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Testing Purchasing Power Parity in Cambodia: Time-Varying Trade Weights in Constructing Real Effective Exchange Rate

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ABSTRACT

The main aim of this study is to figure out whether the PPP hold or not in Cambodia? This research thoroughly takes into account major controversies which many researchers cogitate to be the cause of PPP breakdown. The aforementioned controversies are the using of the bilateral exchange rate which consists of short time-series or the using of multilateral or real effective exchange rate (REER) constructed by the fixed trade weight, the implementing of only the most popular unit root or stationary tests, such as ADF and PP tests to test for PPP. Thereof, this shortcoming is fulfilled through the implementing of another alternative stationary test known as the KPSS test on the monthly constructed REER from January 1995 to July 2019. The total data points or months of 295 is constructed using time-varying trade weights from 1995 to 2019 of Cambodia. After attempting to deal with the controversies thereto, the empirical result indicates that the PPP theory holds in Cambodia based on the result of the ADF test which is modeled with constant and trend. The test result indicates that the REER of Cambodia has a mean reverting process.

Keywords: PPP, REER, Time-Varying Trade Weights, Unit Root Test.

1. INTRODUCTION

The Purchasing Power Parity (PPP) theory assumes that the measure of two countries' purchasing power of a basket of goods equals to one another. However, if this assumption fails to hold, the implication can be drawn and extrapolated that the change of demand of a basket of goods in either country must have been altered. In accordance to the PPP theory, one of the major explanation to this phenomenon is the market imperfection resulted from the tariffs, quotas and the transaction cost, etc. Thereof, to measure the purchasing power of a basket of goods or service, the exchange rate between that two countries is a vital indicator on which serious attention have to be paid. When the price of the same or identical product between two countries are not the same, the arbitrage opportunity is formed. Meaning that with the assumption of no transaction cost, goods or services can be bought low in one country and sold high in another country. The exercising of the arbitrage opportunity will result in the exchange rate appreciation in the country with the low-price goods or services, consequently, correcting the purchasing power parity of the two countries to the same level again.

As a result, if the PPP theory holds in a country, the policymakers can exploit its significant benefit and apply it to regulate and manage the variation of the exchange rate of that country. To measure whether the PPP holds or not begins by generating the real bilateral exchange rate (RER) or the construction of the real multilateral exchange rate which is also known as the real effective exchange rate (REER). The testing on the series of RER or REER is to determine whether its characteristic is in the mean-reverting process or not. The present of this process determines the hold of the PPP. The test which is applied to determine aforementioned process is known as the unit root test or in other word, it is also known as the stationary test.

Controversial discussion has been contended around the whether the PPP hold or not, some of which argues on the length of the time series whether or not it is long enough to capture the impact. Second, researchers argue between the implementing of the bilateral exchange rate and the multilateral exchange rate, which one would affect the conclusion of the PPP theory? Third, the trade share, which is used to construct the REER, should be fixed at a particular time period or should use the time-varying trade weights? The three major controversial discussion above will all be taken into account in this study of

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the PPP in Cambodia. The main purpose of this paper is to demine whether the PPP holds in Cambodia or not. To achieve the main purpose of this study, the monthly REER using time-varying trade shares of Cambodia are constructed from the January 1995 to July 2019. Additionally, the three stationary or unit root tests which will be adopted and applied on the constructed REER of Cambodia are the Augmented Dickey and Fuller (ADF) test, Phillips-Perron (PP) test and Kwiatkowski, Phillips, Schmidt and Shin (KPSS) test.

2. LITERATURE REVIEW

The PPP theory is generally considered as an acceptable model for the exchange rate projections between two countries in proportional to their relative inflation rates in the long run. The existing literature indicates the issues of the validity of the PPP theory in predicting the exchange rates over short period intervals (Shiller, 2013; Taylor, 2000). Most empirical studies rejected the correlation between the relative price levels of the two countries and the movement of the two currencies over a short observation period, witnessing the deviation from PPP. In the long run, the literature suggests that PPP theory is likely to hold for the exchange rate projection of the two currencies, in which market forces may bring the exchange rates to their PPP levels (Cassel, 1916; Keynes, 1923; Gaillot, 1970; Frankel, 1978; Ohno, 1990). However, recent researches provided the evidence that the theory is not valid, but the results were contradicting to the previous studies by Friedman et al. (1963), Frankel (1981), Hakkio (1984), Mark (1990), and Rogoff (1996) that concluded the invalidity of the PPP theory.

The inconsistent findings related to the PPP theory resulted from the variability of price indices between the two countries that are used to measure inflation rates and the studied period (Shiller, 2013; Hyrina and Serlestis, 2010). The failure of the PPP theory in determining exchange rate movements during the investigations attributed to the differences between the observed countries with respect to their economic conditions and policies. The deviations in price levels for nontraded goods of both economies and between international and domestic markets are also important aspects that suggest the violation of the PPP theory. In an attempt to address the issues identified in the prior studies that were not in favor of the theory, the later studies adjusted the methodologies and employed new economic techniques, yet those further empirical analyses produced mixed results (Hyrina and Serlestis, 2010). Hyrina and Serlestis (2010) have classified the testing procedures of the PPP theories in six different categories, from tests on null hypothesis in early studies by Isard (1977), Krugman (1978) and Frenkel (1981), to tests using a non-linear econometric technique by Sercu et al. (1995) and Michael et al. (1997), as well as tests using panel-based unit root developed by Levin et al. (2002) and Im et al. (2003).

The period of the observation becomes a key aspect in the analysis of whether the PPP theory holds, due to different economic context. A number of studies were undertaken to test the theory before and after the Bretton Woods. Frenkel (1977, 1981) concluded the validity of the PPP theory in the 1920s and the collapse of the theory during the transition to the flexible exchange rate regime following the collapse of Bretton Woods in the 1970s. It was argued by Hakkooi (1984) who used cross-country tests to support that the theory worked better in the 1970s than in the 1920s. Enders (1988) performed a test by using the Autoregressive Integrated Moving Average (ARIMA) Model to compare between 1960-1971 and 1973-1986. The study found mixed evidence for the PPP hypothesis during the Bretton Woods System and the flexible exchange rate period. “The point estimates of the long-run real exchange rate for Canada, Japan, and Germany did not significantly differ from unity. Point estimates for all countries indicated that real exchange rates are convergent. However, all confidence intervals are sufficiently large that the null hypothesis that the real rate follows a random walk cannot be rejected” (Ender, 1988).

Frenkel (1986, 1990) pointed out main concerns in previous studies regarding the PPP tests. First, the insufficient data points for the analysis and the types of tests could affect the results of the theory as the predictors of the exchange rate movements. Thus, employing a larger dataset, often extending to a century, and obtaining data for a panel data set for many countries are expected to address the weakness of the PPP tests (Frankel, 1986; Abuaf and Jorion, 1990). Observing a more extended time interval is likely to yield a favorable result to the PPP theory. Klaassen (1999), adopting the Markov regime-switching model, found the evidence in favor of the PPP in the long-run during the post-Bretton Woods period. However, this study emphasized a contradicting result to the research by Hyrina and Serlestis (2010), testing the PPP theory for a sample of 23 countries over a century, which eventually rejected the claims of the theory. The second

approach was supported by Frankel and Rose (1996) and Papell (1997). Frankel and Rose (1996) found a strong statistical correlation between the exchange rate differential and the inflation differential through the analysis of a 45-year annual panel data set of 150 countries. Another study using a "wide-sample" panel analysis highlighted the importance of cross-sectional dependence on the outcome of testing a unit root in panels of real exchange rates (O'Connell, 1998).

Due to the suspicion of the reason of breakdown in PPP through the implementation of the unit root tests on the real effective exchange rate which uses only the trade share that fixed at a single base year in constructing REER. Bahmani (2008) introduces and implement the stationary test on REER for 52 countries using the time-varying trade weight. As a result, the research method indicates that the breakdown of PPP is somewhat sensitive to the use of time-varying trade weight. On the other hand, for the Cambodia case, no research has offered evidence of PPP holds in Cambodia yet. Thereof, the construct of REER using the time-varying trade weights has not yet been conducted and tested in Cambodia yet, for instance, the studies by Joyeux and Worner in 1998 and Liew and Tang in 2009. The detail research result of the aforementioned studies is discussing in detail as the following. Joyeux and Worner (1998) applied the cointegration technique to test whether PPP hypothesis holds in the long run between Cambodia and Thailand. Their sample periods of study was based on the monthly data over a six years periods from 1991:1 to 1997:4 which was a considerably short period of time. Since testing the absolute PPP theory involves examining if the logarithm of the real exchange rate is mean reversion, the absolute version of long run PPP would allow the real exchange rate to be difference from zero in the short run, but it would require real exchange rate to be a zero mean stationary process. However, as Cambodia and Thai markets are quite similar in which the information and transportation costs are not possible to ignore, the relative PPP is a more relevant concept. Consistent with the author's anticipation, the relative version of PPP existed between Cambodia and Thailand as suggested by the empirical data. Liew and Tang (2009a) also used the monthly observations from 2001:M5 to 2009:M2, a relatively long period of time span, to examine the validity of PPP hypothesis for an East Asia transition economy, namely Cambodia. After performing the Johansen's multivariate cointegration test, the empirical results showed that the long-run PPP was verified in Cambodia because the nominal exchange rate and price levels were cointegrated. Even though the studies carried out by Joyeux and Worner (1998) and Liew and Tang (2009a) found supporting evidence of PPP in Cambodia, there are two limitations of their studies as argued by Liew and Tang (2009b). The former concerned with the two methods that they employed to test whether or not PPP hold, in which there is no clear advantage of one method to another. The later drawback is that both works utilized single bilateral exchange rates without taken into consideration the other bilateral exchange rates; therefore, the test results tend to support PPP hypothesis in Cambodia. To bridge the gap of the second shortcoming, Liew and Tang (2009b) reinvestigated the validity of PPP hypothesis in Cambodia by using nine bilateral exchange rates between Cambodia and her trading partners from 1991:M1-1997:M4. In their study, the ADF and PP test failed to reject the null hypothesis of unit root, implying that PPP did not hold in Cambodia. Furthermore, to uncover the potential bias of using a relatively small sample size (which was only 94 observations), the authors further applied panel unit root test to validate the hypothesis of PPP. Unfortunately, the panel unit root test's results were also failed to find supporting evidence of the PPP in Cambodia. Their empirical result contradicted to the previous findings by Joyeux and Worner (1998) and Liew and Tang (2009a).

As refer to the result of Joyeux and Worner (1998) and Liew and Tang (2009a) the drawback of both researches since it applied short period of time period, used bilateral nominal exchange rate between Cambodia and some of her trading partners, the stationary test which were ADF and PP test, and especially the real effective exchange rate by using time-varying trade weights are on employed. To remove the drawback, the current research will employ long period of time series, 1995:M1-2019M7, use multilateral or real effective exchange rate based on time-varying trade weights, and not only use ADF and PP stationary test, but also use KPSS test.

3. METHODOLOGY

This section will be separated into to two main parts. The first part is the construction of the real effective exchange rate which was introduced by Bahmani-Oskooee in 1995. The second part is the reviewing of the econometric theory relating to the unit root or stationary test which will be applied on the constructed real effective exchange rate to determine

whether mean-reverting process of the series does exist or not.

To generate real effective exchange rate, four main steps are carried out. In the first step, the bilateral exchange between Cambodia Riel and her main trading partners of which ten countries including Thailand Baht, Hong Kong Dollar, China Yuan, Vietnam Dong, Singapore Dollar, South Korea Won, Japan Yen, Malaysia Ringgit, Indonesia Rupiah and United States of America Dollar, are constructed. The exchange rate quotation between Cambodia or Khmer Riel (KHR) and her main trading partners currency are not available, but the exchange quotation between each country currency and US Dollar are available, thus cross exchange rate between Khmer Riel and each trading partner can be calculated. Each bilateral exchange rate is denoted by EX_i's and defined as number of units of trading partner i's currency per unit of KHR. If the real effective exchange rate increases means the Cambodian riel is appreciated. In the second step, the nominal bilateral exchange rates found in step one are adjusted with each trading partner consumer price index (CPI) which has year 2010 as based year (2010=100) to make real bilateral exchange rate which is denoted as REX_i as indicate below,

$$REX_i = EX_i \times \frac{CPI_i}{CPI_{KHR}}$$

Where,

REX_i : Real bilateral exchange rate between KHR and her trading partner currency,

CPI_i : Consumer price index, trading partner, i, (i=1,2,3,…,10),

CPI_{KHR} : Consumer price index, Cambodia,

In the third step, the based period of the real bilateral exchange rate is selected which in March 2007. The index of real bilateral exchange rate which is denoted by $IREX_i$:

$$IREX_i^t = \frac{REX_i^t}{REX_i^{March\ 2007}} \times 100$$

Last, but not least, the index of the real effective exchange rate (REER) is determined by the weighted average of $IREX_i$ by each country imported share to Cambodia as presented below,

$$REER^t = \sum_{i=1}^{n} \alpha_i\, IREX_i^t$$

Where α_i is the trade share of Cambodian import from her trading partner i and $\sum_i^{10}=1\alpha_i=1$.

Time varying trade share of import between 1995 and 2019 are employed to construct the REER. Since this study applied monthly data of the real effective exchange rate, each year of the Cambodia's trade share of import from its ten trading partners: Thailand, Hong Kong, China, Vietnam, Singapore, South Korea, Japan, Malaysia, Indonesia and United States of America, is multiplied by each month index of real bilateral exchange rate (IREX) (January to December) in each corresponding year (1995-2019).

Monthly data are applied in this research covering from January 1995 to July 2019 (1995:M01-2019-M07) of which 259 of data points or observations are built. The consumer price index (2010=100) of each country and the period average of bilateral nominal exchange rates (number of units of each respected country currency per US dollar) between Cambodia Riel and her main trading partners of which ten countries including Thailand Baht, Hong Kong Dollar, China Yuan, Vietnam Dong, Singapore Dollar, South Korea Won, Japan Yen, Malaysia Ringgit, Indonesia Rupiah and United States of America Dollar, are extracted from the International Financial Statistics (IFS) of the International Monetary Fund's (IMF) database. In addition, the data related to import value of Cambodia main trading partner measuring in millions of US dollar are collected from the Direction of Trade (DOT) of the IMF's database as well.

Upon constructing of the REER series, the unit root tests are performed to check whether the PPP hold or not in Cambodia. As mention earlier, three most popular unit root tests are applied in this research such as the Augmented Dickey-Fuller (ADF) test, the Phillips-Perron (PP) test, and the Kwiatkowski, Phillips, Schmidt, and Shin (KPSS) test. A brief explanation of each test is presented below.

Augmented Dickey-Fuller (ADF) test

A number of unit root tests had been established by Dickey and Fuller in 1979 to check whether a selected data of time series under investigation has a unit root/non-stationary or has no unit root/stationary or not. A stationary data exhibits a mean-reverting process in general. The fundamental estimation of the Dickey-Fuller (DF) test is an estimation of an first order autoregressive (AR) model of the form:

$$y_t = \beta_1 + \beta_2\, t + \beta_3\, y_{t-1} + \varepsilon_t \qquad (1)$$

Where

y : Time series variable,

β_i : Parameters or coefficients, i=1,2,3,

t : Time trend,

ε : Residual or error term which is assumed to be i.i.d

The equation (1) can be written in another form,

$$\Delta y_t = \beta_1 + \beta_2 t + \beta_3^* y_{t-1} + \varepsilon_t \qquad (2)$$

Where

$\beta_3^* = \beta_3 - 1$

The DF had imposed an assumption on the DF test that the residual terms are serial uncorrelated. In case that the predicted error terms in equation (2) are serial correlated which violate the assumption of the DF test, the estimated result of the test is not consistent. Worth noted that the null hypothesis of the Dickey-Fuller test is $\beta_3=1$ and the alternative hypothesis is $|\beta_3| < 1$. If the null hypothesis is failed to be rejected, the y_t has a unit root or non-stationary. In contrast, the y_t is stationary or has no unit root, if the null hypothesis is rejected (Dickey D.A and Fuller W.A. 1979).

To solve the problem of the serial correlation of the error term, Dickey and Fuller had developed another test known as the Augmented Dickey-Fuller (ADF) test. The ADF test is conducted by running the following form of a regression, while keeping the stated hypotheses as the DF test, the null hypothesis is that the series has a unit root against the alternative hypothesis is that the series has no unit root or stationary.

$$\Delta y_t = \beta_1 + \beta_2 t + \delta y_{t-1} + \sum_{j=1}^{p} \beta_j \Delta y_{t-j} + \varepsilon_t \qquad (3)$$

Where

y : Time series data,

Δ : First difference operator,

β_1, β_2, δ and : Parameters or coefficients,

t : Time trend,

ε : Error term or residual term, i.i.d

The determination of the optimal lags length of regression model (3) is the most crucial task to do in conducting the ADF test since small lags length of this model would not produce a white noise error or residual term and the estimated standard error of each respected parameter would also not be well estimated. The optimal lags length can be defined by using the information criteria such as Akaike Information Criterion (AIC) or Schwarz Information Criterion (SIC). The hypotheses of ADF test, null and alternative hypotheses, are presented below:

$$H_0: \ \delta = 0$$
$$H_1: \ \delta < 0$$

The null hypothesis of δ=0 is failed to reject when the critical value of t-test which can be extracted from the DF table is smaller than the t-statistic which implies that the time series under investigation has a unit root or non-stationary. The hypothesis is rejected or the alternative hypothesis of δ<0 is accepted in case that t-statistic is greater than the critical t-test which can be intercepted that the time series is stationary or has no unit root (Dickey D.A and Fuller W.A. 1979).

Phillips-Perron (PP) test

The lags of the first different terms of the regressors have been added to regression model (1) in order to solve the problem of serial correlation of the residual or error term which produced inconsistency of the estimated result as had been conducted by the Dickey and Fuller. A more comprehensive theory of unit root test latterly had been developed by Phillips and Peron in 1988. The PP test is conducted by running exactly the same form of regression model of the DF test as indicated in equation (4) below,

$$\Delta q_t = \beta_1 + \beta_2 t + \delta q_{t-1} + \varepsilon_t \qquad (4)$$

Despite the regression model of the two tests, PP and DF, are exactly in the same form, instead of adding lag of the first difference terms of regressors into the regression equation in order to get rid of serial correlation of the residual terms problem, a nonparametric adjustment of the t-statistic which assumed in the DF test is transformed into the Phillips-Peron Z-statistic instead, but the asymptotic of Z-distribution and t-distribution for the PP and DF, respectively (Phillips P.C.B and Perron P. 1988).

Kwiatkowski, Phillips, Schmidt, and Shin (KPSS) test

In 1992, Kwiatkowski, Phillips, Schmidt, and Shin (KPSS) developed a unit root test on an observable time series. The null and alternative hypotheses of the KPSS unit root test are completely opposite from

the ADF and PP tests since the null hypothesis of stationary around a deterministic trend is test against the alternative hypothesis of a non-stationary or unit root. The KPSS statistic is derived by predicting the residual or error term from the Ordinary Least Square (OLS) regression as show below,

$$y_t = \xi t + r_t + \varepsilon_t \qquad (5)$$

The residual terms are assumed to be stationary error. t is a time trend and r_t is a random walk which has the following form,

$$r_t = r_{t-1} + u_t$$

Where the u_t are assumed to be independent and identically distributed (iid) $(0,\sigma_u^2)$. The test is the Lagrange Multiplier (LM) test of the hypothesis that $\sigma_u^2=0$. The LM test is defined as,

$$LM = \frac{\sum_t S(t)^2}{(T^2 f_0)} \qquad (6)$$

where S(t) is a cumulative residual function:

$$S(t) = \sum_{r=1}^{t} \hat{u} \qquad (7)$$

4. EMPIRICAL RESULT

Two main parts are presented in this section. The first part describes about the movement as well as the descriptive statistics of the real effective exchange series. Especially, this study is tries to explain whether during the investigation period the Cambodia's Riel are under or over-value. The month or the point at which the Riel is defined to be under-value when the index of real effective exchange rate at specific month or point is less than index of 100, while the Riel is over-value when the REER at a point is more than 100 value. In addition, the estimated result of unit root tests: ADF, PP, and KPSS will be shown in the second part.

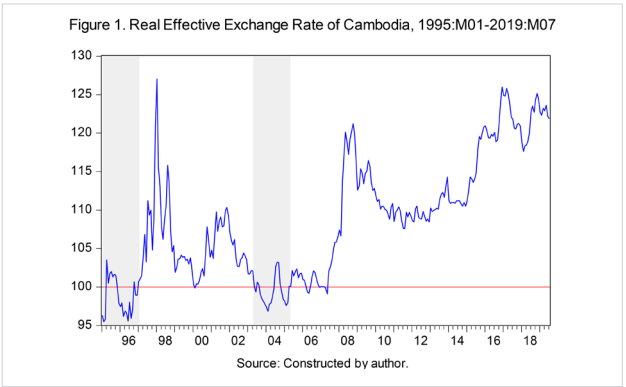

Figure 1 indicates the pattern of REER series form January 1995 to July 2019. The variation of REER within the time frame of this study is divided into four stages with each stage demonstrates the over- or under-value of the Khmer riel based on the purchasing power parity. Stage one starting from January 1995 to January 1997, the value of Khmer riel is lower than the theory on average by 1.29 percent per data point or month. However, the value of Khmer riel is higher than theory on average by 5.78 percent per month in stage two from February 1997 to May 2003. In stage three from January 2003 to April Apr 2005, the value of Khmer riel slightly decreases to under value on average of around 0.76 percent per month. However, from May 2005 to July 2019 which is regarded as stage three of the study of the variation of REER indicates that the Khmer riel maintains its value higher than the theory on average approximately 12.57 percent per month.

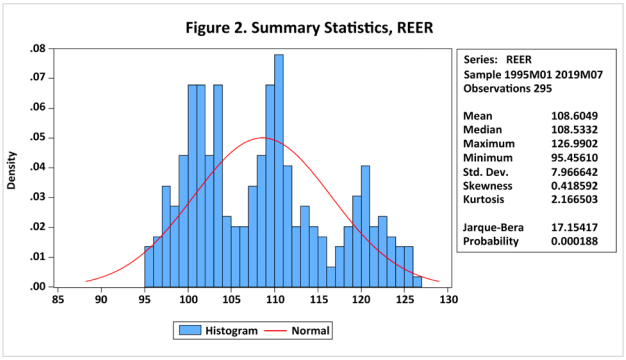

Figure 2 demonstrates that based on the sample size of REER, which is constructed to conduct the unit root tests, the average index of REER is 108.60 while the minimum and maximum index of REER are 95.45 and 126.99 respectively. Moreover, Figure 2 also indicates that the REER series are not distributed as the normal distribution since the null-hypothesis of normal is rejected because the probability value of the Jarque-Bera is lower than 1 percent significant level.

Table 1. Unit Root Tests of REER

Included in the test equation	t and p value	ADF Test	PP Test	KPSS Test
With Constant	t-Statistic	-1.9879	-1.9736	1.3358***
	Prob.	0.2922	0.2985	NA
With Constant & Trend	t-Statistic	-3.5297**	-3.0821	0.192**
	Prob.	0.0381	0.1125	NA
Without Constant & Trend	t-Statistic	0.6871	0.7883	NA
	Prob.	0.8635	0.8826	NA

Notes:
*, **, *** Significant at 10%, 5%, 1% respectively.
NA: Not Available.

Table 1 illustrates the result of the three unit root tests ADF, PP and KPSS on REER series. The model of unit root test, ADF and PP, are divided into three models model with constant, model with constant and trend, and model without constant and trend. On the other hand, the KPSS has only two models model with constant and model with constant and trend. As demonstrated early, the null-hypothesis of ADF and PP is REER series have a unit root and no mean-reverting process which can be interpreted that the PPP does not hold. In contrast, the null-hypothesis of KPSS test is REER series has no unit root. The null-hypothesis of ADF and PP test in the model with constant reach test is failed to reject at the significant level of 5 percent which is consistent with the KPSS test because the null-hypothesis that REER series have no unit root is highly rejected at 1 percent significant level. Although, the model of PP test with constant and trend is failed to reject the null-hypothesis, the same model of ADF successfully rejects the null-hypothesis at 5 percent significant level which can be concluded that the REER series have a mean-reverting process or PPP holds in Cambodia despites the model of KPSS with constant and trend indicates that REER is non-stationary. Additionally, PPP does not hold when the model without trend and constant of ADF and PP tests are used.

5. CONCLUSION

The PPP of each country around the world as well as Cambodia does not hold feasibly causes by some of the reasons. First, the length of the time-series is too short. Second, the exchange rate which is used is a bilateral exchange rate. Although, in some cases, the multilateral or real effective exchange is used, the construction is still based upon the fixed trade weight which is inadequate to demonstrate the actual situation of the trade structure that keeps changing prominently every year. Equally important, the unit root tests implemented in the prior studies are ADF and PP tests. The forgoing problems will be attempted to tackle in this study. In accordance to the result of the ADF test of the model with constant and trend which is implemented on the constructed monthly REER from January 1995 to July 2019 using each respected year trade weights from 1995 to 2019. The result indicates that the theory of PPP is feasible to use in Cambodia. Additionally, this study also demonstrates that the reason PPP does not hold is not due to the unit root tests because regardless of the implementation of the KPSS test, the PPP theory would still breakdown. As a matter of fact, the large time-series data and time-varying trade weight of REER series could probably be the concerning reasons corresponding to the justification of PPP theory holds in Cambodia.

Last but not least, the National Bank of Cambodia (NBC) can implement REER process as the fundamental measure to keep track, manage the variation of the exchange rate and subsequently formulate the strategic planning relating to the monetary policy to ensure price stability and achieve sustainable economic development.

As for the school of thought, the later study that strives to extend the coverage of the study to understand the PPP theory in Cambodia, the structural break of REER should indeed be included and implemented. Provided that the REER implemented in this study shows many structural break as demonstrated in Figure 1. If the structural breaks are controlled and the estimated result from the unit root tests: ADF, PP and KPSS tests which is applied on the REER with time-varying trade shares indicates that PPP still holds in Cambodia, this result would be a new discovery for the study of PPP in other countries around the world.

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APPENDIX

Table A1. Share of Each Trading Partner Imported to Cambodia from 1995 to 2019											
Year	Thailand	Hong Kong	China	Vietnam	Singapore	Korea	Japan	Malaysia	Indonesia	US	Total
1995	26.08%	3.05%	4.03%	7.39%	39.06%	0.00%	5.99%	6.05%	6.24%	2.10%	100%
1996	28.42%	3.52%	4.96%	7.76%	40.39%	0.00%	4.42%	4.12%	4.73%	1.68%	100%
1997	29.29%	9.91%	8.37%	15.94%	0.92%	16.98%	12.37%	0.09%	2.18%	3.97%	100%
1998	23.31%	17.95%	13.23%	12.54%	0.46%	13.25%	9.83%	0.17%	3.87%	5.39%	100%
1999	20.68%	19.67%	9.10%	9.07%	10.49%	8.46%	7.83%	5.28%	5.39%	4.03%	100%
2000	20.40%	23.39%	10.38%	8.42%	9.75%	7.06%	5.37%	5.90%	6.29%	3.01%	100%
2001	37.84%	8.78%	6.53%	8.22%	30.00%	3.73%	1.48%	1.45%	0.74%	1.24%	100%
2002	17.80%	27.76%	14.77%	7.35%	9.15%	7.08%	4.77%	4.37%	5.79%	1.17%	100%
2003	15.22%	28.82%	15.75%	8.40%	8.43%	5.69%	5.27%	5.48%	5.78%	1.15%	100%
2004	13.92%	24.85%	20.56%	10.15%	8.70%	5.99%	5.04%	4.67%	4.73%	1.39%	100%
2005	14.95%	23.14%	21.79%	9.34%	7.00%	7.75%	5.16%	4.76%	4.25%	1.86%	100%
2006	17.43%	22.65%	22.00%	11.34%	6.59%	6.14%	5.44%	3.75%	3.58%	1.07%	100%
2007	17.57%	23.43%	21.53%	11.92%	6.16%	6.57%	4.84%	3.68%	3.07%	1.25%	100%
2008	18.44%	15.61%	24.74%	12.46%	8.04%	6.07%	3.04%	3.24%	2.55%	5.81%	100%
2009	14.39%	15.00%	27.29%	15.29%	6.47%	6.48%	3.68%	4.09%	4.51%	2.81%	100%
2010	17.48%	14.01%	30.05%	12.34%	3.94%	6.29%	3.97%	4.19%	4.44%	3.29%	100%
2011	14.14%	9.33%	33.84%	17.18%	4.63%	5.86%	4.83%	4.08%	3.29%	2.82%	100%
2012	15.32%	8.41%	36.69%	15.91%	4.39%	6.86%	3.78%	2.98%	3.66%	2.00%	100%
2013	13.44%	8.20%	36.86%	12.12%	4.28%	4.56%	2.15%	1.73%	3.03%	13.64%	100%
2014	12.54%	9.96%	44.40%	10.41%	5.81%	4.67%	3.16%	2.56%	3.36%	3.12%	100%
2015	16.85%	7.71%	42.37%	10.00%	5.43%	4.96%	4.56%	2.02%	3.62%	2.48%	100%
2016	17.73%	4.80%	42.25%	13.14%	5.24%	4.07%	4.90%	2.29%	3.96%	1.61%	100%
2017	18.77%	4.09%	42.16%	13.42%	4.86%	3.91%	4.66%	2.28%	4.28%	1.57%	100%
2018	21.09%	3.89%	40.18%	14.54%	3.75%	3.69%	4.82%	2.34%	3.96%	1.74%	100%
2019	16.93%	3.29%	46.34%	12.88%	2.14%	3.28%	5.52%	3.11%	4.80%	1.72%	100%