Deviation from purchasing power parity in Albania

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Abstract

In this study we test the validity of purchasing power parity for Albania in comparison to the Euro-Zone using quarterly data for a period from 2002-2013. As in many similar empirical studies conducted for countries under economic transition, deviations from the PPP in the short run are very likely. Using unit root test approach and Johansen cointegration tests, result that the validity of purchasing power parity does not hold in the short run when comparing these economies. This result might be affected by the existing structural differences between these economies and differences in terms of trade pattern.

Keywords: Purchasing Power Parity; Exchange Rate; VECM; Firms; Albania.

Introduction

Many articles have studied the theory of PPP[1] either in the short term or long term. These studies are carried out in both developing countries and economies in transition and also in developed countries. The study of this hypothesis is of great importance for political decision making, Central Bank policy makers or even for many international firms and for participants in the exchange rate market. The theory is based on the fact that there is a proportional relationship between the price of a product or of a representative basket of goods in a currency relatively to one another currency expressed in the same amount of money recalculated in the same currency. Results are different considering the differences in empirical methods applied, the basics and the period of data taken into consideration or other factors like obstacles in the international market, transaction costs, price index composition etc. Different researchers have examined this hypothesis in a specific case by taking a country under study, and others have carried out studies in data panel for a group of states. In general researchers have agreed to the fact that deviations from PPP of the real exchange rate in the short run is considerable and variable while in the long term, it converges to the expected level of PPP. However, some studies have rejected the PPP hypothesis. This paper presents a survey of PPP for a country in transition like Albania, based on a period of data from 2002 to 2013. In section two is presented a review of the works that are carried around this theory. The third section gives a statement of the model that is used for the analysis of this hypothesis. The fourth section presents data to be used by, and then the results.

Literature Review

Many studies in different countries have been dealing with the analysis of the theory

[1] Purchasing Power Parity.

of PPP. The results obtained from these studies have been of different types and perspectives. For example (Aslan, 2011) tests for long run relative PPP using recently developed nonstationary panel regression estimators, concluding that long run relative PPP holds in European sample (Barlow, 2004) using conventional tests, we find evidence of some variant of PPP for 9 of the 16 countries (Beirne, 2007). The relative version of the PPP in the NMS countries over the time span of 15 years. It tried to shed some light on the 'old PPP puzzle' for a set of transition countries. Authors such as (Christev, 2000), (Froot, 1995), and (Halpern, 1997) question the strong support for the PPP evidence found in the literature for the post-Bretton Woods 3 period. They show that problems with the econometric testing techniques used lead to unreliable results. One notable problem is that of CSD. The typical results from tests that accommodate CSD are found support PPP less strongly or indeed to reject it as do the studies by (Johansen, 1988) and (Johansen, 1991).

A large number of studies with rather ambiguous results were implemented, various econometrics methods were employed. We made use of standard URTs, and additionally, more robust versions of URTs. While standard univariate URTs do not provide a crystal-clear answer to our question, the robust versions do for the Euro exchange rate pairs in particular. The results for the non-linear KSS test (ESTAR model), which gives support to PPP in eight out of 12 NMS countries and the results for another nonlinear test (non-linear in trends, the test (Johansen, 1990), also tends to favor the existence of PPP, once the source of non-linearities has been controlled for. In the case of other currency pairs – the US Dollar and REER, the results are less significant and thus, they seem to give more emphasis on the importance of the Euro currency for the NMS[2] countries (Kutan, 1998) analyze the case of Ukraine for the period 1992–1996 and gain evidence in favor of PPP, despite some short-run deviations.

The Model

The general model of testing for PPP can be specified in the following form (Cheung and Lai, 1993):

$et = \alpha 0 + \alpha 1pt + \alpha 2pt^* + \xi t$ (1),

where et stands for nominal exchange rates, defined as the price of foreign currency in the units of domestic currency; pt denotes domestic price index and pt* foreign price index; while ξt stands for the error term showing deviations from PPP. All the variables are given in logarithmic form.

The empirical analysis starts with the most restrictive version of Equation 1, $\alpha 1=$, $\alpha 2=-1$, that is, with testing the properties of real exchange rates. In the context of relative PPP, the movements in nominal exchange rates are expected to m compensate for price level movements. Thus, real exchange rates should be constant over the long run and their time series should be stationary (Liu, 1992). The real exchange rates are a function of nominal exchange rates and relative price indices in two observed economies. They are calculated from the nominal exchange rates using the consumer price indices:

$REt = Et(Pt^*/ Pt)$ (2),

[2] New member states.

where REt stands for the real exchange rate, Et is the price of a foreign currency in units of domestic currency, while Pt* and Pt represent the foreign price index and the domestic price index, respectively. Taking the logarithms of Equation 2, the real exchange rates are defined as:

ret = et + pt* – pt (3),

For checking the stationary of real exchange rates, the augmented (MacDonald, 1993) lowing equation:

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \sum_{i=1}^{m} \chi_i \Delta Y_{t-i} + \varepsilon_t \quad (4),$$

where β1, β2, δ and χi are parameters of the test, t is linear time trend, Yt is the tested time series, Δ Yt-i=Yt-i -Yt-i-1 and m is selected so that the residuals (εt) are white noise. We test the null hypothesis H0: δ =0, which implies that there is a unit root present and the time series is non-stationary.

Following (Parikh, 2000), equation 4 was estimated assuming β2=0. In order not to unnecessarily lose too many observations in a relatively short time series, the orders of augmentation were set to m=6 for all tests of unit root by using critical values according to (Payne, 2005). (Pufnik, 2002) prefer determining the time lags according to a t-test. They argue that a VAR with a maximum number of lags should be carried out. If the last included lag is statistically significant, it is appropriate to use it in ADF regressions. The number of lags should be reduced as long as the last included lag is statistically significant. Also (Payne, 2005) argue that information-based rules (AIC, SIC) tend to select too low truncation lags, while the t-test is supposed to provide results with more robust size properties in models. In the present analysis, the estimates are obtained on the basis of time lags which correspond to the minimum value of the Akaike Information Criterion (AIC) and are in line with the t-test approach.

Each calculation is stated twice, according to the time lag determined by the two approaches described above. Although AIC and the t-test select different time lags, the results of the ADF test using both selection criteria do not contradict, but are rather similar. The figures show that the eight time series of the real exchange rates of the Lek and the Euro are integrated of order one, which means we cannot reject the hypothesis of the presence of the unit root. Thus, the ADF test confirms the graphical results of non-stationarity in the observed time series.

Analysis and Comments on Results

Variable	Level		First Difference	
	AIC	t-statistic	AIC	t-statistic
LREURLEK	-0.84583	-0.84583	-5.5764	-5.5764

Table 1 results of the ADF Test for Real Exchange Rates of the Albanian Lek.

Notes: L stands for logarithm, R Real; the next three letters EUR represent the currencies of Italy, while the last three letters LEK denote the currencies of the Albania.

The ADF test confirms the results of nonstationarity in the observed time series. When all restraints in Equation 1 are omitted ($\alpha 1 \neq 1$, $\alpha 2 \neq -1$), it becomes the least restrictive version of PPP. The only requirement that remains is the signs of the coefficients. This implies that we are looking for any linear relationship among the observed variables that has stationary properties. Taking into account the unstable characteristics of nonstationary time series, the existence of a stationary relationship among them is more important than deviations of coefficients from the strict theory of PPP (Rogoff, 1996). If a cointegration among nominal exchange rates, domestic consumer prices and foreign consumer prices is found and it is presented by the cointegrating vector of (1, $\alpha 1$, $\alpha 2$) (Equation 1), the validity of the theory of PPP is proven.
Since we are looking for a stationary linear combination of three variables, the Johansen cointegration test is appropriate to use. This method is based on a VAR and can be briefly described as follows (Sarno, 2002):

$$\Delta Y_t = \Pi Y_{t-1} + \sum_{i=1}^{m-1} \Gamma_i \Delta Y_{t-i} + BX_t + \eta_t \qquad (6),$$

$$\text{where } \Pi = \sum_{i=1}^{m} A_i - I \text{ and } \Gamma_i = -\sum_{j=i+1}^{m} A_j \qquad (7).$$

Yt = A1Yt-1 + …. + AmYt-m + BXt + ηt, (5),
where A1, …, Am and B are matrices and the parameters of the model, t ranges from 1 to T, Yt is a vector of k variables, which are integrated of the first order, Xt is vector of deterministic variables and ηt is a vector of innovations. VAR in Equation 5 can be also written as:

Matrix Π contains information about long-run variation of the time series. According to the Granger representation theorem (Sideris, 2006), (Solakoglu, 2006), matrix Π can be divided into k x r matrices ϱ and α with rank of r (r≤k-1), so that Π=ϱα' if Π also has reduced rank r<k. Matrix ϱ contains r linear cointegrating vectors, while matrix ϱ presents adjustment coefficients of the error correction model.
The number of cointegrating vectors is assessed by two statistics. The trace statistic (LRtr) tests H0: the number of cointegrating vectors is less than or equal to r, against the H1: the number of cointegrating vectors is k, where k is the number of endogenous variables for r=0, 1, ..., k-1. The trace statistic is specified as:

$$LR_{tr}(r \mid k) = -T \sum_{i=r+1}^{k} \log(1 - \lambda_i) \qquad (8),$$

where λi is the maximum eigenvalue of Ai in Equation 7. The maximum eigenvalue statistic (LRmax) checks H0: the number of cointegrating vectors is equal to r, and H1: the number of cointegrating vectors is equal to r + 1. LRmax can be calculated as follows:

$$LR_{\max}(r \mid r+1) = -T\log(1-\hat{\lambda}_{r+1}) = \\ = LR_{tr}(r \mid k) - LR_{tr}(r+1 \mid k) \quad (9),$$

where the abbreviations are the same as in Equation 8 and the text above.
Critical values for the Johansen cointegration test are stated in (Taylor, 2003) and (Taylor, 2004). (Varamini, 1998) recalculated and extended them by handling the whole test sequence. Therefore, this study applies improved critical values of (Varamini, 1998). To undertake the Johansen cointegration test, an appropriate lag structure had to be found in order to remove serial correlation in the residuals. Estimation on the basis of VAR's Akaike Information Criterion (AIC) and Final Prediction Error (FPE) gave the same lag specification for all eight cases under consideration. Figures for time lags are quoted next to the individual countries' names in Table 4.
Prior to cointegration analysis, it is necessary to establish the compatible orders of integration of the employed variables. For this reason, ADF tests were conducted for individual nominal exchange rates, domestic consumer prices and foreign consumer prices following the procedure described in the previous section. Results of unit root tests for nominal exchange rates are presented in Table 2, while Table 3 summarizes the unit root tests for selected consumer price indices. Again, AIC and a t-test were used to determine the number of time lags in ADF regressions.

Table 2. Results of the ADF Test for Nominal Exchange Rates of the Albanian Lek.

Variable	Level		First Difference	
	AIC	t-statistic	AIC	t-statistic
LNEURLEK	-4.7543	-4.7543	-9.5482	-9.5482

Notes: L stands for logarithm, N for nominal; the next three letters EUR represent the currencies of Italy, while the last three letters LEK denote the currencies of the Albania.

Number of co integrating equations		Albania Statistic	
Italy		α1=-5.6954	
		α2=20.3856	
H0:	r=0	LR_{TR}	*33.5678
	r≤1		16.6532
	r≤2		0.7685
H0:	r=0	LR_{MAX}	23.8332
	r=1		15.5486
	r=2		0.7685

The nominal exchange rate in level form is found to be non-stationary. A glance at the Table 3 reveals that stationarity of five consumer prices is achieved (at the 5% significance level at least) only after the series are transformed into first differences.

Table 3. Results of the ADF Test for Individual Consumer Price Indices in the

Variable	Level		First Difference	
	AIC	t-statistic	AIC	t-statistic
LCPIALB	-3.7460	-3.7460	-8.7633	-9.5129
LCPIITL	-1.3156	-1.3156	-5.7345	-5.9876
Variable	Level		First Difference	
	AIC	t-statistic	AIC	t-statistic
LCPIALB	-3.7460	-3.7460	-8.7633	-9.5129
LCPIITL	-1.3156	-1.3156	-5.7345	-5.9876

Observed Countries.
*L stands for logarithm, CPI for consumer price index; ALB and ITL denote the Albania and Italy, respectively.
Table 4. Results of the Johansen Cointegration Test for the Albania and Italy
Notes: (*) denotes rejection of the null hypothesis at the (5%) significance level
From Table 4 it can be seen that for the Albania limited evidence on cointegration among the nominal exchange rates and consumer prices was found in comparison to Italy. In this pair of countries the estimated coefficients appear to be statistically significantly different from zero. According to Equation 1, the signs of the coefficients of domestic prices should be positive, while signs of the coefficients of foreign prices should be negative. Thus, the signs of all cointegrating coefficients invalidate the PPP theory on the Albanian data.
The presented results do not support the theory of PPP in any of the two observed economies. Such an outcome is in line with the rather weak empirical evidence on PPP reported for transition countries in the introductory part of this paper. The invalidity of PPP found in our study is also consistent with the real appreciation of the national currencies of the Albania stated by, (Liu, 1992) and (Sarno, 2002). One part of real exchange rate appreciation can be attributed to the faster growth of domestic tradable prices compared to tradable prices of developed European economies, although this sort of real appreciation was substantially mitigated in Italy by monetary policy interventions on foreign exchange markets in order to preserve external competitiveness (Sarno, 2002). In the Albania, on the other hand, the contribution of relative prices of tradables to the real exchange rate appreciation was preponderant (Johansen, 1991) and the domestic monetary authorities were, until 2010, obliged to sustain the exchange rate peg. The Abania example, therefore, corroborates the findings of (Froot, 1995) that implementation of a more rigid exchange rate policy

in conditions of still volatile inflation and price inertia is to blame for violating PPP.

In Albania, a far more important source of real exchange rate appreciation comes from faster growth of nontradable to tradable prices in comparison to relative prices of developed market economies. As documented in (Johansen, 1991), changes in relative labor productivity explain a considerable portion of nontradable/tradable relative price behavior Albania in the 2002-2013 period. Besides this productivity-based real appreciation, relative mark-ups account for real appreciation in the case of Albania as well (see also (Kutan, 1998)). In addition, studies by (Beirne, 2007) and (Johansen, 1991) imply that the variety of real shocks encountered by transition economies and expansive macroeconomic policies can significantly strengthen real exchange rate appreciation, the former via improving efficiency and boosting productivity, while the latter by increasing inflation differentials with respect to levels in developed market economies.

Conclusions

Testing for stationarity of real exchange rates of the Albanian Lek and the Euro (Italy) showed no firm evidence in favor of PPP. After examining the stationarity of real exchange rates, the proportionality and symmetry restrictions were omitted. The Johansen co integration technique was applied to find a long run linear relationship among chosen nominal exchange rates and individual time series of consumer prices. Although some cointegration was proven, the theory of PPP could not be confirmed. Regarding the low national price levels in both countries in question (see, for example, IEDP 2003; 2004) compared to levels in the EU–15, even after a decade of reforms, such a result is not unexpected. Another reason for failing to substantiate PPP could be the relatively short period of observation for such a long relationship to be detected among the observed variables. Since the early twenties both countries had already pursued a strategy of more or less successful gradual disinflation. Managing low variations of nominal exchange rates during periods of excessive inflation could also imply deviations from PPP. However, the empirical work completed so far reveals that the underlying cause of real exchange rate appreciation in Albania stems from differences in relative productivity gains and from steady price increases due to inadequate competition in the no tradable sector.

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