Purchasing Power Parity in the Case of Romania: Evidence from Structural Breaks

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ABSTRACT: Purchasing Power Parity has most likely been one of the most investigated issues of the last decades within economic literature. The results from such studies are not consistent and not only important for policy makers and economists but also extremely important for policy implications in international finance. Purchasing Power Parity states the exchange rate between two countries should reflect the relative purchasing power of these two countries. This study tests the validity of the purchasing power parity hypothesis in Romania with employing Zivot–Andrews unit root test by taking structural break into account. We use annual data from 1991 to 2012 and the results show that purchasing power parity does not hold in Romania.

1. Introduction

Purchasing power parity (PPP here after) is a vital structure block of numerous macroeconomic models so that the PPP hypothesis is important for policy implications to decision- or policy makers of central banks, multinational firms and exchange rate market participants. Also PPP has been viewed as an equilibrium condition, as an exchange rate determination theory and as a basis for international comparison of income (Sideris, 2006).

PPP theory is an important issue for exchange rate determination in international economics literature. Theory of PPP is suggests that exchange rates between currencies are in equilibrium when their purchasing power is the same in each of the two countries (Taylor, 2009). This means that between two currencies exchange rate should be equal to the ratio of the two countries price level of a fixed basket of goods and services. The basis for PPP is the "law of one price".

Early literature on the validity of PPP is voluminous but there is no agreement on the validity of the PPP yet. For developed countries, it has been extensively tested, but it is abundant in developing countries (Taylor 1988, 2003, 2009, Taylor and Taylor 2004). The other view of these empirical findings, researchers believe that in short run the validity of PPP has uncertainty but they may be more willing to believe PPP's validity in the long run, since the price differentials between two countries is unsustainable in the long-run. Also the PPP hypothesis existing empirical literature results inconsistencies can be explained with that past studies indirectly accept that exchange rate behaviour is naturally linear.

Generally most of these studies suggest that the PPP holds in the long-run but the empirical validity of PPP in transition economies remains an unsolved issue (Acaravcı and Ozturk, 2010). The different types of empirical studies on PPP can be categorised in firstly correlation studies, secondly unit root tests studies and thirdly cointegration studies (Acaravci and Acaravci, 2007). Mainly study of the empirical literature which tests the PPP hypothesis for Romania presented at Table 1.

Table 1. Literature Review for PPP in Romania

Author(s)	*Method*	*Conclusion*
Choudhry (1999)	Fractional and Harris-lnder cointegration tests	No evidence
Christev and Noorbakhsh (2000)	Stock-Watson Dynamic OLS Johansen cointegration	Weak evidence
Barrow and Radulescu (2002)	Cointegration analysis	No evidence
Barlow (2003)	Co-integration analysis	Weak evidence
Sideris (2006)	Johansen cointegration Larsson panel cointegration	Strong evidence
Solakoglu (2006)	Panel approach	Strong evidence
Beirne (2007)	Johansen co-integration Larsson panel co-integration	Weak evidence
Cuestas (2009)	Ng and Perron unit root tests KSS nonlinear unit root tests	Strong evidence
Koukouritakis (2009)	Johansen cointegration test	Weak evidence
Kasman et al. (2010)	LM unit root tests	Strong evidence
Acaravcı and Ozturk (2010)	ADF unit root tests KPSS unit root tests	Weak evidence
Chang et al. (2011)	Nonlinear panel unit root test	Strong evidence
Aslan and Kula (2011)	Univariate and panel LM unit root tests	Strong evidence

Although the most tested theories in the international economics literature, the empirical findings for the PPP hypothesis are mixed (Taylor 1988, 2003, 2009). This article aims to investigates the validity of PPP in Romania for the period 1991-2012 this long period will differ this study from previous literature that most of the empirical studies determined that the PPP holds in the long-run. The following section of the study provides the analytical framework. Section 2 shows the sources of the data, methodology and empirical results and in Sections 4 provides conclusions.

2. Analytical Framework
For the strong form of PPP, the nominal exchange rate is proportional to the relative price so that the real exchange rate remains constant overtime.

$$ER_R = NE_r \frac{P^*}{P} \tag{1}$$

in equation (1); ER_R is the real exchange rate, NE_r is the nominal exchange rate, P* is the foreign prices and P is the domestic prices.

The real exchange rate can be shown in logarithmic form by equation (2),

$$\log(ER_R) = \log(NE_r) + \log(P^*) - \log(P) \tag{2}$$

Equation (3) represents the model of mean reverting real exchange rate:

$$\log(ER_R)_t = \sigma + \phi \log(NE_r)_{t-1} + \varepsilon_t \tag{3}$$

in equation (3); σ is the constant term, ε is the error term. Real exchange rate series should be stationary for the PPP hypothesis. Real exchange rate series stationary means that if there is a change in the price level between two countries, it will be offset by an equal depreciation/appreciation on the nominal exchange rate. If there is a unit-root in the real exchange rate, we can say that the real exchange rate shocks are permanent and there is no PPP between two countries.

3. Data, Methodology and Empirical Results

Previous literature of PPP stand on the linear unit root tests, but recent studies account for nonlinearities and/or structural breaks in real exchange rates. Also the discussion on the validity of PPP empirical results has no agreement yet. This study will extend the PPP literature by using annual data that covers the period from 1991 to 2012 and take the US dollar as reference currency to construct the real exchange rates for Romania. The price series are based on the consumer price index and the nominal exchange rates are the end period spot rates relative to the US dollar (domestic price of the US dollar). All data are taken from the International Monetary Fund's International Financial Statistics database.

ZA tests models are stated as the following forms:

$$Model \quad A: \quad \Delta Y_t = \mu_1^A + \gamma_1^A t + \mu_2^A DU_t(\lambda) + \alpha^A Y_{t-1} + \sum_{j=1}^{k-1} \beta_j \Delta Y_{t-j} + \varepsilon_t \tag{4}$$

$$Model \quad B: \quad \Delta Y_t = \mu_1^B + \gamma_1^B t + \gamma_2^A DT^*_t(\lambda) + \alpha^B Y_{t-1} + \sum_{j=1}^{k-1} \beta_j \Delta Y_{t-j} + \varepsilon_t \tag{5}$$

$$Model \quad C: \quad \Delta Y_t = \mu_1^C + \gamma_1^C t + \mu_2^C DU_t(\lambda) + \gamma_2^c DT_t^*(\lambda) + \alpha^C Y_{t-1} + \sum_{j=1}^{k-1} \beta_j \Delta Y_{t-j} + \varepsilon_t \tag{6}$$

In the level of the series Model A allows for a change, in the slope of trend of a series Model B allows for a change while Model C combines both changes in the level and the slope of trend.

Table 2. Zivot-Andrews test results

Model type	t stat
Model A	-3,726
	2005
	(-4,80)
Model B	-3,553
	2000
	(-4,42)
Model C	-3,967
	2009
	(-5,08)

Note: Critical values at 5% are presented in parenthesis.

Zivot–Andrews test is used to examine whether PPP holds in Romania for a long time by taking structural break into account. Zivot–Andrews test results are presented in Table 2 and test results suggests that PPP doesn't hold for Romania.

4. Conclusion

The purpose of this research is to investigate the PPP in Romania because the results of the previous empirical studies inconsistent. Also PPP has been a great important factor that to understand the behaviour of exchange rates for policy makers.

In this study, we apply the Zivot-Andrews unit root test to re-examines the validity of PPP for Romania. In Romania, the early literature on the validity of PPP has mostly motivated on the use of unit root tests which disregard structural break. This study is different from the previous literature by using Zivot–Andrews test with applying exchange rates in Romania for the period of 1991-2012. Our results show that PPP doesn't hold in Romania at least for the period of 1991-2012.

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