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The Effects of Euroization on Monetary and Financial Stability: Empirical Evidence from Five Countries

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Abstract: This paper explores the effects of excessive financial Euroization on monetary and financial stability by using deviation from interest rate parity (dIRP) as a proxy measure of financial and monetary stability, building on the interest rate parity puzzle theory. We focus on five Central and Eastern European (CEE) EU member countries (Poland, Hungary, the Czech Republic, Romania, and Croatia) from January 2002 to December 2019. The impact of euroization parameters on dIRP is empirically tested by employing the ARDL co-integration model and the Granger causality test. Interest rate differentials and inflation were employed as additional explanatory and control variables. Results show that loan euroization and interest rate differentials greatly impact dIRP in all countries except the Czech Republic, where deposit euroization and inflation have a more significant impact. Furthermore, the causality analysis has shown that there is also a vicious circle where dIRP causes Euroization in the short run. At the same time, greater Euroization, in turn, exacerbates dIRP in the long run. This confirms that Euroization is relevant in explaining the interest rate puzzle, impacts greater dIRP among financial markets, and strives to harmonize interest rates with the euro area to maintain financial and monetary stability.

Keywords: Euroization; Interest Rate Parity; CEE Countries; Monetary Policy; Financial Stability.

JEL: E4,E5, E43, G12, N, O23, O42, F45, F33

1. Introduction

The process of integrating Eastern Europe into the European Union is still ongoing. After nearly thirty years of political, social, monetary, and financial reforms, many challenges remain in overcoming the unstable financial markets and exchange rates of the CEE economies. The largest part of the former socialist block, all countries except the Western Balkans and Moldova, have already joined the EU, and some of them,

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like Estonia, Slovenia or Slovakia, have joined the eurozone, implementing the euro as their currency entirely. The remaining countries are characterized by a very high dependence on the EU in terms of foreign trade, financial aid, and institutional aid. Hence, the phenomenon of persistent currency euroization is widespread and expected. Though it refers to the use of any foreign currency, it is typically the euro for the CEE countries. The persistence of this phenomenon is due to historically high levels of volatility of most macroeconomic parameters and a historical lack of confidence of households and investors likewise in their domestic currencies (Dvorsky et al., 2008).

The paper addresses how Euroization may impact the financial and monetary stability of CEE countries as they become new members of the EU. The impact of Euroization (among other determinants) will be analyzed through the prism of the interest rate parity puzzle phenomenon.

Interest rate parity is the theoretical rule that the interest rate differential between two currencies should equal the expected exchange rate change between them (Hayes, 2021). The interest rate parity theorem was conceived more than 100 years ago by the Swedish economist Gustav Cassel and the American economist Irving Fisher. Cassel (1918) related interest rates and exchange rates in his work, stating how changes in the latter must reflect changes in the former. The argument is that the market tends to achieve parity or equilibrium. Fischer (1930) argued that interest rates for different currencies must reflect their inflation differentials.

This principle still holds a crucial role in international finance and the integration of financial markets today. Economists refer to the occurrence of deviation from the expected parity as the interest rate parity puzzle because, the majority of research suggests, interest rate parity rarely holds up in practice.

Hence, the interest rate parity puzzle is essentially the question of why parity doesn't hold up in practice and the possible reasons for it. Factors such as transaction costs, risk premiums, capital controls, and market imperfections are popularly believed to contribute to deviations from interest rate parity. Even while interest rate parity is widely accepted as a guiding principle, its applicability in real-world situations is still being studied and discussed.

Although the interest parity puzzle has more than one answer, the literature debates whether a currency phenomenon such as Euroization influences violations of interest rate parity. As a result, the study's originality lies in its attempt to link excessive Euroization to the interest rate puzzle.

Furthermore, much of the literature focuses on analyzing only one country and its integration and parity with the euro area. Comparing a representative group of pertinent CEE nations to the eurozone could be more beneficial. Contributions in this area can be made for policy proposals for long-term stability.

Therefore, after considering the literature and the issues mentioned, we pitted a chosen sample of developing CEE nations against the euro area. The study explores the following research questions:

- Does the level of Euroization impact the rise in interest rate parity deviations as a gauge of financial and monetary stability?
- Does excessive euroization lead to instability of financial markets?

The study will use co-integration and causality analysis to test the deviation from interest rate parity against the deposit and credit euroization degree. Other pertinent parameters will also be tested, such as their interest rate differential against the euro and the inflation rate. Given the available data, the time frame of the analysis will span from the year 2002 (marking the beginning of their transition towards market economy and EU integration, as well as the introduction of the euro) until 2019 (marking the last year before the Covid crisis, which is purposely omitted due to being a second shock with completely different implications).

Hence, we set out the following hypotheses:

H1: Excessive deposit euroization impacts greater deviation from interest rate parity in the analyzed CEE countries.

H2: Excessive loan euroization impacts greater deviation from interest rate parity in the analyzed CEE countries.

H3: The interest rate differential and inflation variable enhance the explanatory power of the relationship between euroization levels and deviations from interest rate parity.

Integrating Eastern Europe into the European Union is a complex and continuous task involving several political, social, and economic problems. Despite over thirty years of focused endeavours in political, social, monetary, and financial reforms, the economies of Central and Eastern Europe (CEE) still struggle with the volatility of financial markets and exchange rates. Some countries in the region, like Estonia, Slovenia, and Slovakia, have smoothly joined the eurozone by adopting the euro. However, other countries are still heavily reliant on the euro due to historical ties and concerns about currency volatility.

Our article explores how Euroization might significantly affect the financial and monetary stability of Central and Eastern European (CEE) nations as they integrate into the European Union. Our research differs from traditional assessments by investigating the impact of Euroization through the interest rate parity conundrum, a perspective not commonly studied in the literature.

Interest rate parity is a key concept in international finance, proposed by economists Gustav Cassel and Irving Fisher more than a century ago. It states that the difference in interest rates between two currencies should reflect the anticipated exchange rate movement between them. Empirical data frequently contradicts the theoretical expectation, resulting in what economists call the interest rate parity paradox. The practical relevance of interest rate parity in real-world situations is a topic of ongoing discussion and examination, with factors including transaction costs, risk premiums, and market inefficiencies believed to cause departures from the theoretical concept.

Previous studies have explored factors affecting interest rate parity deviations, such as transaction costs and risk premiums, but less focus has been placed on the impact of currency phenomena like Euroization. The originality of our work is in attempting to clarify the connection between excessive Euroisation and departures from interest rate parity.

Our study takes a comparative approach by contrasting a representative group of Central and Eastern European states with the euro area instead of focusing on individual countries' integration and parity with the eurozone as prior research has done. We seek to give information to assist policy suggestions for long-term financial stability and integration within the area.

2. Literature review

The interest rate parity has been analyzed from various perspectives, and literature differs in its explanations. The first group represents the majority supporting the classical interest rate-exchange rate equilibrium theory. These studies strive to quantitatively connect interest rates, exchange rates and inflation as each other's determinants. The other group of studies attempts to prove that there is a more decisive impact of factors such as risk aversion, market liquidity, policy constraints or even political and cultural factors.

2.1. Classical interest rate parity puzzle analysis

Among the first group are papers such as Sarno and Taylor's (2002), where the purchasing power parity (PPP) is an important condition determining bilateral exchange rates among industrialized countries. The authors also present a co-integration analysis, highlighting the necessity of a long-term link between relative prices and exchange rates if the PPP remains stable. From this, we can deduce that the authors' analysis focused on how exchange rates moved in relation to relative price levels, which can also be expressed as inflation.

Nikolaou's (2006) study aimed to analyze the impact of different-sized shocks on the real exchange rate and detect how it adjusts asymmetrically over time. Her assumptions were also based on the equilibrium between PPP and real exchange rate, which is a purely theoretical ideal state that significantly deviated from reality. The results suggested that if large shocks occur at points of significant deviation from the real exchange rate's long-run equilibrium, they induce fast mean reversion of the exchange rate. The shocks were proven necessary for the rapid mean reversion to occur. Even though the research paper byKadić et al. (2022) was written before the 2008 global financial crisis, it is still possible to consider the crisis in light of our work because the 2008 crisis did result in abrupt increases (shocks) in a number of monetary and macroeconomic variables, such as inflation, interest rates, exchange rates, and the levels of Euroization. Through the findings of Nikolaou (2006), we can predict that large shocks have greater reversion tendencies, while small shocks have longer-lasting effects.

The authors of Borio et al. (2016) developed the discussion about the violation of the interest rate parity during the 2008 financial crisis. In their work, the authors analyzed why interest rate parity violations have continued long after the crisis was under control. Their results have given ground to the assumption of a connection between Euroization and interest rate parity violation since they argue that the reason for the persistence of interest rate parity violations lies in increased demand for foreign currency hedges.

The working paper by Du et al. (2017) argues that deviations from interest rate parity are correlated with nominal interest rates and spreads on fixed-income yielding assets. Their analysis focused on the condition of the US Dollar and the parity against other major currencies in the aftermath of the '08 crisis. They have identified several factors that affect interest rate parity deviations. Firstly, the effects of quarterly cycles, as interest rate parity deviations increase towards the end of each quarter. Secondly, interest rate parity deviations are relatively collinear with other near-risk-free fixed-income spreads. Also, interest rate parity deviations are highly correlated with nominal interest rates between compared currencies and over the analyzed period.

The financial integration of the CEE countries Poland, Hungary, the Czech Republic and Slovakia in the EU and EMU accession process were examined by Jochem and Herrmann (2003). The authors applied co-integration analysis to test if the covered interest rate parity holds up. Their analysis compared the individual CEE countries to the euro area and found that the Czech Republic is the most integrated with the euro area, where liberalization of capital flows and the foreign exchange markets have contributed to reducing the deviations from interest rate parity.

The interest rate parity puzzle discussion was put in closer context with CEE countries by Cuestas et al. (2015). Data from five countries was analyzed over ten years (2003-2013) using an interest rate parity deviation variable. This deviation variable is calculated as the difference between the interest rate differential and the monthly change in the exchange rate. The findings have shown positive deviations from the interest rate parity for all countries.

Finally, the inflation variable was included in the interest rate parity regression to challenge the claim of the effects of interest rate differentials on exchange rate movement (Engel et al., 2019). Consequently, the authors found the inflation variable to be more significant than interest rate differentials.

2.2. Alternative interest rate parity Puzzle explanations

Within the second category, the research done by Ilut (2010) provides a more in-depth analysis of the broader consequences of the interest rate parity conundrum. Looking into how variations from interest rate parity are affected by ambiguity aversion. Ambiguity aversion is essentially the individuals' preference for known risks over unknown risks. The study's findings suggest that ambiguity aversion can explain the persistence of interest rate parity violations. Ambiguity aversion creates an endogenous effect on interest rate differentials and expected exchange rate changes.

Factors related to the movement of deviations from interest rate parity in the aftermath of the '08 crisis were studied by Cerutti et al. (2021). They analyzed cross-country deviations and found that market liquidity measures and risk factors play an important role in explaining the interest rate parity deviations. Borio et al. (2016) stated that it is important to note that interest rate parity was believed to have relatively held up and was then distressed by the global crisis. Their results have shown that risk-taking capacity, foreign currency market liquidity, unconventional monetary policy, and financial regulation factors have an explanatory role in the behaviour of interest rate parity violations over the course of the analyzed period.

2.3. Euroization as a factor of interest rate parity

Backus et al. (2011) found that countries that increase the interest rate (in combating inflation) more than their economic partners tend to have their currency appreciate compared to their partners'. In descriptive terms, the study finds an inverse relationship between interest rate differentials and currency depreciation rates. We can infer from Backus et al. (2011) the significance of tight-policy countries using foreign currencies for trade and the anticipated consequences of domestic inflation. Holdings in foreign currencies are marked as a risk factor, potentially increasing deviations from parity (especially in raising the policy rate high). The authors conclude that a significant risk premium is associated with foreign currencies because there is a low tolerance for exchange rate risk and that high-risk premiums exacerbate deviations from parity. It is also important to note that, according to Backus et al. (2011), the countries with higher foreign reserve rates (higher euroization levels) are on the “short side” in the currency trade and are very likely to impose contractionary monetary policies, and therefore, have higher interest rates.

Czaja and Dulkys (2012) chose Poland and Lithuania for their analysis. Neither country is part of the euro area, and their inferior domestic currencies cannot match the euro’s strength. Hence, they experience extensive currency euroization, going as far as 60% and impairing their monetary stability. Their analysis has confirmed that interest rates are lower for the euro-denominated loans. Given the exchange rate with the euro, these findings confirm the assumptions of interest rate parity in this case. The authors argue whether any parities make sense in the first place in an economy where the foreign currency takes up nearly two-thirds of the currency in use and whether, in that case, complete Euroization (switching to the euro) is the best forward move.

Schreiber and Woertz (2008) introduce the term currency euroization in connection with interest rate differentials, a previously proven crucial variable for interpreting interest rate parity in 10 CEE countries, including the Balkan countries. According to their theoretical framework, low-interest rates for foreign currency, high domestic inflation, and excessive exchange rate volatility are all associated with high levels of Euroization. Furthermore, they find that the CEE (and Balkan) countries have steadily lowered the domestic-to-foreign interest rate spread over a rather successful transition. The results showed that there is a significant effect of change in interest rate spread on the change in deposit euroization levels. For Albania, Croatia, and Romania, it was proven that a decrease in the spread of interest rates affects the increase of deposit euroization. For the other countries, the results showed that the spread decrease coincides with a decline in euroization levels.

2.4. Literature gap

From the examined literature, it is deduced that the majority supports the classical quantitative analysis of parameters which determine deviations from interest rate parity. The literature has linked deviation from interest parity with money supply, the exchange rate, and a measure of monetary stability. It has also been linked with investor risk and financial stability (Jochem & Herrmann, 2003). Finally, studies have introduced financial Euroization as a determinant factor of dIRP. However, no study has analyzed whether excessive deposit and loan euroization is a financial and monetary stability factor, as measured by dIRP. Furthermore, monetary and financial stability must be analyzed both long-term and short-term. Most studies take short timespans, periods only after a shock (crisis), or periods with no shocks. The impact of Euroization on interest rate parity would be better understood if a representative business cycle is used.

3. Methodology

3.1. Data

The data collected for this study is on a monthly basis. It should be mentioned that monthly data is preferred for co-integration analysis for several reasons. Firstly, monthly data provides more frequent observations, capturing finer variations in the relationships between the variables. The increased frequency provides us with a more accurate representation of short-term fluctuations and a better understanding of the dynamics of the variable.

The data sources include primarily the countries' central banks chosen for analysis and the European Central Bank database for eurozone data. Furthermore, data was acquired from the individual annual IMF country reports and other international databases. Within the scope of this study, the final collected dataset contains monthly data on the following variables: Interest rate parity deviation, Deposit euroization, Loan euroization, Interest rate differential between the domestic currency and the euro, and the Inflation rate of each of the countries analyzed. The listed variables are collected for five EU emerging countries: Poland, Hungary, the Czech Republic, Romania and Croatia. The complete timespan ranges from January 2002 to December 2019. Overall, the data set contains 216 observations for each of the five variables included for each of the five countries, giving a total of 5,400 observations.

3.2. Variables

3.2.1. Interest rate parity

Interest rate parity is a theoretical assumption that the difference in interest rates between two currencies should equal the expected exchange rate change over the same period. As Hayes (2021) and Engel et al. (2019) clearly state, this can never be seen in practice, as it would imply a perfect market and frictionless and morally hazardous relationship between economies. Nonetheless, international finance literature has extensively studied interest rate parity and is portrayed as a variable that reflects monetary and financial soundness. Studies such as that of Jochem and Herrmann (2003) and Cuestas, Filipozzi and Staehr (2015) have established the deviation from interest rate parity as a measure of financial market stability. Engel and West (2005) have established it as a measure of monetary policy effectiveness.

The common formula which has been employed by Filipozzi and Staehr (2013), Jochem and Herrmann (2003) and Engel et al. (2019) and will be applied in this study for calculating the interest rate parity goes as follows:

$$[((\textit{exchange rate } n - \textit{exchange rate } n{-}1)/\textit{exchange rate } n{-}1) * 100] - (\textit{interest rate domestic currency} - \textit{interest rate euro}) = dIRP$$

Where exchange rate n indicates the exchange rate for the current month, and exchange rate $n - 1$ indicates the exchange rate for the previous month. dIRP denotes deviation from interest rate parity. (Jochem & Herrmann, 2003; Engel et al., 2019; Filipozzi et al., 2013)

3.2.2 Deposit euroization and loan euroization

Deposit euroization is calculated by dividing foreign-denominated deposits by one country's total domestic currency deposits. Data for more complex monetary parameters such as financial Euroization are usually not explicitly stated, especially not on a monthly basis, so they must be derived from the overall balance sheets of the financial sector, which the national central banks provide. Small variations from country to country have occurred in the methodology of data compiling; however, none are too significant on the overall trends.

Loan euroization implies borrowers (individuals and firms) in an economy predominantly being issued foreign-denominated loans by banks. It is typically measured by the share of foreign currency-denominated loans in the total amount of loans taken out in the domestic market. Even though the total levels of deposits and loans do not have to have the same trend, there is a clear connection between the trends of loans and deposit euroization since they often share the same drivers. (Manjani, 2015; Ivanov et al., 2011)

3.2.3. Interest rate differentials

Interest rate differentials refer to the differences in nominal interest rates between two countries (currencies). They have a crucial role in determining capital flows and the efficiency of financial markets. Interest rate differentials and exchange rate movements are closely related and interdependent. The interest rates in relation to the interest rate parity puzzle pertain to interest rates on deposits and/or short-term government bonds (Ilut, 2010). The main assumption of interest rate parity is about the yield from deposits and short-term debt instruments and whether it is possible to profit from the disparities between currencies. Hence, the interest rate differential was calculated by subtracting the ECB's monthly interest rate on deposits from the interest rate on domestic currency deposits.

3.2.4. Inflation

Inflation plays a critical role in the EU's monetary and financial policy. Central banks closely monitor inflation levels and aim to maintain price stability. The most used measure of inflation is the Consumer Price Index (CPI), which tracks the changes in the prices of a basket of goods and services consumed by households. In accordance with the literature, inflation was taken as an explanatory variable (Sarno & Taylor, 2002; Jochem & Herrmann, 2003; Su et al., 2014). Data on inflation was collected from the national central Banks. For the purposes of co-integration analysis, which underlines long-term relationships, the base value for every monthly inflation observation was the inflation rate in the corresponding month of the previous year. This approach helps identify patterns and/or trends in inflation and how they relate to interest rate parity deviation.

3.3. Model specification

The data will be analyzed for co-integration and causality by a procedure including a unit root and stationarity testing, autoregressive distributed lag (ARDL), co-integration testing (both short-term and long-term) and testing the short-run and long-run Granger causal relationships between the variables (Ganić, 2023).

The Phillips-Perron (PP) test and the Augmented Dickey-Fuller (ADF) test are the chosen first-generation tests. Stationarity may be indicated if the unit root's null hypothesis is proven false (Dickey & Fuller, 1981).

The standard regression equation applied for the ADF test to determine if the variable has a unit root goes as follows:

$$\Delta y_t = \beta_1 + \beta_2 t + \delta y_{t-1} + \sum_{i=1}^{m} \alpha_i \, \Delta y_{t-1} + \varepsilon_t \quad (1)$$

Where Δy_t is the first difference of y_t, our considered variable, β_1, β_2, δ, and α_i are the regression coefficients and ε_t is the error term.

Furthermore, the regression for the PP unit root test follows the equation:

$$y_t = \mu + \alpha y_{t-1} + \varepsilon_t \quad (2)$$

Where y_t is the considered (dependent) variable, μ and α are the conventional least square coefficients, and ε_t is the error term (Phillips & Perron, 1988).

The selected second-generation unit root tests are the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) and the Elliott-Rothenberg-Stock (ERS) tests. If the null hypothesis of stationarity is rejected, it implies non-stationarity due to the presence of a deterministic trend (Kwiatkowski et al., 1992; Elliott et al., 1996).

The deterministic trend, the random walk process, and the stationarity error term make up the three components of the KPSS stationarity test model. Thus, the equation is as follows:

$$y_t = \xi t + r_t + \varepsilon_t$$

$$r_t = r_{t-1} + u_t \tag{3}$$

Where y_t represents the observations of the variable of interest, t denotes the deterministic trend, and ε_t the error term. r_t denotes the random walk process and is defined by its own equation. The error term of the first equation is assumed to be stationary. u_t denotes the error term of the second equation, assumed to be equal to zero and to have constant variation (Syczewska, 2010).

Finally, the ERS test for unit root is conducted based on the following regression equation:

$$\Delta y_t^d = a_0 y_{t-1}^d + a_1 \Delta y_{t-1}^d + \cdots + a_p y_{t-p}^d + \varepsilon_t \tag{4}$$

Here, y_t^d is the generalized least square-detrended version of y_t. Under the null hypothesis of the test, $a_0=0$, p is the number of lags of the dependent variable, and ε_t the error term (Otero & Baum, 2017).

As the test results may vary due to the nature of different variables, we performed the first differentiation of each set of variables, effectively providing additional forms for all of the five variables selected for analysis. The primary goal is to achieve a stationarity of variables (Tjøstheim et al., 2022).

Following confirmed unit roots and non-stationarity of the data, the ARDL model will estimate the short-term and long-term relationship between dIRP, FCD, FCL, interest rate differentials and inflation. Hence, the long-run relationship will be based on the following equations:

$$\begin{aligned}\Delta IRP_t = {} & \lambda_1 + \lambda_T T + \lambda_{IRP} IRP_{t-1} + \lambda_{FCD} FCD_{t-1} + \lambda_{FCL} FCL_{t-1} + \lambda_{IRATE} IRATE_{t-1} + \lambda_{INFL} INFL_{t-1} \\ & + \sum_{i=1}^{p} \lambda_i \Delta IRP_{t-i} + \sum_{j=0}^{q} \lambda_{FCD} \Delta FCD_{t-j} + \sum_{k=0}^{r} \lambda_{FCL} \Delta FCL_{t-k} + \sum_{l=0}^{s} \lambda_{IRATE} \Delta IRATE_{t-l} \\ & + \sum_{m=0}^{q} \lambda_{INFL} \Delta INFL_{t-m} + \varepsilon_{1t}\end{aligned} \tag{5}$$

$$\begin{aligned}\Delta FCD_t = {} & \alpha_1 + \alpha_T T + \alpha_{IRP} IRP_{t-1} + \alpha_{FCD} FCD_{t-1} + \alpha_{FCL} FCL_{t-1} + \alpha_{IRATE} IRATE_{t-1} + \alpha_{INFL} INFL_{t-1} \\ & + \sum_{i=1}^{p} \alpha_i \Delta IRP_{t-i} + \sum_{j=0}^{q} \alpha_{FCD} \Delta FCD_{t-j} + \sum_{k=0}^{r} \alpha_{FCL} \Delta FCL_{t-k} + \sum_{l=0}^{s} \alpha_{IRATE} \Delta IRATE_{t-l} \\ & + \sum_{m=0}^{q} \alpha_{INFL} \Delta INFL_{t-m} + \varepsilon_{2t}\end{aligned} \tag{6}$$

$$\Delta FCL_t = \gamma_1 + \gamma_T T + \gamma_{IRP} IRP_{t-1} + \gamma_{FCD} FCD_{t-1} + \gamma_{FCL} FCL_{t-1} + \gamma_{lnIRATE} LnIRATE_{t-1} + \gamma_{INFL} INFL_{t-1} + \sum_{i=1}^{p} \gamma_i \Delta IRP_{t-i} + \sum_{j=0}^{q} \gamma_{FCD} \Delta FCD_{t-j} + \sum_{k=0}^{r} \gamma_{FCL} \Delta FCL_{t-k} + \sum_{l=0}^{s} \gamma_{IRATE} \Delta IRATE_{t-l} + \sum_{m=0}^{q} \gamma_{INFL} \Delta INFL_{t-m} + \varepsilon_{3t} \quad (7)$$

$$\Delta IRATE_t = \mu_1 + \mu_T T + \mu_{IRP} IRP_{t-1} + \mu_{FCD} FCD_{t-1} + \mu_{FCL} FCL_{t-1} + \mu_{IRATE} IRATE_{t-1} + \mu_{INFL} INFL_{t-1} + \sum_{i=1}^{p} \mu_i \Delta IRP_{t-i} + \sum_{j=0}^{q} \mu_{FCD} \Delta FCD_{t-j} + \sum_{k=0}^{r} \mu_{FCL} \Delta FCL_{t-k} + \sum_{l=0}^{s} \mu_{IRATE} \Delta IRATE_{t-l} + \sum_{m=0}^{q} \mu_{INFL} \Delta INFL_{t-m} + \varepsilon_{4t} \quad (8)$$

$$\Delta INFL_t = \varphi_1 + \varphi_T T + \varphi_{IRP} IRP_{t-1} + \varphi_{FCD} FCD_{t-1} + \varphi_{FCL} FCL_{t-1} + \varphi_{IRATE} IRATE_{t-1} + \varphi_{INFL} INFL_{t-1} + \sum_{i=1}^{p} \varphi_i \Delta IRP_{t-i} + \sum_{j=0}^{q} \varphi_{FCD} \Delta FCD_{t-j} + \sum_{k=0}^{r} \varphi_{FCL} \Delta FCL_{t-k} + \sum_{l=0}^{s} \varphi_{IRATE} \Delta IRATE_{t-l} + \sum_{m=0}^{q} \varphi_{INFL} \Delta INFL_{t-m} + \varepsilon_{5t} \quad (9)$$

Where variables with Δ in front represent the differenced values $\lambda, \alpha, \gamma, \mu$, and φ are the regressors and estimated parameters of the model. q, p, r, and s are the optimal lags of the dependent variable, and ε_{it} represents the error term for the time period t.

If the long-run test proving co-integration is successful, we will also estimate the short-run relationship's coefficients to ascertain the short-run effects. The equations for the short-run estimations can be presented as follows:

$$IRP_t = \lambda_1 + \sum_{i=1}^{p} \lambda_{11} IRP_{t-1} + \sum_{j=0}^{q} \lambda_{22} FCD_{t-j} + \sum_{k=0}^{r} \lambda_{33} FCL_{t-k} + \sum_{l=0}^{s} \lambda_{44} IRATE_{t-l} + \sum_{m=0}^{q} \lambda_{55} INFL_{t-m} + \varepsilon_{1t} \quad (10)$$

$$FCD_t = \alpha_1 + \sum_{i=1}^{p} \alpha_{11} IRP_{t-1} + \sum_{j=0}^{q} \alpha_{22} FCD_{t-j} + \sum_{k=0}^{r} \alpha_{33} FCL_{t-k} + \sum_{l=0}^{s} \alpha_{44} IRATE_{t-l} + \sum_{m=0}^{q} \alpha_{55} INFL_{t-m} + \varepsilon_{2t} \quad (11)$$

$$FCL_t = \gamma_1 + \sum_{i=1}^{p} \gamma_{11} IRP_{t-1} + \sum_{j=0}^{q} \gamma_{22} FCD_{t-j} + \sum_{k=0}^{r} \gamma_{33} FCL_{t-k} + \sum_{l=0}^{s} \gamma_{44} IRATE_{t-l} + \sum_{m=0}^{q} \gamma_{55} INFL_{t-m} + \varepsilon_{3t} \quad (12)$$

$$IRATE_t = \mu_1 + \sum_{i=1}^{p} \mu_{11} IRP_{t-1} + \sum_{j=0}^{q} \mu_{22} FCD_{t-j} + \sum_{k=0}^{r} \mu_{33} FCL_{t-k} + \sum_{l=0}^{s} \mu_{44} IRATE_{t-l} + \sum_{m=0}^{q} \mu_{55} INFL_{t-m} + \varepsilon_{4t} \quad (13)$$

$$INFL_t = \varphi_1 + \sum_{i=1}^{p} \varphi_{11} IRP_{t-1} + \sum_{j=0}^{q} \varphi_{22} FCD_{t-j} + \sum_{k=0}^{r} \varphi_{33} FCL_{t-k} + \sum_{l=0}^{s} \varphi_{44} IRATE_{t-l} + \sum_{m=0}^{q} \varphi_{55} INFL_{t-m} + \varepsilon_{5t} \quad (14)$$

Where IRP_t, FCD_t, FCL_t, $IRATE_t$, and $INLF_t$ represent the dependent variable, $\lambda, \alpha, \gamma, \mu$, and φ represent the short-run coefficients, and ε_{it} represents the error term (Francis, 2011; Pesaran & Shin, 2012.

The F-bound test is performed for each country and includes all the variables (regressors) to see whether the computed F-statistic falls within the asymptotic critical values. If the F-statistic is outside the bounds, then co-integration exists among the variables (Pesaran et al., 2001).

Furthermore, a series of further diagnostic tests were conducted to ensure the estimated model's robustness.

Firstly, the Breusch–Godfrey serial correlation lag range multiplier test ("LM test") is employed to examine the existence of autocorrelation (Godfrey, 1978).

Secondly, the White test examines the presence of heteroskedasticity in the model, that is, whether the variance of the error terms is affected by the values of the independent variables (White, 1980).

Finally, the Ramsey RESET test (Ramsey Regression Equation Specification Error Test) exists. This test confirms that the model is appropriately specified and that no additional variables are required (Ramsey, 1969).

Finally, to test for a causal link between our variables, we use the two-step procedure as defined by Engle and Granger (1987). The Granger causality test assesses whether a one-time series variable can predict another variable's behaviour. It can be applied to data sets of two or more time series variables with enough observations and a theoretically plausible causal relationship. This test will be applied to determine the short-run and long-run causality among dIRP, FCD, FCL, Interest rate differentials and inflation.

4. Empirical results

4.1. Unit root and stationarity tests

Table 1 displays the results of the first and second-generation unit root and stationarity tests on the data for all the selected countries.

Table 1. 1st and 2nd generation unit root tests

COUNTRY	POLAND	HUNGARY	CZECH REPUBLIC	ROMANIA	CROATIA
ADF					
dIRP	-9.065044***	-9.065044***	-9.882604***	-9.065044***	-9.065044***
D(dIRP)	-13.01365***	-13.01365***	-13.12104***	-13.01365***	-13.01365***
FCD	-2.001969	-1.395603	-0.659938	-1.690431	-0.562113
D(FCD)	-13.62237***	-18.38217***	-19.85216***	-14.68266***	-16.37538***
FCL	-1.117983	-0.467424	-2.997834**	-2.009249	-0.134369
D(FCL)	-6.518740***	-13.62331***	-21.14515***	-19.54583***	-14.21896***
INFL	-2.298596	-2.165061	-2.253905	-3.655997***	-2.486395
D(INFL)	-10.08052***	-11.01006***	-7.196978***	-6.085604***	-12.38105***
IRATE	-3.551683***	-3.551683***	-1.532259	-3.551683***	-3.551683***
D(IRATE)	-4.857831***	-4.857831***	-5.155102***	-4.857831***	-4.857831***

COUNTRY	POLAND	HUNGARY	CZECH REPUBLIC	ROMANIA	CROATIA
PP.					
dIRP	-9.146536***	-9.146536***	-9.860427***	-9.146536***	-9.146536***
D(dIRP)	-30.26256***	-30.26256***	-35.26274***	-30.26256***	-30.26256***
FCD	-2.013487	-1.822090	-0.900539	-1.697581	-0.535250
D(FCD)	-13.58904***	-18.38217***	-20.07549***	-14.68312***	-16.29649***
FCL	-1.493238	-0.586309	-3.879587***	-2.141556	-0.172895
D(FCL)	-15.23932***	-13.66496***	-21.40819***	-22.88188***	-14.21708***
INFL	-2.214326	-2.270877	-2.958646**	-5.041877***	-2.467365
D(INFL)	-10.09931***	-11.05810***	-12.06649***	-11.14639***	-12.38465***
IRATE	-4.315297***	-4.315297***	-1.218532	-4.315297***	-4.315297***
D(IRATE)	-11.90487***	-11.90487***	-7.792329***	-11.90487***	-11.90487***
KPSS					
dIRP	0.108588***	0.108588***	0.056659***	0.108588***	0.108588***
D(dIRP)	0.050892***	0.050892***	0.027057***	0.050892***	0.050892***
FCD	1.170032	0.445233*	1.027532	1.631801	1.527644
D(FCD)	0.167020***	0.130121***	0.338217***	0.025101***	0.091737***
FCL	0.401901*	0.568531**	0.122638***	1.183172	0.854399
D(FCL)	0.179860***	0.649239**	0.154820***	0.080725***	0.234813***
INFL	0.346829***	0.950061	0.144516***	1.382151	0.740494
D(INFL)	0.094942***	0.067548***	0.047325***	0.711248**	0.036993***
IRATE	0.241438***	0.241438***	1.161900	0.241438***	0.241438***
D(IRATE)	0.309667***	0.309667***	0.068896***	0.309667***	0.309667***
ERS					
dIRP	1.071733***	1.071733***	0.267969***	1.071733***	1.071733***
D(dIRP)	0.025486***	0.025486***	0.014633***	0.025486***	0.025486***
FCD	-0.382320	5.841576	14.44274	8.811922	71.43566
D(FCD)	0.245417***	0.247601***	0.321186***	0.275916***	0.567002***
FCL	6.824012	29.67321	27.43661	7.486934	21.32857
D(FCL)	0.617122***	0.274966***	1.321594***	0.935830***	0.242424***
INFL	3.607638*	6.645053	4.625583	425.6131	3.284365*
D(INFL)	0.409116***	0.482247***	3.628123*	3.297128*	0.564687***
IRATE	32.10304	32.10304	13.64604	32.10304	32.10304
D(IRATE)	29.41482	29.41482	0.456798***	29.41482	29.41482

Source: (Authors' calculation, 2023); * Significant at 10%; ** Significant at 5%; *** Significant at 1%

The ADF and PP tests unveil the non-stationarity of dIRP and interest rates across all countries, while the euroization variables (FCD, FCL) demonstrate non-stationarity after differencing. Notably, FCD and FCL exhibit relatively mild trend-stationarity, particularly noticeable in Hungary (at 10% significance) and Poland. Additionally, Romania's volatile variable parameters during the early 2000s contributed to non-stationarity. In contrast, Croatia's high and persistent euroization trends result in a unit root for the level data, except for FCD, FCL, and inflation. Despite some variations, the data generally points towards trend-stationarity across the examined countries, underlining the interconnectedness and stability within the Euro area. The second-generation KPSS and ERS tests complement the ADF and PP results, confirming the trend-stationarity of interest rates. However, they do not provide enough evidence to reject the null hypothesis in favour of the stationarity hypothesis, especially for the Czech Republic and Romania data. The results for Romania display an outlier in inflation, indicating significant unit root presence only at the 10% confidence level, possibly due to extreme observations. Additionally, the ERS test highlights the significant mean-stationarity of FCD and FCL variables, while Croatia's inflation is comparatively more mean-stationary than other countries.

4.2. ARDL co-integration and robustness tests

The critical values for the F-stat. bounds test depends on k, that is, the number of independent variables (non-deterministic regressors) in question. For our research, k=4 (FCD, FCL, IRATE and INFL). Hence, the critical values are selected from the asymptotic critical value bounds table for F-statistics. The assumed case of the regression model for which the F-statistic is calculated is the so-called Case II. Case II assumes a restricted intercept and that the model includes the trend component (Pesaran et al., 2001).

Table 2 shows the critical values, i.e., bounds, which will be used to assess the F-statistic of the data for each of our countries.

The interpretation of the calculated F-statistics for the respective countries will be based on the previously stated hypothesis: if the F-stat. value is smaller than the critical values, so we do not reject the null hypothesis that there is no long-term relationship between the level values of the variables. If the F-stat. value on the other hand, is outside of the bounds, then we reject the null hypothesis, indicating that there is indeed a long-term levels relationship.

The outcomes of the F-bound test (the F-statistic) and the subsequent robustness tests are displayed in Table 3:Breusch-Godfrey (LM test), the White test for Heteroskedasticity, and the Ramsey. Next to the calculated chi-square values of the LM test and, the White test, and the F-value of the Ramsey test are their respective p-values (probabilities) in the brackets. The p-values are interpreted based on the critical values for significance at 10%, 5% and 1%, respectively (0.1, 0.05, 0.01) (Ganić, 2023).

Table 2. ARDL bounds test critical values (k=4, F-statistic)

	0.100		**0.050**		**0.025**		**0.010**	
k	***I*** (0)	***I*** (1)	***I*** (0)	***I*** (1)	***I*** (0)	***I*** (1)	***I*** (0)	***I*** (1)
4	2.20	3.09	2.56	3.49	2.88	3.87	3.29	4.37

Source: Pesaran et al. (2001)

Table 3. ARDL co-integration and robustness tests

Country	F-bounds test	Selected model	Conclusion	LM test	Heteroskedasticity test X^2 White	X^2 Ramsey
Poland	27.27***	ARDL (1,1,1,0,0)	Co-integration	0.313 (0.5758)	39.32 (0.3361)	2.24 (0.1033)
Hungary	16.75***	ARDL (1,0,0,0,0)	Co-integration	0.659 (0.4170)	15.27 (0.4993)	1.46 (0.2271)
The Czech Republic	23.21***	ARDL (1,0,0,1,0)	Co-integration	0.550 (0.4584)	36.69 (0.3190)	1.97 (0.1491)
Romania	17.099***	ARDL (1,0,0,0,0)	Co-integration	2.409 (0.1206)	40.34 (0.3901)	1.70 (0.1691)
Croatia	17.45***	ARDL (1,1,0,0,0)	Co-integration	0.027 (0.8687)	25.86 (0.2070)	1.23 (0.3001)

Source: (Authors' calculation, 2023); * Significant at 10%; ** Significant at 5%; *** Significant at 1%

The F-bound test results for all the countries indicate a strong long-term connection between dIRP and the explanatory variables FCD, FCL, interest rate differentials, and inflation, suggesting a coherent and synchronized movement among these variables.

Furthermore, the results of all three robustness tests confirm the absence of autocorrelation, heteroskedasticity, and omitted variable bias for all countries, lending further support to the robustness of the conclusions drawn. While the data for Romania demonstrates slightly weaker outcomes compared to the other countries, potentially due to the presence of more volatile trends during certain periods, the overall test results reinforce the stability and interconnectedness of the analyzed variables throughout the specified time frames.

Moreover, Table 4 presents the estimated short-run and long-run coefficients for our selected ARDL models. We applied the Akaike information criterion (AIC) for the appropriate lag order of the model (Akaike, 1973).

The findings from the estimated coefficients for Poland indicate a substantial influence of interest rate differentials on the changes in dIRP, both in the short and long term, with a marked negative impact at the 1% significance level. Foreign currency loans (FCL) exhibit a notable positive effect on dIRP, while foreign currency deposits (FCD) demonstrate a significant negative impact in the short term but a relatively minor positive impact in the long term. Conversely, inflation displays a small and adverse impact on dIRP, consistent in both the short and long run. For Hungary, the results highlight a higher equilibrium value for dIRP, as suggested by the positive intercept C. Despite the negligible impact of most variables on dIRP, inflation demonstrates a statistically significant effect in the short run, while interest rate differentials have a significant impact in the long run.

In contrast to Poland, the impact of euroization parameters is statistically insignificant for Hungary. Similarly, foreign currency loans positively impact the Czech Republic and Romania, while foreign currency-denominated loans negatively affect dIRP, although less pronounced. The interest rate differential remains the dominant factor, exerting a significant and consistent negative

Table 4. ARDL model long-run and short-run estimates

Variable	POLAND	HUNGARY	CZECH REPUBLIC	ROMANIA	CROATIA
Short-run coefficients					
D(FCD)	-0.585232**	-0.025939	0.190514***	0.001504	0.559101***
D(FCL)	1.448428***	0.009194	-0.052065	-0.008318	-0.017411
D(INFL)	-0.082127	-0.058819***	-0.210005**	0.051554	0.035162
D(IRATE)	-0.549418***	-0.554408	-4.615977***	-0.601633***	-0.528362***
C	-1.109401	0.448035	-2.890001	-0.150015	-0.071994
Long-run coefficients					
FCD	0.010110	-0.040584	0.248242***	0.002359	0.035744
FCL	0.069762	0.014385	-0.067841	-0.013049	-0.027701
INFL	-0.120195	-0.092028	-0.273638**	0.080884	0.055945
IRATE	-0.804090***	-0.867427***	0.830855***	-0.943906***	-0.840655***
C	-1.623642	0.700995	-3.765698	-0.235360	-0.114546

Source: (Authors' calculation, 2023); * Significant at 10%; ** Significant at 5%; *** Significant at 1%

impact on dIRP across both the short and long term. Croatia, exhibiting a unique trend, signifies the considerable impact of foreign currency deposits in the short term, potentially owing to its higher FCD levels compared to other countries, while other variables follow similar trends as observed in the previous countries.

4.3. Granger causality tests

Table 5 shows the results of the pairwise Granger Causality test for the countries. Table 5 displays the respective short-run and long-run causality estimations, setting each variable against all the others.

Table 5. Granger causality test

Variable	POLAND	HUNGARY	CZECH REPUBLIC	ROMANIA	CROATIA
Short-run Granger causality					
Δ(IRP) **?**Δ(FCD)	0.607678	1.202006	9.475461***	0.094306	2.061836
Δ(IRP) **?**Δ(FCL)	9.371180***	7.766308*	0.924893	1.916230	4.547516
Δ(IRP) **?**Δ(INFL)	4.542641	2.785873	8.036634**	5.015759*	2.606124
Δ(IRP) **?**Δ(IRATE)	28.89668***	24.25347***	14.71510***	21.02772***	18.51959***
Δ(FCD) **?**Δ(IRP)	3.770803	1.609761	0.345826	2.712774	1.106428
Δ(FCD) **?**Δ(FCL)	1.461625	10.11992***	0.766546	2.191400	5.908215*
Δ(FCD) **?**Δ(INFL)	1.544248	7.182366**	0.989808	2.869796	5.403259*
Δ(FCD) **?**Δ(IRATE)	6.157423**	0.796743	2.800789	0.653885	2.046714
Δ(FCL) **?**Δ(IRP)	2.806927	5.294251*	0.103677	5.459142*	1.435298

Variable	POLAND	HUNGARY	CZECH REPUBLIC	ROMANIA	CROATIA
Δ(FCL) **?**Δ(FCD)	0.001825	1.955871	9.218645***	0.502190	3.192474
Δ(FCL) **?**Δ(INFL)	3.236678	16.66204***	3.185871	10.88595***	1.709731
Δ(FCL) **?**Δ(IRATE)	1.126053	0.559488	6.485229**	2.797984	2.262321
Δ(INFL) **?**Δ(IRP)	1.135792	1.092113	4.908914*	3.957162	1.849402
Δ(INFL) **?**Δ(FCD)	0.380900	2.741888	1.157967	1.285666	3.008722
Δ(INFL) **?**Δ(FCL)	0.305297	0.331020	3.306513	0.748340	0.866383
Δ(INFL) **?**Δ(IRATE)	2.182811	0.662352	9.432515***	3.242472	3.772365
Δ(IRATE) **?**Δ(IRP)	4.448533	2.129824	7.870656**	3.545624	3.288573
Δ(IRATE) **?**Δ(FCD)	2.676954	2.345483	3.406454	0.283528	3.452410
Δ(IRATE) **?**Δ(FCL)	0.160774	1.032160	0.629465	5.654701*	5.142309*
Δ(IRATE) **?**Δ(INFL)	4.525218	2.179047	2.767074	1.226809	1.228000
Long-run Granger causality					
FCD does not Granger Cause IRP	0.67220	0.51471	0.32933	0.06777	0.99068
IRP does not Granger Cause FCD	0.19472	1.24457	0.34618	1.22177	0.75130
FCL does not Granger Cause IRP	5.08046***	2.83428*	0.25660	1.96948	2.45424*
IRP does not Granger Cause FCL	2.02155	2.62964*	0.31281	3.55659**	1.25708
INFL does not Granger Cause IRP	1.24079	0.70302	4.83553***	0.28449	1.73953
IRP does not Granger Cause INFL	2.44911*	0.58768	5.65745***	1.67704	1.29336
IRATE does not Granger Cause IRP	11.0847***	11.0847***	3.43946**	11.0847***	11.0847***
IRP does not Granger Cause IRATE	1.92928	1.92928	3.12515**	1.92928	1.92928
FCL does not Granger Cause FCD	0.09989	3.75290**	0.35629	2.60403*	3.94317**
FCD does not Granger Cause FCL	0.26843	2.95507**	1.75884	0.51558	3.01101*
INFL does not Granger Cause FCD	1.06136	1.62993	1.92784	3.14237**	1.90001
FCD does not Granger Cause INFL	0.34544	1.81020	1.50038	0.38193	2.60947*
IRATE does not Granger Cause FCD	2.20020	1.17469	0.65129	0.76248	1.30460
FCD does not Granger Cause IRATE	1.53621	1.27666	0.15070	0.96968	0.89283
INFL does not Granger Cause FCL	1.23672	9.12227***	0.07971	6.63828***	1.74470
FCL does not Granger Cause INFL	0.26682	0.26788	0.19768	0.13357	0.05355
IRATE does not Granger Cause FCL	1.43502	0.86043	0.21613	2.69240*	0.82654
FCL does not Granger Cause IRATE	1.18517	0.84332	1.23681	3.93113**	2.51889*
IRATE does not Granger Cause INFL	2.78937*	0.43357	1.57396	1.13382	2.62680*
INFL does not Granger Cause IRATE	1.90983	1.70088	4.84275***	0.46365	0.31168

Source: (Authors' calculation, 2023); * Significant at 10%; ** Significant at 5%; *** Significant at 1%

The findings reveal unidirectional causality from interest rate differentials to dIRP for all countries and from FCL to dIRP for Poland, Hungary, and Croatia in the long run. Furthermore, interest rate differentials and dIRP unidirectionally Granger cause inflation in the long term, with significance at 10%. Peculiarly, in the short run, the results show that it is, in fact, dIRP which Granger causes interest rate differentials, at 1% level significance. Additionally, FCD is shown to Granger cause interest rate differentials in the short run. These results mirror the estimated short-term and long-term coefficients, highlighting the substantial impact of euroization factors, particularly FCL in both the short and long term and FCD in the short term. The evidence emphasizes FCL and interest rate differentials as key determinants in the analysis of IRP. For Poland, there is an absence of bidirectional causal relationships among the variables in the short or long term. In the case of Hungary, the causal links evident in the results correspond to the literature regarding the relationship between interest rate differentials and IRP, as well as between interest rate differentials and the euroization parameters.

Conversely, the bidirectional causal links indicate a strong interdependence among the variables between the short and long term for the Czech Republic. The results for Romania showcase an intricate pattern, with bidirectional causal links occurring mostly in the long term, indicating the change of relationship of dIRP with the euroization measures. Finally, the findings for Croatia demonstrate a robust relationship between various indicators, emphasizing the interplay between FCD and FCL and the causal relationship between these variables and inflation and interest rate differentials, respectively.

5. Discussion

This study explored whether excessive Euroization leads to monetary instability and instability of financial markets, employing deviation from interest rate parity as a variable, which was proven to measure both monetary and financial stability. The study's first hypothesis was that excessive deposit euroization impacts greater deviation from interest rate parity. The results have shown that high deposit euroization impacts greater dIRP only in the Czech Republic. Some less significant impacts of FCD were also found in Poland and Croatia. The second hypothesis stated that excessive deposit euroization impacts greater dIRP. The analysis has proven that loan euroization causes dIRP for all countries except the Czech Republic. Increases in loan euroization were proven to impact greater dIRP.

Regarding the third hypothesis, the contribution of interest rate differentials to the explanatory power of the relationship between Euroization and dIRP was also confirmed. Interest rate differentials have had a negative impact on dIRP for all countries. On the other hand, inflation was proven to have a significant impact only in the Czech Republic. Hence, our results align with studies such as Borio et al. (2016) and Cerutii et al. (2021), which proved the decisive impact of foreign currency markets and interest rate differentials. The reasons for obtaining different results for the Czech Republic may lie in the fact that the Czech Republic is more integrated with the rest of the EU than other countries (Jochem & Herrmann, 2003).

Interestingly, foreign currency loans have proven to cause dIRP in the long run in Poland, Hungary and Croatia. However, it was also shown that, for Poland and Hungary, dIRP causes loan euroization in the short run. It is observed that higher dIRP causes loan euroization in the short run. However, in the long run, a rise in Euroization causes dIRP. In other words, interest rate disparity discourages the usage of the domestic currency and exacerbates Euroization. The Euroization, in turn, then increases the deviation from IRP, completing a vicious circle.

6. Conclusion

The study confirms that high Euroization and high deviations from interest parity are harmful to the economy. The analyzed CEE countries and their citizens are at a perpetual disadvantage against the euro area. Hence, in terms of policy, the analyzed countries should strive to reduce Euroization and the interest differentials between them and the eurozone. Measures of interest rate harmonization could be the best option for curbing interest rate disparities and discouraging Euroization (Schreiber & Woertz, 2008). Furthermore, policymakers should prefer long-run strategies since it has been proven multiple times that short-term measures curbing Euroization hardly see success (Borio et al., 2016; Manjani, 2015). Nonetheless, there is no guarantee that such measures will yield long-term results. In particular, the results indicate that the more integrated countries become with the eurozone, the harder it becomes to control the domestic currency. This leaves options such as a currency peg or currency board paving the way for absolute Euroization. The argument points towards CEE countries embracing the idea of joining the eurozone. In line with the arguments of Czaja and Dulkys (2012), given the proper integration of financial markets, the benefits of being part of the eurozone would outweigh the drawbacks.

Overall, this study has contributed to the elaboration of the interest rate parity puzzle and shows that tackling Euroization plays a significant role in achieving monetary and financial stability.

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