationary test, selecting the optimal lag length is an important requirement in ARDL cointegration technique. In this study, the Akaike Information Criterion (AIC) is used to select an optimal lag length of ARDL model. Accordingly, the ARDL (2, 0, 1, 1) model has the optimal lag length compared to other models produced by AIC. This study, therefore, selects the ARDL (2, 0, 1, 1) model to investigate the dynamic impact of workers' remittances on financial development in Sri Lanka.

The bounds test results are presented in Table 2. The calculated F-statistic is 6.79 which is greater than the upper bound critical value of 3.63 at 5% significance level. Therefore, the null hypothesis of no cointegration is not accepted at 5% significance level. It is, therefore, confirmed that there is a long-run relationship between workers'remittances and financial development in Sri Lanka.

Table 2. ARDL bounds test results

Test statistic	Value	
F- Statistic	**6.79**	
K	3	
Significance	$I(0)$ Bound	$I(1)$ Bound
10%	2.01	3.1
5%	2.45	**3.63**
2.5%	2.87	4.16
1%	3.42	4.84

Source: Authors' calculation

The estimated long-run coefficients of this study are given in Table 3 which indicates the variables used in this study are statistically significant at different levels, respectively. The estimated coefficient of the inflation rate is -0.26 and its p-value is 0.04. As the p-value is less than 0.05, the variable of the inflation rate is statistically significant at 5% level. Therefore, if the inflation rate is increased by 1%, the financial development in Sri Lanka will be decreased by 0.26%. In contrast, if the inflation rate is decreased by 1%, the financial development in Sri Lanka will be augmented by 0.26%. Therefore, this finding is consistent with the studies of Bittencourt (2011); Abbey (2012); Ozturk & Karagoz (2012); Almalki & Batayneh (2015); Khan (2015); Tinoco Zermeño, Venegas Martínez, & Torres Preciado (2018).

In Table 3, the coefficient of GDP is 1.10 and its p-value is 0.000. The variable of GDP is significant at 1% level as the p-value is less than 0.01. Thus, if the GDP in Sri Lanka is increased by 1%, the financial development will be encouraged by 1.1%. On the other hand, if the GDP is decreased by 1%, the financial development will be declined by 1.1%. Therefore, this conclusion is in line with the studies of Al-Jarrah, Al-Zu'bi, Jaara & Alshurideh (2012); Cecchetti & Kharroubi (2012); Liang & Reichert (2006).

The variable of workers'remittances in this study is the key independent variable. The estimated coefficient of workers'remittances in Table 3 is 0.21 and its p-value is 0.006. As the p-value of this variable is less than 0.01, the variable is statistically significant at 1% level. Thus, if workers' remittances are increased by 1%, the financial development in Sri Lanka will be augmented by 0.21%. But, if workers' remittances are decreased by 1%, the financial development will be declined by 0.21%. Therefore, the finding of this study confirms the findings of Aggarwal, et.al. (2006); Giuliano & Ruiz-Arranz (2009); Chowdhury (2011); Cooray (2012); Bettin & Zazzaro (2012); Masuduzzaman (2014); Shahzad, et.al. (2014); Sibindi (2014).

Table 3. Long – run and short-run dynamics

Dependent Variables: LFD_t			
Variable	Coefficient	t- statistic	P value
LINF	-0.264	-2.127	0.040**
LGDP	1.102	27.227	0.000*
LWRE	0.218	2.896	0.006*
Dependent Variables: ΔLFD_t			
D(LINF)	-0.049	-2.692	0.011**
D(LGDP)	0.073	0.969	0.339ns
	0.119	1.247	0.220ns
D(LWRE)	-0.186	-3.983	0.000*
ECT_{t-1}			

Source: Authors' calculation   Note: * p<0.01, ** p<0.05, ns: not significant

Rear part of Table 3 illustrates the short-run dynamics of the variables used in this study. The variable of inflation rate negatively affects the financial development at 1% significance level, whereas other variables used in this study have not a significant relationship with the financial development in the short-run. In the meantime, the coefficient of error correction term (ECT_{t-1}) is statistically significant at 1% with a negative sign. The negative sign indicates that the response variable of financial development moves towards the long-run equilibrium path. Further, the coefficient of the error correction term is -0.186, which implies that 18.6% of disequilibrium error will be adjusted every year (see Table 3)

The diagnostic test results of this study are given in Table 5 which shows that the estimated model is not suffering from serial correlation and is homoscedasticity as the corresponding p-values of these tests are greater than 5% significance level. As well the corresponding p-value of the Jarque-Bera test is greater than 5% significance level, it can be concluded that the residual of the estimated model is also normally distributed (see Table 4).

Table 4. Diagnostic Tests result

Model	Test statistic			
	Breusch-Godfrey Serial Correlation LM Test		Heteroskedasticity Test: ARCH	
	F-statistic	Prob.F(2, 31)	F-statistic	Prob.F(1,37)
ARDL (2, 0 1, 1)	0.782	0.466	2.223	0.144
	χ^2_{JBN} 0.981 (0.612)			

Source: Authors' calculation

Fig. 2 and Fig 3 show the plots of the CUSUM and CUSUMSQ for the estimated model. The null hypothesis of parameter coefficient constancy is not rejected as the CUSUM plot is within the critical bounds at 5% significance level. Therefore, it can be concluded that the estimated model of this study is stable over the study period.

Fig. 2 the CUSUM plot for long – run model
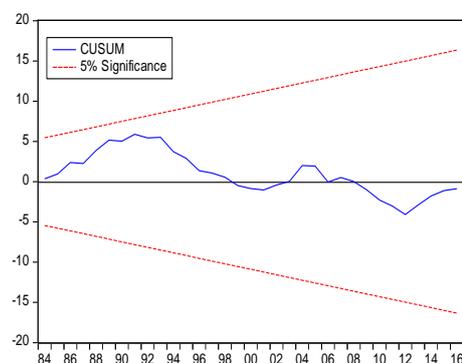
Source: Authors' derivation

Fig. 3 the CUSUMSQ plot for long – run model
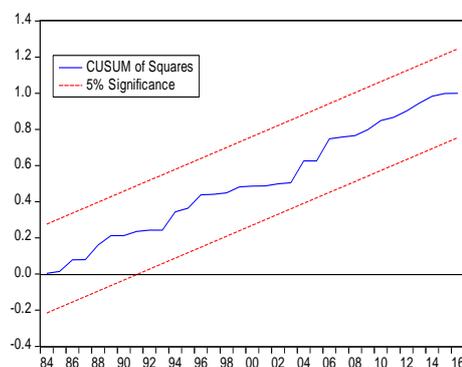
Source: Authors' derivation

Conclusion and Policy Recommendation

This study examined the dynamic impact of workers' remittances on financial development in Sri Lanka using the annual time series data over the period of 1975-2017. The ADF and PP unit root test results confirmed that the variables used in this study were stationary at 1st difference. The ARDL bounds cointegration test results showed that workers' remittances have a positive relationship with the financial development in Sri Lanka in the long-run period but not in the short-run. The coefficient of error correction term revealed that 18.6% of error was corrected every year and it was noted that the response variable of financial development moved towards the long-run equilibrium path. The diagnostic test results showed that the estimated model was robust. Based on the findings of this study, it was confirmed that workers' remittances moved the financial development in the long-run. Therefore, policymakers should consider these findings when they form the financial development policies in Sri Lanka. Further, to our knowledge, this study is the first research in examining the relationship between workers' remittances and financial development in Sri Lanka.

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