International Journal of Engineering & Technology, 7 (4.28) (2018) 26-29

International Journal of Engineering & Technology

Website: www.sciencepubco.com/index.php/IJET

Research paper



Investigating the ppp theory and long-run estimates for five Asian countries

Niri Martha Choji[1]*, Siok Kun Sek[2]

[1]*Department of Mathematics, Plateau State University Bokkos, Nigeria.*
[2]*School of Mathematical Sciences, Universiti Sains Malaysia, 11800 Minden, Penang, Malaysia.*
**Corresponding author E-mail: marthaniri@yahoo.com*

Abstract

The theory of purchasing power parity (PPP) theory posits that the conversion rate between two currencies ought to be the same as the ratio of the total price levels between two currencies. Using monthly recent panel data for five Asian countries, from the period 1996M01-2016M08, the paper examined the PPP theory by utilizing robust methods of panel unit root and cointegration (Pesaran and Westerlund) tests that put into consideration cross-sectional dependence. The panel unit root test results show that all the variables considered are not stationary at levels but stationary at first difference (all variables are I(1)), because of that, the cointegration test was carried out. Results showed the presence of long-run relationship among the variables implying that the purchasing power parity theory exists in the long-run. Furthermore, the long-run relationships were estimated using the dynamic ordinary least squares (DOLS), fully modified ordinary least squares (FMOLS) and the mean group (MG) estimators. Surprisingly, all these estimators gave similar results, they showed that the domestic prices cause depreciation while the foreign prices cause appreciation of the nominal exchange rates in the five Asian countries. Generally, the effect of nominal exchange rate appreciation is more than depreciation in the five Asian countries.

Keywords: *DOLS; FMOLS; MG; Purchasing Power Parity; Westerlund*.

1. Introduction

Since its inception more than fifty years ago, research is still being carried out on the purchasing power parity (PPP) theory because it is one of the most important theories in the area of international economics. The theory posits that the exchange rate between two currencies (nations) ought to be the same as the ratio of the total price levels between two currencies (nations). In other words, one unit of a nation's money will have the same ability to buy goods in a foreign country. The idea of PPP is established on the law of one price which says that identical goods in different nations or countries should have the same price when denominated in the same currency. In other words, when there is no cost of transaction and official barriers to trade, similar goods should sell for the same price in two separate markets when the prices are converted to the same currency. The law of one price applies to single goods while PPP applies to a basket of goods and services [1].

Although a lot of empirical studies have been carried out on the theory of PPP, research is still being carried out because of its usefulness for policy makers in international finance and trade. The importance of PPP is not limited to the fact that it can be used to predict conversion/exchange rate to find out whether a currency/money is over- or under-valued. It is also used in comparing and measuring national income levels among countries. We can use it as a tool to forecast general economic situations/circumstances of countries [2].

This paper investigates the purchasing power parity theory and the long-run estimates by utilizing mostly, methods that account for cross-sectional dependence in panel for Singapore, Thailand, Philippines, Indonesia and Malaysia from January 2000 to August 2016. Results of the analyses revealed that the theory of PPP holds in the five Asian countries and that there are depreciation and appreciation of the nominal exchange rate by the domestic and foreign prices respectively. This study also provide important policy implication on the results obtained.

The remaining paper is organized as follows; section 2 presents literature of previous work others have done, the methods and data used are presented in section 3, the results and discussions are in section 4, and we conclude in section 5.

2. Literature review

This section presents some of the empirical studies done on the theory of PPP by several researchers. These include [3], who utilized the unit root tests of [4] which accounts for one structural breakpoint endogenously from the data and [5] approach that accounts for two structural breaks for four garment exporting countries. The tests failed to find evidence for the validity of the PPP in Bangladesh, India, Pakistan and Sri Lanka when a set of data for 55 years was utilized. In re-examining the PPP theory for fifteen European Union countries using heterogeneous panel nonlinear unit root test in which symmetric or asymmetric exponential smooth transition autoregressive method is allowed in the alternative hypothesis, [6] found that the results of the heterogeneous panel linear and symmetric nonlinear unit root tests are not in agreement with the PPP hypothesis, however, the heterogeneous panel asymmetric nonlinear unit root test which they proposed gave support for the PPP hypothesis. They arrived at the conclusion that the panel test of linear unit root or the panel test of nonlinear unit root that do not put asymmetry into consideration may be deceptive.

Copyright © 2018 Authors. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Moreover, [7], used a unique approach to panel unit root with sharp breaks and smooth shifts proposed by [8]. They found support for the PPP theory in 34 OECD nations from 1994 to 2013. Furthermore, [9] used the asymmetric nonlinear unit root test proposed by Emirmahmutoglu and Omay (2014) through the sequential panel selection method of [10] for 20 African countries over the period 1971I– 2012IV. The data was made available by [11]. Results of their analysis found evidence in support of the PPP hypothesis. Thereafter, [12], discovered evidence to support the PPP in most of the twenty-three developed countries considered in their study. They utilized monthly data on real effective exchange rates from 1974:1 to 2012:11 by applying unit root test that accounts for nonlinearity and multiple smooth temporary breaks. [13] used monthly data from 200-2013 to test the validity of PPP for ten Central Eastern European Countries (CEEC) by utilizing the non-linear threshold unit root test of [14]. Results revealed that the nonlinear threshold unit root test is more powerful than linear test in revealing evidence of PPP in seven out of ten of the Central Eastern European Countries.

Moreover, [15], utilized the [16] panel cointegration technique which allows for heterogeneous relationship across goods to examine the long-run relationship between the US and Mexican prices found evidence in favour of the PPP. Futhermore, [17] gained support for the validity of PPP when he utilized the cointegration test of [18] which uses stationary instrumental variables with the updated version of Taylor's data set (Rev Econ Stat 84(1): 139-150, 2002). Finally, [19] found proof for the purchasing power parity in Malaysia, Indonesia, Thailand, Philippines and Singapore when they applied the [20] test of cointegration to test for the long-run relationship in ASEAN-5.

From the work done previously, a lot of the researchers used unit root methods and few used cointegration method to test for the PPP. Quite a number of researchers did not consider methods that account for cross-sectional dependence in panel data. However, this study utilized methods of unit root and cointegration that put into account the issue of cross-sectional dependence in the data. It also combines several (DOLS, FMOLS and MG) methods of estimation to estimate the long-run relationships which was not done in previous studies. Further, none of the studies above used recent data up to 2016. Therefore, this paper also contributes to this area of research by using recent (latest) data which have not been used in the area of testing for the purchasing power parity theory or used in any other area to the best of our knowledge. No study in this area has utilized data up to 2016 in testing for the PPP theory, therefore, our data is the latest in this area of study. Further, prior to the main analyses, the study conducted the tests of descriptive statistics, correlations and cross-sectional dependence to ascertain the general properties of the data which have not been done in past studies.

3. Data and methodology

3.1. Data

The data utilized in this study is a set of monthly data from January 2000 to August 2016 for five Asian countries. The countries involved in the sample are Singapore, Thailand, Philippines, Indonesia and Malaysia gathered from Datastream, Thomson Reuters.The data comprise of the nominal exchange rate, Consumer price index for every country and the consumer price index for the US (EXRATE, CPI and CPIUS). The variables used were in their log forms i.e. the log of the nominal exchange, log of consumer price index for every nation and the log of consumer price index for the U.S. (LEXRATE, LCPI and LCPIUS).

3.2. Methodology

3.2.1. Panel unit root test of pesaran

[21] proposes an easier way of removing cross-sectional dependence by augmenting the normal Augmented Dickey-Fuller regression with the lagged cross-sectional mean and its first difference to get/capture the cross-sectional dependence that emerges through a model with a single factor. This is known as the cross-sectionally augmented Dickey-Fuller (CADF) test and is represented as:

$$\Delta y_{it} = \alpha_i + \rho_i^* y_{i,t-1} + d_0 \bar{y}_{t-1} + d_1 \Delta \bar{y}_t + \varepsilon_{it} \tag{1}$$

where $\bar{y}_t$ is the average at time t of all N observations. The cross-sectional dependence is accounted for by the presence lagged cross-sectional average and its first difference through a factor structure. In the presence of serial correlation in the error term, lagged first-differences of both y_{it} and $\bar{y}_i$ must be added and the regression augmented as normal in the univariate case to give;

$$\Delta y_{it} = \alpha + \rho_i^* y_{i,t-1} + d_0 \bar{y}_{t-1} + \sum_{j=0}^{p} d_{j+1} \Delta \bar{y}_{t-j} + \sum_{k=1}^{p} c_{k+1} \Delta y_{i,t-k} + \varepsilon_{it} \tag{2}$$

where an information criterion or sequential testing is used to choose the degree of augmentation. Pesaran's method averages the CADF*i* to obtain the CIPS statistic after running the CADF regression for each unit *i* in the panel,

$$CIPS = \frac{1}{N} \sum_{i=1}^{N} CADF_i. \tag{3}$$

The joint asymptotic limit of the CIPS statistic is not standard and critical values are given for various choices of *N* and *T* [22].

3.2.2. Cointegration test of westerlund

Figures Following [23], the panel cointegration test of [24] has four test statistics of two Panel and two Group statistics in error correction tests. The tests are as follows in error correction model:

$$\Delta y_{it} = \delta_i' d_t + \alpha_i (y_{i,t-1} - \beta_i' x_{i,t-1}) + \sum_{j=1}^{\rho_i} \alpha_{ij} \Delta y_{i,t-j} + \sum_{j=0}^{\rho_i} \gamma_{ij} \Delta x_{it-j} + e_{it} \tag{4}$$

where, d_t, δ', α_i show deterministic composition, vector parameters and error correction parameter, appropriately. They can be estimated with error correction model $(y_{i,t-1} - \beta_i' X_{i,t-1})$. (4) can be parameterized and stated as:

$$\Delta y_{it} = \delta_i' d_t + \alpha_i y_{i,t-1} - \lambda_i' x_{i,t-1} + \sum_{j=1}^{\rho_i} \alpha_{ij} \Delta y_{i,t-j} + \sum_{j=0}^{\rho_i} \gamma_{ij} \Delta x_{it-j} + e_{it} \tag{5}$$

Equation (5) can first of all be estimated with ordinary least squares for every unit in the panel to form the group mean statistic of the form:

$$\Delta y_{it} = \hat{\delta}_i' d_t + \hat{\alpha}_i y_{i,t-1} - \hat{\lambda}_i' x_{i,t-1} + \sum_{j=1}^{\rho_i} \hat{\alpha}_{ij} \Delta y_{i,t-j} + \sum_{j=0}^{\rho_i} \hat{\gamma}_{ij} \Delta x_{it-j} + \hat{e}_{it} \tag{6}$$

Moreover, α_i which is the error correction parameter is estimated. Finally, the two group statistics are calculated thus:

$$G_t = \frac{1}{N}\sum_{i=1}^{N}\frac{\hat{\alpha}_i}{SE(\hat{\alpha}_i)} \qquad G_\alpha = \frac{1}{N}\sum_{i=1}^{N}\frac{T\hat{\alpha}_i}{\hat{\alpha}_i(1)} \tag{7}$$

In the same way, three stages are involved in the calculation of panel statistics. Stage one is the same as the first stage of group statistics.

$$\Delta\tilde{y}_{it} = \Delta y_{it} - \hat{\delta}_i' d_t + \hat{\lambda}_i' x_{i,t-1} + \sum_{j=1}^{\rho_i}\hat{\alpha}_{ij}\Delta y_{i,t-j} + \sum_{j=0}^{\rho_i}\hat{\gamma}_{ij}\Delta x_{it-j} \tag{8}$$

$$\Delta\tilde{y}_{it-1} = \Delta y_{it-1} - \tilde{\delta}_i' d_t + \tilde{\lambda}_i' x_{i,t-1} + \sum_{j=1}^{\rho_i}\tilde{\alpha}_{ij}\Delta y_{i,t-j} + \sum_{j=0}^{\rho_i}\tilde{\gamma}_{ij}\Delta x_{it-j} \tag{9}$$

Estimation of the standard error is done in the second stage with the inclusion of common error term parameter α in $\Delta\tilde{y}_{it}$ and $\Delta\tilde{y}_{it-1}$, however, in the last stage, the panel statistics are calculated thus;

$$p_t = \frac{\hat{\alpha}}{SE(\hat{\alpha})} \qquad p_\alpha = T\hat{\alpha} \tag{10}$$

4. Results and findings

Below are the results of the analyses. Before the main analyses, preliminary analyses were carried out to examine the statistical properties of the data. Results of the preliminary analyses are displayed on Tables 1-3. Table 1. Shows the summary of descriptive statistics of the raw data used. The descriptive statistics for nominal exchange rates for ASEAN-5 (EXRATE), consumer price indices for the five Asian countries (CPI) and the consumer price indices for the US (CPIUS). Even though we have the same number of observations, all other statistics are different with the EXRATE having the highest sum of 2,295,944, followed by CPIUS with the total of 247,294.9 and the CPI with the lowest sum of 107,426.7. Furthermore, the standard deviation which measures dispersion or spread of the data is displayed on the table. Lower values of standard deviation are preferred. CPIUS has the lowest standard deviation, next low value is the CPIUS, EXRATE, on the other hand, has the highest value of standard deviation. These evidences of either high or low standard deviations can be seen by the differences or distances between the minimum and maximum values as can be seen from the table. However, the mean and median are measures of central tendencies, they tell us the centre of the data. Since the mean is affected by extreme observations, we decided to use both the mean and the median. Here, the mean of the EXRATE is the highest with the value of 1851.568 with a very low median of 34.0750, followed by the mean of CPIUS with 199.4314 and the median value of 2201.000, then the CPI with the lowest mean value of 86.6345 with the median of 85.2500. Comparing these values, it is seen that the EXRATE has much higher mean than median this is because it is affected by extreme observation which is seen from the maximum and minimum values. Therefore, the median is a better measure of central tendency for the EXRATE and CPI while the mean is a better measure for CPIUS.

Table 1: Summary of Descriptive Statistics

Statistic	Exrate	Cpi	Cpius
Mean	1851.568	86.6345	199.4314
Median	34.0750	85.2500	201.0000
Maximum	15400.00	144.2500	240.3050
Minimum	1.202400	19.0000	154.7000
Std. Dev.	3847.321	22.9958	27.1276
Sum	2295944	107426.7	247294.9
No. Of Observations	1240	1240	1240

Table 2. displays the correlations between the variables. The table clearly shows that there is a correlation between the CPI and the CPIUS, this shows that the gap between them is not so wide as confirmed by the summary of the descriptive statistics. On the other hand, the EXRATE whose values are far different from others have no correlations with CPI and CPIUS.

Table 2: Correlations

Variables	Exrate	CPI	CPIUS
EXRATE	1.0000	-0.2095	0.0899
CPI	-0.2095	1.0000	0.8067
CPIUS	0.0899	0.8067	1.0000

Table 3. Presents the results of cross-sectional dependence test of [25] to find out if the data have cross-sectional dependence. For all the variables, LEXRATE, LCPI and LCPIUS, the null hypotheses of no cross-sectional dependence are rejected. Therefore, the data exhibit cross-sectional dependence.

Table 3. Cross-sectional dependence test (Pesaran CD).

Test	Lexrate	LCPI	LCPIUS
Pesaran CD	28.6597***	47.6387***	49.7996***

Where *** represents significance at 1% level.

Furthermore, since there is evidence of cross-sectional dependence in the data, we run the [21] unit root test which takes into account cross-sectional dependence in the data. Table 4. shows results of the [21] panel unit root tests for all the variables at levels and at first difference (LEXRATE and ΔLEXRATE, CPI and ΔCPI, CPIUS and ΔCPIUS). From the table, results show that at levels all the variables (LEXRATE, CPI and CPIUS) are not stationary, however, they are at first difference (ΔLEXRATE, ΔCPI, and ΔCPIUS). Since all the variables are integrated of order one, we go ahead with cointegration.

Table 4. Panel Unit Root Tests

Variables	Pesaran
LEXRATE	0.6870
ΔLEXRATE	-10.9320***
LCPI	0.6930
ΔLCPI	-8.1910***
LCPIUS	0.4170
ΔLCPIUS	-10.8380***

Where *** is significance at 1% level.

Table 5. presents results of [24] test of cointegration which also puts into account cross-sectional dependence. Here, the p-values for the statistics Gt, Ga, Pt and Pa show that both group (Gt and Ga) statistics are not significant while the two panel (Pt and Pa) statistics are significant. For the Robust P-values, we can see that all the statistics are significant (Gt, Ga, Pt and Pa). Because the robust p-values are significant, there is evidence of long-run relationship between the nominal exchange rates and the prices indicating that PPP holds.

Table 5. Westerlund (2007) Test of Cointegration

Statistic	Value	Z-value	p-value	Robust p-value
Gt	-2.0070	-1.3340	0.0910	0.0000
Ga	-6.3720	-0.2240	0.4110	0.0000
Pt	-4.9300	-2.1330	0.0170	0.0000
Pa	-8.6180	-2.7920	0.0030	0.0000

The outcome of the table above was evaluated based on 5% significance level.

Since there is a long-run association (cointegration) among the variables, we use the DOLS, FMOLS and the MG estimators to estimate the long-run relationships. Table 6. presents the results of the long-run estimates. Surprisingly, all the estimators produce almost the same outcome/result both in sign and magnitude. For the DOLS, a one percent increase in the domestic price causes a 1.68% depreciation of the nominal exchange rates and a one percent increase in the foreign price causes a 3.27% appreciation of the nominal exchange rates. For FMOLS, one percent increase in

the domestic price causes a 1.73% depreciation of the nominal exchange rates and one percent increase in the foreign price causes a 3.33% appreciation of the nominal exchange rates. Finally, for MG, a one percent increase in the domestic price causes a 1.67% depreciation of the nominal exchange rates and one percent increase in the foreign price causes a 3.24% appreciation of the nominal exchange rates. As can be seen from the table, the coefficients of DOLS, FMOLS and MG are all significant and positive showing that the domestic price (LCPI) causes a depreciation of the nominal exchange rates. However, the coefficients of DOLS, FMOLS and MG are also significant but positive indicating that the foreign price (LCPIUS) causes the nominal exchange rates to appreciate.

Table 6. Long-run estimates

Variable	DOLS	FMOLS	MG
LCPI	1.6802***	1.7286***	1.6736*
LCPIUS	-3.2665***	-3.3314***	-3.2417***

Where *** and * indicate significance at 1% and 10% levels respectively.

5. Conclusion

The purchasing power parity theory was examined by utilizing robust methods of panel unit root and cointegration (Pesaran and Westerlund) tests that account for cross-sectional dependence. The results revealed evidence of PPP in the long-run. Since there is proof of the purchasing power parity theory in these countries, it is not possible to make so much profit in traded goods from arbitrage since the prices of goods are supposed to be the same. Furthermore, results of the long-run estimates showed both appreciation and depreciation on the nominal exchange rates of the five Asian countries. In consequence, appreciation of the nominal exchange rate will make imports to be cheaper, exports more expensive thereby reducing inflation while depreciation of the nominal exchange rate will cause imports to be more expensive, export cheaper and hence, increase inflation. The combined effects of appreciation and depreciation of the nominal exchange rates is good since the effect of one alone is not good for the economies of these countries considered. Therefore, the government of these countries should look for ways to strike a balance between appreciation and depreciation since the effect of one alone will not be advantageous for these Asian countries.

This study has made several contributions in the area of testing/examining the PPP theory. These contributions include the use of unit root and cointegration methods that account for cross-sectional dependence in panel data since a lot of studies on the PPP did not put into consideration the issue of cross-sectional dependence when utilizing panel data methods in testing for the PPP theory. In addition, the study also contributes to this area of research by using recent data which have not been used in the area of testing for the purchasing power parity theory or used in any other area to the best of our knowledge. Further, prior to the main analyses, the study conducted the tests of descriptive statistics, correlations and cross-sectional dependence to ascertain the statistical properties of the data. These prior tests allowed us to choose appropriate methods or tests for the data. This is also a contribution to the literature on testing for the PPP since no previous study on the PPP has taken time to check the statistical properties of the data before choosing appropriate methods or tests to use. Moreover, the paper made another contribution by estimating the long-run relationships among the variables which is not the usual practice in examining the PPP theory. Finally, the paper made yet another giant contribution by providing important policy implications on the results obtained not only on whether PPP but also on the effect of appreciation and depreciation of the nominal exchange rates on the five Asian countries.

References

[1] Choji NM, & Sek SK (2017a). Testing for purchasing power parity in 21 African countries using several unit root tests. *AIP Conference Proceedings*, *1830*, 080015-1-080015-7. http://doi.org/10.1063/1.4980999

[2] Beirne J, (2010). *International exchange rate dynamics and purchasing power parity*. *PhD Thesis*, *Brunel University*, *UK*. Retrieved from http://bura.brunel.ac.uk/handle/2438/4246

[3] Hoque A, & Banerjee R, (2012). Does Purchasing Power Parity Hold for Garment Export-Oriented Developing Countries? *Procedia - Social and Behavioral Sciences*, *65*, 8–13. http://doi.org/10.1016/j.sbspro.2012.11.083

[4] Andrews D, & Zivot E, (1992). Further evidence on the Great Crash, the oil price shock, and the unit-root hypothesis. *Journal of Business and Economic Statistics*, *10*, 251–270.

[5] Clemente J, Montañés A, & Reyes M, (1998). Testing for a unit root in variables with a double change in the mean. *Economics Letters*, *59*, 175–182. http://doi.org/10.1016/S0165-1765(98)00052-4

[6] Emirmahmutoglu F, & Omay T, (2014). Reexamining the PPP hypothesis: A nonlinear asymmetric heterogeneous panel unit root test. *Economic Modelling*, *40*, 184–190. http://doi.org/10.1016/j.econmod.2014.03.028

[7] Jiang C, Bahmani-Oskooee M, & Chang T, (2015). Revisiting Purchasing Power Parity in OECD. *Applied Economics*, *47*, 4323–4334. http://doi.org/10.1080/00036846.2015.1026592

[8] Bahmani-Oskooee M, Chang T, & Lee K.-C, (2014). Purchasing Power Parity in the BRICS and the MIST Countries : Sequential Panel Selection Method. *Review of Economics & Finance*, *4*, 1–12.

[9] Bahmani-Oskooee M, Chang T, & Lee K.-C, (2015). Panel asymmetric nonlinear unit root test and PPP in Africa. *Applied Economics Letters*, *23*, 554–558. http://doi.org/10.1080/13504851.2015.1088132

[10] Chortareas G, & Kapetanios G, (2009). Getting PPP right: Identifying mean-reverting real exchange rates in panels. *Journal of Banking and Finance*, *33*, 390–404. http://doi.org/10.1016/j.jbankfin.2008.08.010

[11] Bahmani-Oskooee M, & Kones A, (2014). Real and nominal effective exchange rates of African countries during 1971Q1–2012Q4. *Applied Economics*, *46*, 1961–1984. http://doi.org/10.1080/00036846.2014.889805

[12] Kutan AM, & Zhou S, (2015). PPP may hold better than you think: Smooth breaks and non-linear mean reversion in real effective exchange rates. *Economic Systems*, *39*, 358–366. http://doi.org/10.1016/j.ecosys.2014.12.001

[13] Jiang C, Jian N, Liu T-Y, & Su C-W, (2016). Purchasing power parity and real exchange rate in Central Eastern European countries. *International Review of Economics & Finance*, *44*, 349–358. http://doi.org/10.1016/j.iref.2016.02.006

[14] Caner M, & Hansen BE, (2001). Threshold Autoregression with a Near Unit Root. *Econometrica*, *69*, 1555–1596.

[15] Robertson R, Kumar A, & Dutkowsky DH, (2014). Weak-form and strong-form purchasing power parity between the US and Mexico: A panel cointegration investigation. *Journal of Macroeconomics*, *42*, 241–262. http://doi.org/10.1016/j.jmacro.2014.08.005

[16] Pedroni P, (1999). Critical values for cointegration tests in heterogeneous panels with multiple regressors. *Oxford Bulletin of Economics and Statistics*, *61*, 653–670. http://doi.org/10.1111/1468-0084.0610s1653

[17] Wallace FH, (2013). Cointegration tests of purchasing power parity. *Review of World Economics*, *149*, 779–802. http://doi.org/10.1007/s10290-013-0165-2

[18] Im KS, Lee J, & Enders W, (2008). Cointegration Tests Using Instrumental Variables with an Example of the U . K . Demand for Money. *Cba.Ua.Edu*, *35487*, 1–44.

[19] Choji NM, & Sek SK, (2017b). Testing for purchasing power parity in the long-run for ASEAN-5. *AIP Conference Proceedings*, *1830*, 080017-1-080017-7. http://doi.org/10.1063/1.4980999

[20] Pedroni P, (2004). Panel Cointegration: Asymptotic and Finite Sample Properties of Pooled Time Series Tests With an Application To the Ppp Hypothesis. *Econometric Theory*, *20*, 597–625. http://doi.org/10.1017/S0266466604203073

[21] Pesaran MH, (2007). A Simple Panel Unit Root Test in the Presence of Cross-Section Dependence. *Journal of Alpplied Econometrics*, *22*, 265–312. http://doi.org/10.1002/jae

[22] Baltagi BH, (2005). *Econometric Analysis of Panel Data*. http://doi.org/10.1017/CBO9781107415324.004

[23] Mehmet S, Ekrem AY, & Gokcen O, (2014). Cross Sectional Dependence and Coitegration Analysis among the GDP-Foreign Direct Investment and Aggregate Credits : Evidence from Selected Developing Countries. *Asian Economic and Financial Review Journal*, *4*, 1485–1501.

[24] Westerlund J, (2007). Testing for error correction in panel data. *Oxford Bulletin of Economics and Statistics*, *69*, 709–748. http://doi.org/10.1111/j.1468-0084.2007.00477.x

[25] Pesaran MH, (2004). General Diagnostic Tests for Cross Section Dependence in Panels. *SSRN Electronic Journal*, *1229*(August).