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An empirical investigation of purchasing power parity for a transition economy - Cambodia

Venus Khim-Sen Liew
Faculty of Economics and Business, Universiti Malaysia Sarawak

Tuck Cheong Tang
Department of Economics, School of Business, Monash University Sunway campus

Abstract

This study has found an empirical support of Purchasing Power Parity (PPP) theory for an East Asia transition economy – Cambodia. It is based on the results of cointegration among KHR/USD, Cambodia CPI, and world CPI over the monthly period May 2001-February 2009. This finding is useful for policy implications i.e. de-dollarization (and exchange rates) policy designs in Cambodia.

1. Introduction

Purchasing Power Parity (PPP) hypothesis postulates that in an efficient market, identical basket of goods and services faces the same price in different countries when converted to a common currency. In other words, nominal exchange rate is adjusted to reflect differences in price levels across countries. The validity of PPP does reflect relative prices in determination of foreign exchange rate. In addition, PPP can be used to judge whether the nominal exchange rate is under-valued or over-valued, while PPP also implies integration of the goods markets of the countries. PPP depicts the international competitiveness of a country's goods and services. In general, empirical studies support that PPP holds in the long-run.[1]

The current study aims to contribute to the existing literature of PPP by exploring the case of a transition economy in East Asia. Other transition economies are China, Lao People's Democratic Republic and Vietnam.[2] Cambodia provides an interesting sample country in the PPP framework mainly due to the natural of exchange system in the country. From the Sihanouk period (1953-1970) to Democratic Kampuchea period (1975-1978), post-Democratic Kampuchea period, Cambodia's exchange rate systems have undergone several revolutions.[3] In 1990, Cambodian Riel was introduced with two exchange rate systems namely (1) official rate - which is classified as managed floating by International Monetary Fund (IMF) and is mostly used for external transactions; and (2) the parallel rate, which is tolerated by the government and it actually dominates interbank and most other transactions (IMF, 1997, p.154).

In the era of dollarization (suddenly introduced in the early 1990s), the share of the USD has reached more than 70% of the total currencies (Kang, 2005), and the USD circulates freely and is used for payment in Cambodia (IMF, 1998, p. 166). Interestingly, under the highly dollarized economy, economic policies such as monetary, fiscal, international trade policies are not fully available in Cambodia (Kang, 2005, p. 201). The market economy since 1980s and the liberalization policies in the last decade in Cambodia might promote exchange rate volatility (or uncertainty) (Wong and Tang, 2008). A better understanding of the fundamental of exchange rate – PPP is promising from the policy makers' point of view i.e. de-dollarization.

Next section describes the empirical testing method for PPP, and their findings are discussed. Section 3 concludes the study.

2. Empirical Findings

The PPP hypothesis has been widely examined by researchers with application of cointegration approach i.e. PPP is supported if the nominal exchange rate, domestic and foreign price levels are found to be cointegrated. In this study, the candidate variables employed are the bilateral KHR/USD exchange rate (ER), the consumer price indices (CPIs) of Cambodia (P) and U.S.A. (P[*]). The data covers monthly observations between May 2001 and February 2009 from the

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[1] See, for instance, Taylor and Taylor (2004) and Taylor (2006) for surveys on PPP study.
[2] Cambodia was one of the first least developed countries to join the World Trade Organization (WTO) in 2004.
[3] http://intl.econ.cuhk.edu.hk/exchange_rate_regime/index.php?cid=13 accessed 17/9/09.

CEIC Asian Database. For the analysis purpose, all data are then converted into logarithmic form, ln.

The augmented Dickey-Fuller (ADF) (Dickey and Fuller, 1979, Said and Dickey, 1984), Phillips-Perron (PP) (Phillips and Perron, 1988) and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) (Kwiatkowski *et al*., 1992) (see Tables 1 and 2) show non-stationary for the exchange rate and the CPIs of both of the Cambodia and U.S.A. or they are integrated of order one, $I(1)$.

Table 1: Unit root test results of variables in their levels

Variable	Unit Root Test		
	ADF	PP	KPSS
lnER	-1.538(0)	-2.431(3)	0.212(7)**
lnP	-2.243(1)	-1.870(5)	0.245(7)***
lnP*	-2.827(8)	-2.732(1)	0.136(6)*
Critical Value			
1%	-4.06	-4.06	0.216
5%	-3.46	-3.46	0.146
10%	-3.18	-3.18	0.119

Notes: ADF, PP and KPSS denote augmented Dickey-Fuller, Phillips-Perron and Kwiatkowski-Phillips-Schmidt-Shin (1992) unit root tests. All tests include a constant and trend terms in the estimation. Optimal lag determined by AIC (for ADF) and Newey-West bandwidth (for PP and KPSS) is given in parentheses. lnER, lnP and lnP* represent the natural logarithmic form of nominal exchange rate (Riel per USD), Cambodia's CPI and U.S.A.'s CPI respectively. *, ** and *** denote significant at 10, 5 and 1% level respectively.

Table 2: Unit root test results of variables in their fist differences

Variable	Unit Root Test		
	ADF	PP	KPSS
ΔlnER	-9.221(0)***	-9.221(1)***	0.050(1)
ΔlnP	-5.061(0)***	-4.710(2)***	0.123(5)
ΔlnP*	-5.220(7)***	-4.495(1)***	0.083(1)
Critical Value			
1%	-2.59	-2.59	0.739
5%	-1.94	-1.94	0.463
10%	-1.61	-1.61	0.347

Notes: All tests include a constant term in the estimation. See also notes to Table 1.

Subsequently, Johansen's multivariate cointegration test is applied to test the validity of PPP, and the results (see Table 3) show a cointegrating relation – it implies that nominal exchange rate, and Cambodia and U.S.A. price levels are cointegrated. Thus, long-run PPP is valid for Cambodia.

Table 3. Johansen cointegration tests

Trace Test

Null Hypothesis	Alternative Hypothesis	Test Statistic	5% Critical Value
$r = 0$	$r > 0$	46.761[**]	42.915
$r \leq 1$	$r > 1$	18.333	25.872
$r \leq 2$	$r = 3$	4.222	12.518

Maximum Eigen Test

Null Hypothesis	Alternative Hypothesis	Test Statistic	5% Critical Value
$r = 0$	$r = 1$	28.428[**]	25.823
$r \leq 1$	$r = 2$	14.111	19.387
$r \leq 2$	$r = 3$	4.222	12.518

Notes: ** indicates rejection of the null hypothesis at 5% significance level. A VAR(13) is shown to be optimal based on the Likelihood Ratio (LR) statistics and Akaike Information Criterion (AIC). Intercept and linear trend terms are included in cointegrating equation for optimality, based on the Pantula Principle for the specification of the deterministic components in the cointegration test (see, for instance, Hatemi, 2002).

Nevertheless, a fundamental question of whether the Riel (per USD) is under-valued or over-valued can initially be answered by the PPP.[4] The estimated PPP equation, ER_t = 2.82 +3732.26$(P/P^*)_t$ +e_t is used to generate the residuals series in order to depict the Cambodian exchange rates valuation. As Figure 1 showed, the Riel was over-valued for the periods 2001-2004, and 2007-2008, but under-valued the Riel in between 2004 and 2007 (including the latest observed periods). In February 2009, the actual exchange rate is 4,122 Riel for one USD. In fact, less Riel is actually needed to buy a Dollar (i.e. under value), since the fitted (estimated equilibrium value) is 4,080 riel in exchange for one USD.

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[4] Hoarau (2008) points out that evidence of long-run PPP implies that misalignment indicators of exchange rate can be obtained from simple PPP calculations. Similar determination of under-valuation or over-valuation of exchange rate after establishing the long-run validity of PPP was conducted in Furman and Stigliz (1998), Chinn and Dooley (1999), Sazanami and Yoshimura (1999), Chinn (2000). This way of misalignment evaluation has been extended to the monetary model of exchange rate (see, for instance, Lee and Azali, 2005).
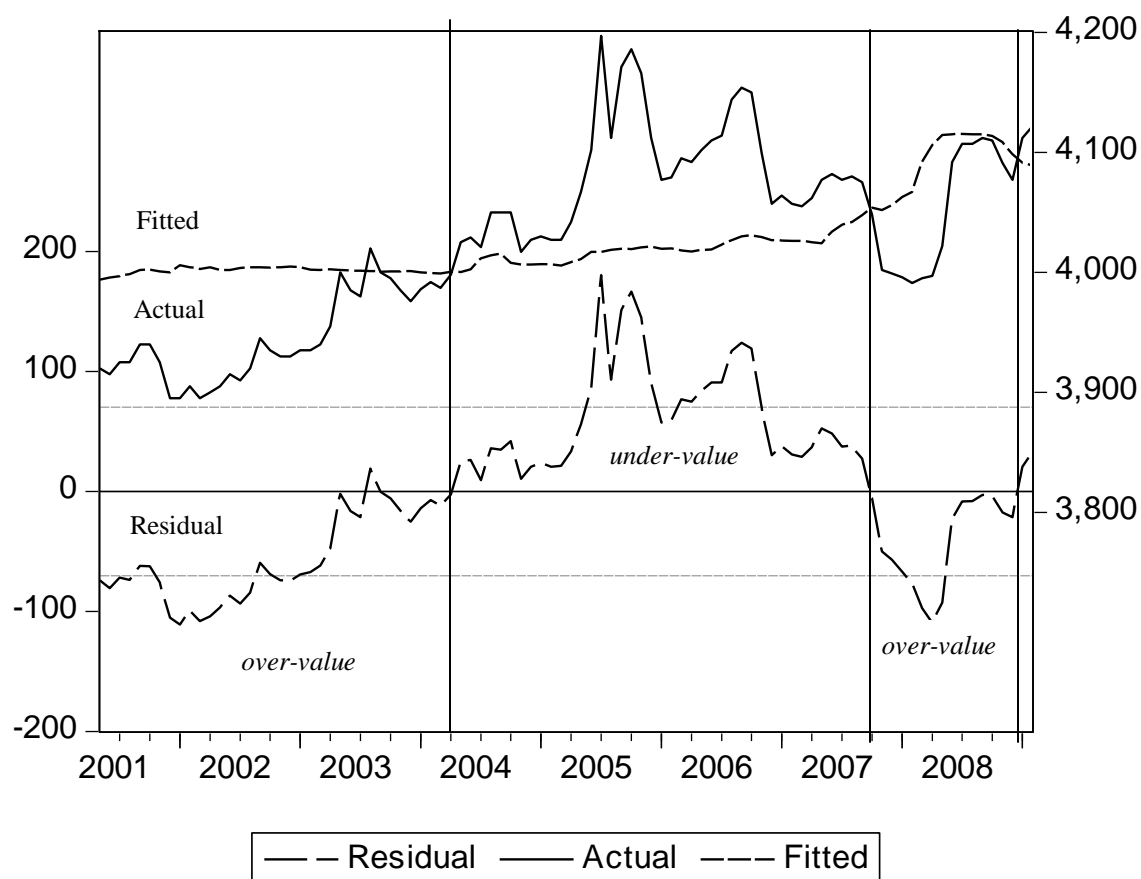
Figure 1. Plot of Nominal Exchange Rate (Riel per USD), Fitted and Residual, May 2001- Februari 2009.

3. Concluding remarks

This study attempts to validate a well-examined international economics theory i.e. purchasing power parity (PPP) hypothesis for a transition economy – Cambodia. The finding of cointegration reveals that PPP is valid for Cambodia. The valuation of Riel per USD is changing over the sample period May 2001- February 2009, and there is a signal of under-valuation of Riel in the recent period i.e. January and February of 2009 (see Figure 1). It does help to provide a fundamental understanding to policy makers in order to formulate exchange rates policy and other relevant policies in a relation to de-dollarization as focused by the Cambodian government (see Kang, 2005).

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