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DETERMINANTS OF FINANCIAL EUROISATION IN A SMALL OPEN ECONOMY: THE CASE OF SERBIA

ABSTRACT: *This paper examines the phenomenon of financial euroisation in Serbia, focusing on the liability side of the banking system. A time series model is estimated and evaluated using a monthly data sample from January 2007 to January 2016 for Serbia. The results of this paper show that the mean pattern of financial euroisation in Serbia is determined by the exchange rate, inflation, and the interest rate differential. Financial euroisation in Serbia is found to be volatile and to exhibit a clustering pattern. Of the estimated and tested models the ARCH (1) model is found to be best suited to explain the volatile behaviour pattern of financial euroisation in Serbia.*

KEY WORDS: *financial euroisation, ARCH, volatility, Serbia*

JEL CLASSIFICATION: C13, C58, F31, F32

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1. INTRODUCTION

In South Eastern European (SEE) countries the phenomenon known as 'dollarisation' is an extremely hot topic. We use the term 'euroisation' to denote the dollarisation of financial systems in countries where the reference currency is the euro. Euroisation is a domestic currency substitution process and may take a variety of forms: De Nicolo et al. (2003) provide an extensive overview. The focus of this paper is financial euroisation or, more specifically, euroisation in commercial banks, since the financial system in South Eastern European countries is bank-centric and this form of euroisation predominates in those countries. Though high at the regional level, euroisation is not uniform across Central Eastern and South Eastern European countries. First, there are countries in Emerging Europe in which FX and FX-indexed loans account for more than two-thirds of total private sector lending. Banking regulators often limit direct exposure to foreign currency risk in financial institutions by requiring them to balance their lending in foreign currency and foreign-currency-denominated liabilities. Thus, the key problem results from the liability side of the banking system, with the focus on deposits or the liability side of euroisation in the banking system. Of the South Eastern European countries (Bosnia and Herzegovina, Bulgaria, Romania, Croatia, Macedonia, Albania, Montenegro, Serbia), Ostojić and Mastilo (2013) find the highest euroisation deposits in Croatia and Serbia. Montenegro is excluded from the analysis, since deposit euroisation in Montenegro is complete. The euroisation phenomenon has been the topic of previous research papers, but the approach used in this paper is to examine the determinants of financial euroisation and its volatility pattern in Serbia with the aim of determining Serbia's deposit euroisation patterns.

The reminder of the paper is organized as follows. Section 2 briefly summarises existing literature on dollarisation. Section 3 presents the research data and methodology, while Section 4 presents the empirical results and discussion. The final section provides an overview of the main findings of the research.

2. DOLLARISATION LITERATURE OVERVIEW

The literature on euroisation argues that currency mismatch risk is the main source of fragility for the financial system in the presence of euroisation (Goldstein and Turner 1996; De Nicolo et al. 2005). Josifidis et al. (2011) emphasise exchange rate pass-through and financial euroisation as the two main motives for managing exchange rate fluctuations in Serbia. Ribnikar and Kosak

(2011) show that even after Serbia experienced very high levels of inflation and even hyperinflation, monetary policy did not target stabilisation of, first, the German mark, and then a fixed euro exchange rate. Chailloux et al. (2010) show that foreign capital inflow has triggered easy access to FX lending in Serbia. Tkalec (2013) points out that Croatia, Hungary, Romania, Serbia, and to some extent even Turkey have mostly relied on regulatory measures but have failed to significantly decrease deposit euroisation. Velickovski (2013) points out that euroisation limits the ability of the central bank, which is oriented towards price stability, to use the nominal exchange rate to achieve other goals (for example, output stabilization). Urošević and Rajković (2017) follow Ize and Levy Yeyati (2003) and focus on the long-run and short-run determinants of euroisation in Central, Eastern, and South-Eastern Europe. A well known fact is that domestic currency depreciation through real exchange rate undervaluation can boost economic growth and thus be a key variable in promoting economic activity, especially in developing countries (see, for example, Rodrik 2008). Euroisation establishes more-direct channels between exchange rate changes and price changes (Velickovski and Pugh 2011). Depreciations could threaten financial stability and inflation targets, the primary goal of central banks, due to the burden of servicing debts resulting from unofficial financial euroisation. Benazić and Tomić (2014) show that due to high levels of euroisation, exchange rate devaluation has a recessionary impact on the economy, similar to Fischer's "debt-deflation phenomenon" (Fisher 1933). Brown and Stix (2014) suggest that a stable monetary policy may not be sufficient to deal with the hysteresis of deposit euroisation across the region. In a small open economy such as Serbia's, credit and liability euroisation reduces the efficiency of the foreign exchange rate as a shock absorber, such that the positive effects of free floating are easily mitigated against (Devereux and Lane 2003). A combination of weak institutions and a lack of trust in banks influences household to save in cash (Stix 2013), while historical experiences of banking and currency crises also play a part. della Valleet et al. (2018) examine the case of Albania and recommend a commitment to low and stable inflation combined with exchange rate flexibility to encourage saving in the local currency. Saving in euros is a kind of insurance against purchasing power risk, but some households may rather search for higher yields and interest rates on savings in the local currency, and here the interest rate differential could play a role. Due to the high euroisation in commercial banks' balance sheets, the Serbian National Bank cannot support the Serbian economy by expansionary monetary policy, but as a consequence of the European Central Bank's monetary expansion, Serbia might experience adverse effects from inflation imported from the European Monetary Union.

Since contemporary literature points to euroisation as a hot topic in Serbia and neighbouring countries, the aim of this paper is to contribute to the literature by further examining the properties of financial euroisation in Serbia.

In this paper we examine the determinants of euroisation and its pattern of volatility in order to reveal its properties and reach a deeper understanding of the euroisation phenomenon and its drivers.

3. RESEARCH DATA AND METHODOLOGY

In this research we observe a monthly data sample from January 2007 to January 2016 for the observed variables. The financial euroisation level in month *t* (denoted DE_t) is measured as the portion of bank deposits in foreign currency or indexed to a foreign currency in total Serbian bank deposits. The data is from the National Bank of Serbia (NBS). The average monthly foreign exchange rate of RSD to EUR in month *t* (denoted as FX_t) is also from the NBS, while the monthly harmonised index of consumer prices in month *t* (denoted $INFLATION\_RATE_t$) is from the Statistical Office of the Republic of Serbia. The monthly three-month EURIBOR is from the European Central Bank (ECB) and the monthly key policy rate is from the NBS. As in most empirical finance literature, the variables to be modelled are return rates, which are the first difference of the logarithm of the average monthly exchange rate and financial euroisation. The inflation rate is already recorded as a monthly change so we take the logarithm of inflation only, with no further differences. Thus, in their mathematical form the variables take the following expressions:

$$FCD = log\left(\frac{DE_t}{DE_{t-1})}\right) \tag{1}$$

$$ERSD = log\left(\frac{FX_t}{FX_{t-1})}\right) \tag{2}$$

$$INF = log\left(INFLATION\_RATE_t\right) \tag{3}$$

$$IRD = log\left(\frac{IRS_t - IREMU_t}{IRS_{t-1} - IREMU_{t-1}}\right) \tag{4}$$

The descriptive statistics for the observed variables given by equations (1), (2), and (3) are provided in Table 1.

Table 1: Descriptive statistics for the observed variables

	INF	FCD	ERSD	IRD
Mean	4.610646	0.000808	0.003988	–0.000282
Median	4.610158	0.000129	0.002373	0.000192
Maximum	4.632785	0.044057	0.068704	0.217874
Minimum	4.594109	–0.080688	–0.032076	–0.119466
Std. Dev.	0.008031	0.014610	0.015845	0.054544
Skewness	0.440288	–0.869223	1.261256	1.005901
Kurtosis	2.934864	11.69242	7.136756	5.982092
Observations	109	109	109	109

Source: Authors

Table 1 gives the descriptive statistics for the observed variables and we can see that no deflation is recorded in Serbia. Furthermore, the monthly jump in the direction of RSD depreciation was higher in intensity then the monthly jump towards appreciation. Although there were some de-euroisation trends during the observed period, the degree of euroisation was higher. We now provide the methodological tool employed in this paper.

The first question in any time series analysis is whether or not the time series is stationary. Thus, we start the research with unit root tests, based on the assumption that time series data $\{Y_t\}$ follows a random walk:

$$Y_t = \rho Y_{t-1} + \varepsilon_t \tag{5}$$

where ρ is the characteristic root of an AR polynomial and ε_t is purely a random process with mean zero and variance σ^2. After testing the stationarity properties of the observed time series, we estimate the mean and variance equation of euroisation in Serbia. While checking diagnostics for the estimated mean equation we found heteroscedasticity in residuals or clustering volatility, and so directed our methodology choice towards ARCH-based models.

In order to resolve the problem of autocorrelation and heteroscedasticity in financial time series, Engle (1982) introduced the autoregressive conditional heteroscedasticity (ARCH) approach. Following Engle (1982), conditional variance can be modelled as a linear function of lagged squared residuals. The model of the ARCH(1) process is given by equation (6):

$$\sigma_t^2 = \omega + \alpha\varepsilon_{t-1}^2 \tag{6}$$

Bollerslev (1986) extended the basic ARCH model to a Generalized ARCH (GARCH) and described the conditional variance by its own lagged values and the square of the lagged values of innovations or shocks. The GARCH (1,1) conditional variance equation is given by equation (7):

$$\sigma_t^2 = \omega + \alpha\varepsilon_{t-1}^2 + \beta\sigma_{t-1}^2 \tag{7}$$

where ω is a constant term, the ARCH term ε_{t-1}^2 is given as the first leg of the squared residual from the mean equation and represents news about the volatility from the previous period, and the GARCH term σ_{t-1}^2 represents the last period's forecast variance. Research on financial markets often observes that a downward price movement in the market generates a different volatility response than an equivalent upward movement. This is called asymmetric news impact. Glosten et al.'s (1993), and Zakoian's (1994) Threshold ARCH (TARCH) specification is used to test for this asymmetric news impact. The TARCH specification for the conditional variance is given by equation (8)

$$\sigma_t^2 = \omega + \alpha\varepsilon_{t-1}^2 + \gamma\varepsilon_{t-1}^2 d_{t-1} + \beta\sigma_{t-1}^2 \tag{8}$$

The model is based on the assumption that unexpected changes in the exchange rate return, expressed in terms of ε_t, have different effects on the conditional variance of the exchange rate return. Thus, the basic GARCH model of equation (6) is extended to include a threshold term $\gamma \cdot \varepsilon_{t-1}^2 \cdot d_{t-1}$. In this model, $d_t = 1$ if $\varepsilon_t < 0$, and 0 otherwise. An upward spike means $\varepsilon_t < 0$ has an impact of α, and downward or negative news $\varepsilon_t > 0$ has an impact of α+γ. If γ >0, negative news increases volatility and a leverage effect is present. If γ≠0, the impact of news on the series returns is asymmetric. Bošnjak et al. (2016) provide a comprehensive overview of the ARCH-based model. After estimation of all the models presented in this section and following the information criterion, we chose the model that fitted best to explain financial euroisation volatility in Serbia.

4. RESEARCH RESULTS AND DISCUSSION

Any time series research starts with testing stationarity properties for the observed time series. Stationarity diagnostics are provided by unit root tests. To compensate for the low power of unit root tests and improve the validity of the results, this paper employs several different unit root tests: the Augmented Dickey Fuller (1979) (ADF) test, Phillips–Perron (1988) (PP) test, and Kwiatkowski et al. (1992) (KPSS) test. The ADF test and the PP test under null hypothesis consider the presence of a unit root, while the KPSS test assumes the alternative hypothesis of stationarity under the null hypothesis and the presence of a unit root. Thus, first standard unit root tests are performed. The results are provided in Table 2.

Table 2: Unit root test results for the observed series

Variable	Levels	
	Constant	Constant and trend
ADF test		
FCD	−14.55565 (0.0000)	−14.69814 (0.0000)
INF	−7.909936 (0.0000)	−8.532088 (0.0000)
ERSD	−7.183695 (0.0000)	−7.177670 (0.0000)
IRD	−5.383240 (0.0000)	−5.595300 (0.0000)
PP test		
FCD	−14.38359 (0.0000)	−14.67303 (0.0000)
INF	−8.021241 (0.0000)	−8.441061 (0.0000)
ERSD	−7.214673 (0.0000)	−7.210114 (0.0000)
IRD	−5.355910 (0.0000)	−5.553186 (0.0001)
KPSS test		
FCD	0.177446 (>0.10)	0.067449 (>0.10)
INF	0.568207 (<0.01)	0.067734 (<0.01)
ERSD	0.066345 (>0.10)	0.036377 (>0.10)
IRD	0.334227 (>0.10)	0.099714 (>0.10)

Source: Authors

In the results in Table 2 the t-statistic and p-value in brackets indicate the stationary series in its observed form. Since we find the log values of the observed variables to be stationary we estimate the regression given by Equation (9):

$$FCD_t = \beta_0 + \beta_1 \cdot ERSD_t + INF_t + IRD_t + \varepsilon_t \quad (9)$$

The estimates of financial euroisation determinants given by equation (9) are summarized in Table 3.

Table 3: Euroisation determinants – mean equation estimates

Variable	Coefficient	Std. Error	z-Statistic	p-value.
Constant	–0.223601	0.102275	–2.186278	0.0288
ERSD	0.242805	0.044572	5.447427	0.0000
INF	0.206419	0.001014	2.195743	0.0281
IRD	0.046355	0.017109	2.709320	0.0067

Source: Authors

The results in Table 3 show that the euroisation mean in Serbia is significantly determined by the EUR/RSD exchange rate, inflation, and an interest rate differential at the 5% significance level. The correlogram indicates no autocorrelation in residuals in the estimated models and the Jarque-Bera test does not reject the null hypothesis that assumes normality of residuals. Nonetheless, the ARCH test indicates heteroscedasticity of variance in the estimated model (the p-value is 0.0047). Since the ARCH effect is significant, further steps are directed towards estimating and diagnostics the ARCH-based model. Following the methodology presented in Section 3, several ARCH-based models are estimated, namely ARCH(1), GARCH(1,1) and TARCH(1,1) models. The estimated results are summarized in Table 4.

Table 4: Euroisation variance equation estimates

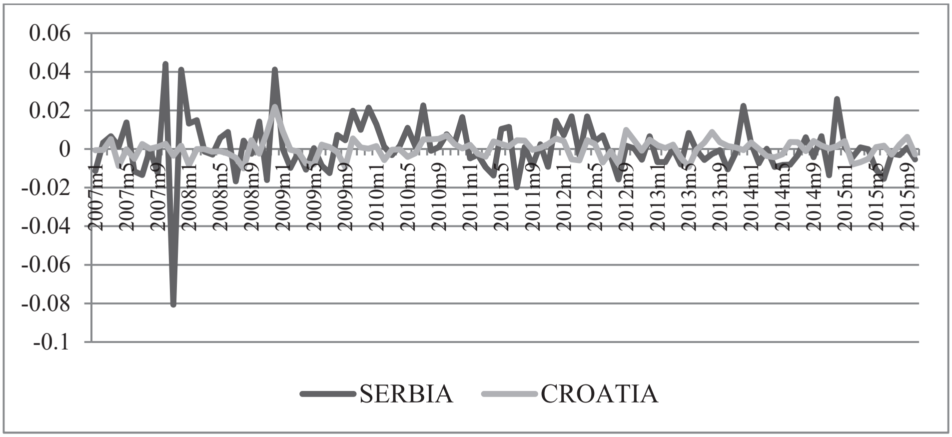
Parameter	ARCH (1)	GARCH (1,1)	TARCH (1,1)
ω	7.93E-05 (0.0000)	8.44E-05 (0.0003)	0.000116 (0.0000)
α	0.522007 (0.0003)	0.800049 (0.0011)	0.535710 (0.0002)
β	-	-0.157872 (0.0551)	-0.294694 (0.0073)
γ	-	-	-0.252362 (0.1922)
AIC	-6.067084	-6.106701	-6.114147
SIC	-5.918077	-5.932859	-5.915471
ARCH - LM Test	4.396641 (0.0384)	0.202874 (0.6533)	3.266664 (0.0736)

Source: Authors

According to the results in Table 4, the GARCH(1,1) specification is the best fitting model for financial euroisation in Serbia. There is no confirmation of a significant asymmetric impact on the pattern of volatility. Diagnostic checking using the Breusch-Godfrey Serial Correlation LM Test and the correlogram shows no serial correlation between residuals in any of the estimated ARCH-family models up to leg 36. One strand of literature points out that GARCH models remain the best models for capturing volatility in the exchange rate time series (Barunik et al. 2016; Bošnjak et al. 2016; Gupta and Kashyap 2016). Thus, the dynamic of euroisation in Serbia shows the property of exchange rate fluctuation.

Finally, we provide comparison with Croatia. Figure 1 compares financial euroisation in Serbia and Croatia in the same observation period.

Figure 1: Comparison of financial euroisation in Serbia and Croatia



Source: Croatian National Bank, National Bank of Serbia

A visual inspection of the data series in Figure 1 indicates higher financial euroisation volatility in Serbia than in Croatia. Furthermore, financial euroisation in Serbia exhibits clustering volatility consistent with the econometric model fitted in this paper. Mwase and Kumah's (2015) research on a sample of low-income countries shows that the size and variance of inflation and depreciation are important determinants of deposit dollarisation, and the research results in this paper are consistent with their findings. Considering the Croatian example where the exchange rate is more stable, Bošnjak et al. (2016) find that to de-euroise or resolve the problem of financial euroisation it is necessary to achieve overall macroeconomic stability and not just exchange rate stability. Finally, the results are consistent with those of Urošević and Rajković (2017) pointing out the importance of lowering the volatilities of eoroization determinants in Serbia.

5. CONCLUDING REMARKS

There are several conclusions that can be drawn from the research presented in this paper. Firstly, the phenomenon of financial euroisation is very prominent in the Serbian financial system.

Secondly, the main drivers of the dynamics of Serbian financial euroisation are exchange rate, inflation dynamics, and interest rate differential. Thirdly, financial euroisation in Serbia is volatile and exhibits volatile clustering properties. The GARCH (1,1) model outperforms other model specifications tested in this paper and is found to be the best fitted model to explain the pattern of financial euroisation volatility in Serbia. The phenomenon of the growth of euroisation in Serbia is very significant, which might be due to poor macroeconomic management and unstable economic conditions. Financial euroisation is often the result of nominal and real exchange rate changes as well as changes in inflation and the interest rate differential. Following the Croatian example, to de-euroise or resolve the problem of financial euroisation it is necessary to achieve not only exchange rate stability but also overall macroeconomic stability. In order to strengthen the credibility of the monetary authorities, to gain credibility for a monetary policy regime, and consequently to stabilize the euroization in Serbia, the first step needs to be stabilizing the monetary variables.

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