9 TESTING THE VALIDITY OF THE PPP HYPOTHESIS AND ITS EXTENSIONS FOR CROATIA PRIOR TO THE ADOPTION OF THE EURO

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Abstract

The aim of this research is to assess the validity of purchasing power parity (PPP) hypothesis and its extensions for the Republic of Croatia prior to its adoption of the euro. To this end, the period from January 1994 to June 2022 is examined via testing for stochastic trend(s) utilising monthly data. Initially, the conventional augmented Dickey-Fuller (ADF) test equations are examined for the presence of structural breaks and non-normal errors. Following this procedure enables the study to make several important contributions. First, it broadens the residual augmented least squares (RALS)- based ADF testing procedure by utilising the fourth power of the error terms. Second, by examining nearly the entire kuna period, this research investigates the stability of the pre-euro Croatian currency, shedding light on Croatia's currency integration process into the Eurozone. Third, unlike other studies conducted for Croatia, this study not only assesses the formal PPP but also examines the validity of the extensions of the PPP hypothesis. The findings reveal that neither the formal PPP hypothesis nor its extensions are valid for Croatia and its trade partners, highlighting potential challenges in Croatia's euro adoption and underscoring the need for strategic policy measures to facilitate a successful transition.

Keyword: *Purchasing Power Parity, Fourier ADF Test, Fractional-Frequency Fourier ADF Test, RALS-ADF Test, Non-normal Errors, Excessive Kurtosis*

JEL Classification: *C12, C22, C52, F31, F47*

1. Introduction

Croatia, located at the crossroads of Central Europe, the Balkans, and the Mediterranean, occupies a central position within transport networks, encompassing the Adriatic Sea and the Pan-European corridors. Due to its strategic location, with its accession to the World Trade Organization in 2000 and the European Economic Area in 2013, Croatia has become an indispensable hub for international trade and investment in Continental Europe.

With the collapse of socialism, Croatia declared its independence in 1991. Croatia's economic transition encountered significant challenges in the early 1990s, stemming not only from the remnant of a mismanaged by the communist regime economy but also from issues such as

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physical damages of the internecine fighting, a substantial displacement of population, and mishandled privatisation. To strengthen its political, economic, and institutional stabilization process, Croatia applied for membership in the European Union (EU) in 2003. Receiving candidate status in the following year unlocked EU development funds, facilitating the accession process. Croatian governments remained committed to necessary reforms for EU alignment, and in 2013, Croatia became an EU member.

Following its declaration of independence, Croatia underwent several currency changes. Initially, the Croatian dinar was introduced as a transitional currency. After the implementation of stabilization policies in 1993, the country experienced deflation. Subsequently, in 1994, Croatia replaced the dinar with the kuna. Upon its accession to the EU, Croatia adopted the euro as its official currency in 2023. For a successful integration into the Eurozone, the validity of the purchasing power parity (PPP) hypothesis for Croatia would play a pivotal role in mitigating the risks and uncertainties associated with adopting the euro. Therefore, it is important to investigate whether PPP was valid for Croatia before adopting the euro currency.

The PPP hypothesis, originated by Cassel (1918), is one of the most frequently discussed and empirically investigated topics in international economics. The foundation of the hypothesis is the law of one price. This law states that the identical goods will have the same prices, regardless of location. In reality, one price is difficult to be achieved for a variety of reasons, such as transaction and shipping costs, legal restrictions or differences in demand level. The PPP hypothesis relaxes the law of one price by recognizing that the value of the two currencies is equal if the price of a basket of identical goods is the same in both countries. The PPP hypothesis defends that though in the short run foreign and domestic prices may differ, in the long run they converge to an equilibrium level, and thus the real exchange rate (RER) is mean-reverting. Some relaxed versions of this hypothesis are Trend-PPP, in which the RER is trend-reverting; Quasi-PPP/Qualified-PPP, in which the RER is mean-reverting with level shifts; Trend Qualified-PPP, in which the RER is trend-reverting with level shifts (see, Ventosa-Santaulària and Gómez-Zaldívar, 2013). Additionally, Guloglu, Ispir and Okat (2011) showed that the RER can be trend-reverting with level and trend shifts (GIO-PPP hereafter). Although there are a high number of empirical studies investigating the validity of the PPP hypothesis, majority of the studies do not distinguish between PPP and its extensions (see, for example, Wang et al., 2019; Papell and Pradon, 2020; She et al., 2020; Bahramian and Saliminezhad, 2021; Lim, 2021; Jacobo and Sosvilla-Rivero, 2021). In these studies, either traditional methods are used or only one of the features such as non-linearity, structural breaks, or non-normality is selected in advance and tried to be modelled in test equations.

The aim of this research is to assess the validity of the PPP hypothesis and its extensions for the pre-euro period in Croatia in order to determine whether Croatia's transition to the euro would be smooth, ensuring price and economic stability during its integration into the Eurozone. Empirical investigations of the PPP hypothesis generally follow two main approaches. One examines the validity of absolute PPP by analysing the cointegration between prices and nominal exchange rates, while the other tests the validity of relative PPP by investigating the mean- or trend-reverting behaviour of the RER using unit root tests (URTs). In some empirical studies, by using real effective exchange rates (REERs), the coverage of PPP is expanded from one foreign currency to a weighted average of the main trade partners' currencies. Although Wallace, Ventosa-Santaulària and Gómez-Zaldívar (2014) criticise the interpretation of the results obtained using REERs, Craig (2005) emphasises that different countries weight their basket goods differently and that even a different base year provides different weights. Therefore, the use of bilateral RERs may be subject to similar criticism. Considering that most of Croatia's trading partners are EU countries and taking all these criticisms into account, it is obvious that investigating the mean- or trend-reverting behaviours of REER via URTs is more suitable to achieve the purpose of this study.

To examine the validity of the PPP hypothesis and its extensions for Croatia, the conventional augmented Dickey-Fuller (ADF) test equations are first examined for structural breaks/nonlinearities and non-normal errors to identify the appropriate URT. Based on the diagnostic test results, it is determined that the residual augmented least squares (RALS) based ADF test equations are the most suitable for performing the URTs. In empirical applications of the RALS equations, only the second and third powers (variance and skewness informatives) are used. However, since excessive kurtosis in the errors is detected as the primary cause of deviation from the normal distribution, the fourth power (kurtosis informative) of the error terms is, for the first time, utilised in the testing procedure, alongside the second and third powers.

Since relaxed forms of PPP (except Trend-PPP) require DGPs with structural breaks, testing the presence of breaks actually examines whether these relaxed forms of PPP might be valid. As no structural breaks are detected, it is concluded that the Quasi-PPP/Qualified-PPP, Trend Qualified-PPP, and GIO-PPP forms of the hypothesis are not valid. Additionally, RALS-ADF test results show that, on average, formal PPP or Trend PPP also do not hold for the Republic of Croatia and its trade partners. These findings suggest that Croatia's transition to the euro may present substantial challenges; consequently, it is imperative to develop a comprehensive strategy that integrates temporary price controls with robust fiscal and monetary policies to effectively manage the transition process.

The contribution of this research has several dimensions. First, it broadens the RALS-ADF testing procedure by utilising the fourth power of the error terms instead of assuming the t-distribution, taking into account the sample size. Second, by examining nearly the entire kuna period, this research investigates the stability of the pre-euro Croatian currency, shedding light on Croatia's currency integration process into the Eurozone. Third, unlike other studies conducted for Croatia, this study not only assesses the formal PPP but also examines the validity of the extensions of the PPP hypothesis.

2. Literature Review

Although numerous studies in the literature test the validity of the PPP hypothesis for different countries, the number of studies focused on Croatia is quite limited. Pufnik (2000), one of the pioneering studies in this field, tests the validity of the PPP hypothesis by examining whether the Croatian currency is cointegrated with the American dollar and the Italian lira. The results show that the hypothesis is not valid between December 1991 and September 1996. But this period covers two different currencies (the dinar and the kuna). Another study examining the validity of the PPP hypothesis for Croatia is Kozul (2013). This study investigates the existence of a long-term relationship between the euro and the kuna using both the Engle – Granger and Bounds testing methods. The results of Kozul (2013), covering the period from January 2000 to December 2012, similar to those of Pufnik (2000), do not provide any evidence for the validity of the PPP hypothesis with either method. By employing ADF, PP, ERS, KPSS, and KSS tests, as well as the quantile autoregression approach, Bošnjak, Bilas and Novak (2020) examine the validity of the PPP hypothesis for the period covering January 1996 to October 2018. While quantile autoregression analyses demonstrate the existence of asymmetries in shocks, the URTs results demonstrate the existence of a stochastic trend in the REER, indicating that the PPP hypothesis is not valid for Croatia during this period.

The examination of PPP for 8 transition countries, including Croatia, performed by Acaravci and Ozturk (2010) demonstrates that the results differ according to the testing method used. The study employs four different URTs, namely ADF, KPSS, LS1, and LS2, for the period covering January 1992 to January 2009. The ADF and KPSS test results are against the validity of the hypothesis, whereas the results of URTs allowing for structural breaks are in favour of the validity of the PPP hypothesis for Croatia during the tested period. Žďárek (2012) investigates the validity of the PPP

for nine transition countries and Turkey using quarterly data covering the period from 1995:1 to 2011:1. The study employs conventional URTs (ADF, PP, KPSS, and DF-GLS), URTs having alternatives of smooth transition (ESTAR and AESTAR), and URTs allowing for structural breaks (Perron, LS1, and LS2). Results indicate that the Croatian RER is linear and nonstationary, characterised by a deterministic trend (i.e., trend-reverting). The study by Jiang et al. (2016) examines the validity of the PPP hypothesis for CEECs by employing a threshold stationarity test. The study uses monthly data covering the period from 2000 to 2013. The results indicate that the PPP hypothesis is not valid for Croatia during this period.

Tica (2006) provides evidence supporting the PPP hypothesis for Croatia. However, the study utilises annual data from 1952 to 2003 to assess the validity of the hypothesis. Unfortunately, the selected period largely covers data on Federal Yugoslavia and the Yugoslav dinar.

3. Data and Methodology

3.1. Data

The data set used in this study is monthly Real Broad Effective Exchange Rate for Croatia (data code: RBHRBIS), (2010=100) retrieved from FRED (2022). The data set covers the period between January 1994 and June 2022.

3.2. Methodology

Empirical investigations of the PPP hypothesis follow two main approaches. One is testing whether prices and nominal exchange rates are cointegrated, and the other one is testing the mean- or trend-reverting behaviours of RERs via unit root tests (URTs). In this study the second approach will be followed.

Although the ADF test of Dickey and Fuller (1979; 1981) is the most widely used method for testing the existence of stochastic trends, there are two main issues that affect the power of the test and thus its reliability. One issue is the non-normality of the testing equations errors, and the other is structural breaks in the time series to be tested for nonstationarity.

To determine the appropriate testing method, the conventional ADF test equations are estimated and diagnostic tests related to these equations are performed. Number of lags are selected using Bayesian information criterion (BIC) of Schwarz (1978), and are checked for remaining autocorrelation using Q-statistics of Ljung and Box (1978) to ensure uncorrelated errors. Normality of the error terms is examined using Jarque and Bera (1987) (hereafter, JB) normality test.

Additionally, in order to model any existing breaks or nonlinearities a Fourier approximation component in the form

$$f(t) = \varphi_0 + \varphi_1 \sin(2\pi kt/T) + \varphi_2 \cos(2\pi kt/T) \tag{1}$$

is fitted to each ADF testing equation using k=1,2,3,4,5 as is suggested in Enders and Lee (2012), and k=1.1, 1.2, … ,1.9 as is suggested in Omay (2015). The minimiser of residual sum of squares is determined as optimal fitting Fourier component and the significance of this component is tested. The optimally fitting nonlinear component is found to be statistically insignificant and therefore - Fourier ADF and Fractional Frequency Fourier ADF URTs allowing for structural breaks/nonlinearities are also eliminated.

Although the nonlinear component is found to be insignificant, it is determined that the error terms of the test equations are not normally distributed. Therefore, to increase the power of the

conventional ADF test, the RALS based ADF test of Im, Lee and Tieslau (2014) is performed. As it is illustrated by Lee and Hur (2021), another good property of this testing procedure is that besides its power improvement under non-normal errors, it is still powerful if there are various neglected nonlinearities in the underlying data.

RALS estimation procedure is proposed by Im and Schmidt (2008) for efficiency gain in OLS when errors are not normally distributed. This procedure uses higher order moment conditions asserting that regressors are not dependent on these moments. In RALS estimation technique, new variable(s) defined as

$$v_{jt} = f_j(\hat{\varepsilon}_t) - \overline{f_j(\hat{\varepsilon}_t)} - \overline{f_j'(\hat{\varepsilon}_t)}\hat{\varepsilon}_t \tag{2}$$

are constructed and added to the regression equation to provide a simpler estimator asymptotically equivalent to GMM. Here, $f_j(\hat{\varepsilon}_t) = \hat{\varepsilon}_t^j$, $\overline{f_j(\hat{\varepsilon}_t)} = T^{-1}\sum_{t=1}^{T}\varepsilon_t^j$ for $j \geq 2$, f_j' is the derivative of f_j , and $\hat{\varepsilon}_t$ is the non-normal error term of the ordinary regression. Unless $\mu_{j+1} = j\sigma^2\mu_{j-1}$, higher moments are informative in improving efficiency.

Utilising this estimator in estimation of the conventional ADF test equations with non-normally distributed errors, Im, Lee and Tieslau (2014) proposed RALS-ADF unit root testing procedure.

RALS-ADF testing procedure utilises RALS estimator to conventional ADF test, to improve the efficiency of the OLS estimator in estimation procedure of the unit root testing equations when errors are not normally distributed. To this end, variable(s) created as in (2) are added to the conventional ADF test equations such as

$$\Delta y_t = \delta y_{t-1} + \sum_{i=1}^{p}\phi_i \Delta y_{t-i} + v_t'\omega + e_t . \tag{3}$$

Of course, as in ADF, deterministic component such as constant and trend also can be added to the equation (3), if needed. Here, δ , ϕ_i , ω are parameters to be estimated. $v_t' = \begin{bmatrix} v_{2t} & v_{3t} & \dots & v_{nt} \end{bmatrix}$ is the vector of created higher order moments informative variables; and though theoretically higher order elements are allowed, only the first two elements (variance and skewness informatives) are used in empirical applications. This is primarily due to the fact that Im, Lee and Tieslau (2014) do not employ the higher moments, noting that using the second and third moments markedly improves the power of the test and that employing higher moments necessitates larger sample sizes. However, in this study, it is found that the primary cause of deviation from the normal distribution is excessive kurtosis of the errors. Therefore, taking into account the size of the sample, besides the variance and the skewness informatives, the kurtosis informative is also utilised. Thus, three different moment conditions are applied in the testing procedure, namely RALS-ADF(2), RALS-ADF(2&3) and RALS-ADF(2&3&4).

To test the null of unit root (i.e., $\delta = 0$), besides the t-statistic related to the equation (3),

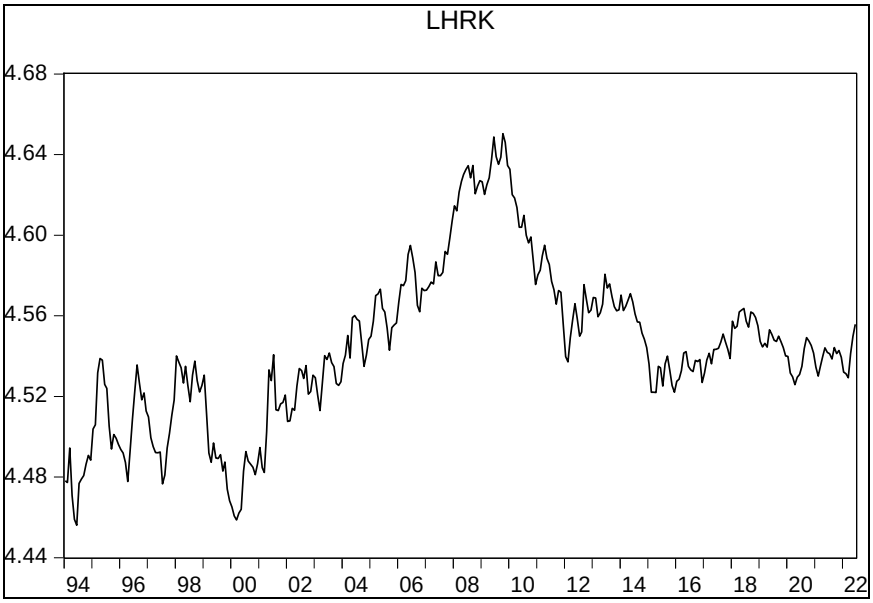
$$\hat{\rho}^2 = \hat{\sigma}^2_{RALS-ADF} \Big/ \hat{\sigma}^2_{ADF} \tag{4}$$

ratio is calculated. Here, $\hat{\sigma}^2_{RALS-ADF}$ is the estimated error variance of the RALS-ADF test equation in (3), and $\hat{\sigma}^2_{ADF}$ is the estimated error variance of the conventional ADF test equation. Critical values in Hansen (1995) related to the $\hat{\rho}^2$ ratio are used to perform the test.

4. Testing the Validity of PPP and its Extensions for Croatia

At the first step a logarithmic transformation is applied to the kuna (HRK) series. The transformed series is denoted by LHRK. Figure 1 demonstrates the graph of this series.

Figure 1. Natural logarithm of HRK in the period from January 1994 to June 2022



Source: Created by the author using FRED (2022) data.

To determine the appropriate testing method, the conventional ADF test equations are estimated and diagnostic tests related to these equations are performed. Lags are selected using BIC, and are checked for remaining autocorrelation using Q-statistics to ensure non-correlated errors. Q-statistics for the first lags are reported in Table 1. Additionally, using both Fourier ADF (FADF) and Fractional Frequency Fourier ADF (FFFADF), a Fourier approximation is tried to be fitted in order to model any existing breaks or nonlinearities, but this nonlinear component is found to be statistically insignificant. The results of these tests are also reported in Table 1. Since no strong evidence for structural breaks is detected, a URT that does not allow for structural breaks will be more powerful. Therefore, testing procedures allowing for structural breaks are eliminated.

Findings supporting that there is no statistically significant structural breaks in the series, also indicate that there is no evidence for the validity of Quasi-PPP/Qualified-PPP, Trend Qualified-PPP or GIO-PPP.

Table 1. ADF, FADF, and FFFADF test results for the LHRK, and diagnostic tests results for the corresponding test equations

Model	Lag	Q(1)-stat	ADF	FADF/FFFADF F-stat
Trend & Intercept	1	0.0365	-2.465	8.111[1.5] (b)
Intercept	1	0.0393	-2.469	5.062 [1.5] (b)
None	1	0.0366	0.445	0.772 [2] (a)

*Notes: ***p<0.01, **p<0.05, *p<0.10. Q(1) is Ljung-Box statistic for the first lag, FADF/FFFADF F-stat is F statistic for testing the significance of nonlinear component in (a) FADF and (b) FFFADF testing equations, [.] is the frequency of the optimal Fourier function.*

Source: Author.

Normality of the error terms are examined using JB normality test, and it is concluded that all of these 3 models have non-normal errors. Test results, as well as standard deviation, skewness and kurtosis of error terms for each model are reported in Table 2.

Table 2. Descriptive statistics and JB test results for conventional ADF test equations

Model	Std. Dev.	Skewness	Kurtosis	JB stat
Trend & Intercept	0.008	0.115	3.894	12.078***
Intercept	0.008	0.081	3.913	12.195***
None	0.008	0.181	3.966	15.072***

*Notes: ***p<0.01, **p<0.05, *p<0.10.*

Source: Author.

Since no strong evidence for structural breaks is detected, but testing models have non-normal errors, the RALS-ADF test is performed to increase the power of the nonstationarity test.

Table 3. RALS-ADF(2), RALS-ADF(2&3), and RALS-ADF(2&3&4) test results for LHRK

Model	RALS-ADF(2)	$\rho^2_{(2)}$	RALS-ADF(2&3)	$\rho^2_{(2\&3)}$	RALS-ADF(2&3&4)	$\rho^2_{(2\&3\&4)}$
Trend & Intercept	-2.419	0.998	-2.206	0.941	-2.435	0.929
Intercept	-2.312	1.001[2]	-2.146	0.942	-2.218	0.935
None	0.456	0.992	0.470	0.931	0.467	0.923

*Notes: ***p<0.01, **p<0.05, *p<0.10.*

Source: Author.

[2] *Although the residual sum of squares of the RALS-ADF test equation is smaller than that of the ADF test equation, the contribution of the added variance informative is not high enough to compensate for the additional reduction in the degree of freedom, resulting in a rou square greater than one.*

Although only the first two elements (variance and skewness informative) are used in empirical applications, in this study, besides the second and the third power of the error terms, the fourth power additionally is utilised in the RALS estimations. Because, as it is obvious from Table 2, the main cause of deviating from the normal distribution is excessive kurtosis of the errors. Thus, three different moment conditions are applied in the testing procedure: 1- only the second power, 2- the second and the third powers, and 3- the second, the third and the fourth powers of the errors. Test results are reported in Table 3. Test statistics of RALS-ADF test using only the second moment condition are denoted as RALS-ADF(2), the test statistics of RALS-ADF test using both the second and the third moment conditions are denoted as RALS-ADF(2&3), and the test statistics of RALS-ADF test using the second, the third and the fourth moment conditions are denoted as RALS-ADF(2&3&4).

RALS-ADF test results for the testing equation including a deterministic trend (model with trend and intercept) indicate that the testing equation has a unit root. This means that the HRK does not return to an equilibrium trend in the long run. Thus, the Trend-PPP is not valid for HRK because the DGP of HPK does not possess a trend reversion. Test results for the testing equations including only an intercept are also in favour of a unit root existence; indicating that the DGP of HPK is not mean-reverting. These results indicate that PPP hypothesis is not valid for HRK during the period investigated. Consequently, all RALS-ADF test results indicate that, on average, PPP or Trend PPP does not hold for the Republic of Croatia and its trade partners.

5. Discussion

The FADF, FFFADF, and RALS-ADF unit root tests are applied to investigate the validity of PPP for Croatia before adopting the euro as its currency. During the investigation process, it is determined that the deviation from normal distribution primarily arises from excessive kurtosis. Although Im, Lee and Tieslau (2014) employ a t-distribution to eliminate the impact of excessive kurtosis in their simulation studies, this is due to their small sample sizes of 50 and 100 observations. They emphasise that employing higher moments necessitates larger sample sizes. In this study, having a large sample size of 342 observations, for the first time, the fourth power of residuals (i.e., the kurtosis informative) is implemented to eliminate the impact of excessive kurtosis in the RALS-ADF testing equations instead of assuming a t-distribution.

The testing approach of this study is selected so that to examine not only the validity of PPP hypothesis but also its extensions, namely Trend-PPP, Quasi-PPP/Qualified-PPP, Trend Qualified-PPP, and GIO-PPP. The test results indicate that neither formal PPP hypothesis nor any of its extensions are valid. These findings are in line with Pufnik (2000), Kozul (2013), Bošnjak, Bilas, and Novak (2020), and Jiang et al. (2016), but differ from Acaravci and Ozturk (2010), Žďárek (2012), and Tica (2006) in some ways.

The statistical insignificance of the Fourier function component in the FADF and FFFADF tests indicates that there are no structural changes, negating the validity of the Quasi-PPP/Qualified-PPP, Trend Qualified-PPP, and GIO-PPP hypotheses. These results differ from those of Acaravci and Ozturk (2010) because, although they do not explicitly state it, their findings suggest the validity of at least one version of the PPP hypothesis that allows for structural breaks. There could be two possible reasons for this discrepancy. One reason could be that the period they study covers two different currencies: the dinar (from January 1992 to December 1993) and the kuna (from January 1994 to January 2009)—which could be the cause of the structural break. The other possible reason could be that the URTs that allow for structural changes that they use are of different forms.

One potential explanation for the discrepancy between our findings and those of Žďárek (2012) and Tica (2006) is that both studies employ low-frequency data (quarterly and yearly, respectively). It is a well-known fact that lower frequencies result in smoother data. Žďárek (2012)

concludes that the Croatian RER is nonstationary having a linear deterministic trend. The trend-reverting characteristic of the RER suggests the validity of Trend-PPP. Although this may be due to the actual deterministic trend in the data during the investigated period, it is also possible to be due to the drift of the stochastic trend, which appears as a deterministic trend because of the low frequency used. Tica (2006) provides evidence in support of the formal PPP hypothesis; however, in addition to the low frequency of the data, the selected period mainly covers data on the Yugoslav dinar, and contains little information about the Croatian exchange rate.

The fact that Croatia's transition to the euro does not align with PPP could give rise to several issues, including inflationary pressures, economic disparities, and a loss of market confidence. Moreover, the country's control over monetary policy would be limited by the European Central Bank (ECB) as a result of this transition. Therefore, cooperation with the ECB will be essential, especially in the first years after the adoption of the euro, to ensure that monetary policy decisions take Croatia's specific economic conditions into account. Additionally, several measures could be taken to better manage the complexities of euro adoption and to mitigate potential negative consequences of misalignment with PPP. The government could implement a robust communication strategy to inform the public about the euro transition, the expected impacts on prices, and how to manage finances during the shift. Businesses could be encouraged to adjust prices gradually rather than in sudden jumps, supported by guidelines or incentives to maintain stable pricing. Temporary fiscal stimulus measures, such as targeted subsidies or direct financial assistance to the most affected population groups, could be considered to alleviate immediate economic pressures. A regulatory framework, including penalties for companies that exploit the transition to raise prices excessively, could be put in place to monitor price changes and address unjustified price increases. Furthermore, strengthening social safety nets, such as unemployment benefits and social assistance programmes, can help cushion the impact on the most vulnerable groups during the transition.

Conclusion

This research aims to assess the validity of the PPP hypothesis and its extensions for the pre-euro period in Croatia to identify potential economic issues that the Croatian economy may face during its integration into the Eurozone and transition to the euro.

One important contribution of this paper is to examine not only the validity of PPP hypothesis but also its extensions, namely Trend-PPP, Quasi-PPP/Qualified-PPP, Trend Qualified-PPP, and GIO-PPP. This paper additionally makes a valuable contribution to RALS-ADF testing procedure by implementing for the first time the fourth power of residuals (i.e., the kurtosis informative) into the testing equations to eliminate the impact of excessive kurtosis.

The findings of this study suggest that none of the PPP forms are valid for the pre-euro period of the Croatian currency, kuna. The nonexistence of PPP could lead to inflationary pressures and economic instability during integration into the Eurozone. In this case, increased prices due to the currency transition could reduce export competitiveness and domestic consumption, leading to disadvantages for Croatian businesses. Several cost-controlling and economic efficiency-enhancing measures are suggested to address these potential consequences and mitigate associated risks.

Although this research uses a variety of URTs to investigate the validity of the PPP hypothesis in all its extensions, the methodology is limited to modifications of the ADF test. Further studies could be conducted by employing different types of URTs, such as similar Fourier function modifications of the conventional KPSS or LM tests, URTs allowing for sharp breaks, or URTs that have alternatives with smooth transitions. Alternatively, only the post-EU membership period could be examined to investigate the impact of EU membership on the stability of the kuna.

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