National Bank of the Republic of North Macedonia

2022

Households' euroization in the Republic of North Macedonia: Is it close to or far from the optimal levels?

Tanja Jakimova[1], Milan Eliskovski[2], Artina Bedzeti Baftijari[3]

Abstract

The paper deals with the challenges stemming from the phenomenon of unofficial euroization in the Republic of North Macedonia. It tries to identify the main drivers of the households' deposit euroization in the Republic of North Macedonia and contributes to the literature by providing an empirical measure of optimal level of euroization. With focus on the household deposits, it is an additional attempt to empirically estimate the optimal level of euroization in the Republic of North Macedonia, following an already published IMF study on this issue. Looking ahead, persistence in stability-oriented macroeconomic policies and measures for promotion of the use of local currency could further support the de-euroization trend in the Republic of North Macedonia.

Keywords: euroization, local currency, financial stability, monetary policy, prudential policy, Republic of North Macedonia

JEL classification: C32, E47, E58

[1] National Bank of the Republic of North Macedonia, Monetary Policy and Research Department, jakimovat@nbrm.mk.
[2] National Bank of the Republic of North Macedonia, Monetary Policy and Research Department, eliskovskim@nbrm.mk;
[3] National Bank of the Republic of North Macedonia, Monetary Policy and Research Department, bedzetia@nbrm.mk;
The views expressed in this paper are those of the authors and do not necessarily represent the views of the National Bank of the Republic of North Macedonia. The authors express gratitude to Ana Mitreska, Biljana Davidovska-Stojanova, Aneta Krstevska and one anonymous reviewer for their support and comments during the writing of this paper.

Table of Contents

1. Introduction

The euroization (or dollarization) refers to a variety of cases in which a domestic currency is, to a certain degree, substituted by a foreign currency. The literature makes a clear distinction between *de jure*, also referred to as full, unilateral or official and *de facto* euroization, also referred to as partial, financial or unofficial (Orszaghova, 2015).

The phenomenon of euroization is not a new one. It is present in many developing and emerging economies, in different forms and degrees. The reason why euroization matters is that it makes countries more sensitive to external shocks, harms investment, profitability and economic activity, in general. Additionally, euroization weakens monetary policy transmission mechanism and exposes the financial system to a number of risk factors. This is more pronounced in the case when capital inflows from abroad are used to support the credit activity in the domestic economy. Thus, understanding the drivers of euroization is a key for designing policies that either contain it or limit the harm it can do to the economy.

The main motivation for our analysis comes from the results of the IMF study done by Della Valle et al. (2018). Inspired by the IMF study, this paper is our attempt to empirically estimate the optimal levels of euroization in North Macedonia, based on different regressions, thus additionally contributing to the literature in this area. We adopt the household perspective and we use the share of household deposits in foreign currency in broad money (M4) as a measure for euroization. We employ a vector error correction model (VECM) on data which covers the period 2003q1-2018q4. By our analysis we try to answer two questions: first, why households hold foreign currency deposits in the Republic of North Macedonia and second, is there an empirical measure which can serve as indicator for the optimal level of euroization. Estimated indicator takes into consideration the structural characteristics of the Macedonian economy, as a small and open economy with a fixed exchange rate, high level of trade openness and relatively high capital mobility. Given the exchange rate peg, the foreign exchange market developments as well as the foreign reserves level and adequacy are the main focus of the policy makers. Considering that inflows from abroad were mainly exceeding the outflows to abroad, there is a positive financing gap and gradual foreign reserve increase on a cumulative basis. The National Bank is mainly buying on the foreign exchange market and accordingly injecting liquidity in the system, which is mostly withdrawn by issuing CB bills. With stable exchange rate and low and stable inflation for more than two decades, and supportive measures towards the use of the local currency, euroization in North Macedonia is registering a downward trend.

The remainder of the paper is organized as follows: Section 2 reviews the empirical literature on determinants of financial euroization, giving special attention to households' deposit euroization. The third section gives a brief overview of the trend in households' deposit euroization in the Republic of North Macedonia and its main drivers. The fourth section discusses the applied methodology, data and results of

the empirical analysis. The sections 5 and 6 are devoted to calculation of optimal (equilibrium) households' euroization level and forecasts. Section 7 concludes.

2. Literature review

Most of the literature on euroization has focused on aggregate (households and firms) deposit data and/or aggregate credit data (e.g. Nicolo, Honohan, and Ize, 2005, Levy-Yeyati, 2006, Stix, 2013). Moreover, relatively little empirical evidence is available in the context of households' euroization, despite its importance.

The first household-level analysis of deposit euroization was provided by Brown and Stix (2014). Based on survey data covering 16,375 households in ten countries from Eastern Europe in 2011 and 2012, they examine how households' preferences for and holding of foreign currency deposits are related to individual expectations about monetary conditions and network effects. They also examine to what extent monetary expectations, network effects and deposit euroization are the legacy of past financial crises or the outflow of current policies and institutions in the region. Their findings suggest that the households' preferences for Euro deposits are partly driven by their distrust in the stability of their domestic currency, which in turn is related to their assessment of current policies and institutions. However, their findings also suggest that a stable monetary policy may not be sufficient to deal with the hysteresis of deposit euroization across the region. First, they confirm that the holding of foreign currency deposits has become a "habit" in the region. Second, they find that deposit euroization is still strongly influenced by households' experiences of financial crises in the 1990s.

Factors that drive this phenomenon are crucial for understanding its persistence. Driving factors or determinants of euroization for EU candidate and potential candidate countries in the Western Balkans are analyzed by Windischbauer (2016). The author found that several driving factors of euroization can be identified for this region. Macroeconomic instabilities and memories of high and hyperinflation led to relatively low levels of trust in local currencies that are difficult to reverse. Furthermore, close trade and financial linkages with the euro area, the presence of euro area headquartered banks, as well as workers' remittances from the euro area tend to increase the use of the euro in the Western Balkan economies. Their status as prospective EU and, eventually, euro area member states is a further contributing factor to euroization. Hence, all countries are relatively highly euroized, with the highest levels observed in Serbia (Kosovo and Montenegro as officially euroized economies are not taken into account in the analysis). Overall, euroization rates in EU candidate and potential candidate countries in the Western Balkans have gone down in recent years, even though the progress is slow and uneven. To what extent specific measures have reinforced this trend is difficult to ascertain. However, the analysis confirms literature findings that

macroeconomic stability (in particular, but not only, disinflation) is key as it not only increases trust in local currencies, the monetary policy framework and the domestic financial system, but also enhances the credibility of domestic policymakers and institutions.

Why people continue to use foreign currencies even after their economies have stabilized, is the main question that Stix (2010) tried to answer, when analyzing factors that drive persistence of euroization. He uses survey data for Croatia, Slovenia and Slovakia to provide an answer. The results confirm the role of network effects and of remittances. Furthermore, the extent of currency substitution is found to be positively associated with the level of income and education. An important aspect of euroization seems to be age (the older ones are more likely to hold foreign currencies). In contrast, neither expectations about inflation rates, nor about exchange rates, do seem to affect the degree of euroization in a systematic and predictable way. Trust in the banking system is found to affect the choice between foreign currency cash and foreign currency deposits. Overall, the results support the view that the persistence in the use of foreign currencies is driven to a large extent by factors that are related to the past.

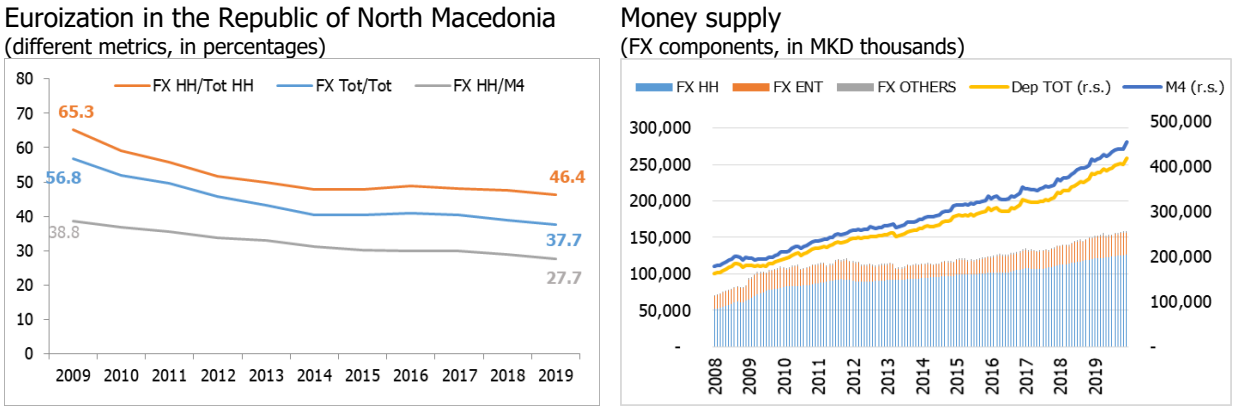
The first attempt to provide an empirical measure of the optimal level of euroization in the literature on euroization was provided by Della Valle et al. (2018). Based on a worldwide panel data analysis of 78 countries (including the Republic of North Macedonia) and covering the period 2000-2015, the authors estimate euroization benchmark (share of foreign currency deposits in broad money) for all countries, assuming that euroization would not deviate from its optimal level on average over time and across regions. The euroization benchmark indicates the level of euroization that an economy is expected to experience given its structural characteristics while controlling for its record of macroeconomic performances. The results of the study place North Macedonia in the category of countries for which euroization is close to the benchmark model-predicted value. The authors provide a conceptual framework to identify and analyze euroization drivers with a view to inform the appropriate policy response. The estimated benchmark reveals that the optimal level of euroization could be high in small economies with relatively high remittances flows, such as Albania. The authors conclude that euroization is mainly driven by macroeconomic factors. However, they argue that the different factors come into play with an importance that depends on the position of the economy in the euroization life cycle.

Geng et al. (2018) in their study make clear distinction between deposit-driven euroization and carry trade euroization, stating that they are fundamentally different phenomena with different root causes. They found that the root cause of deposit-driven euroization is the distrust in the local currency as savings vehicle. In CEE, deposit-driven euroization is (or has been) prevalent in countries that experienced hyperinflation during transition from socialism, notably former Yugoslavia, Bulgaria and to some degree the Baltics. Deposit-driven euroization is highly persistent; the only escape root in the past quarter century has been for countries to join the euro area.

3. Euroization in North Macedonia

The phenomenon of euroization in North Macedonia persists from the onset of the transition, in the early 1990s. Measured as a share of household deposits in foreign currency to total household deposits and/or share of deposits in foreign currency to total deposits, as usually communicated measures, deposit euroization amounted to 46.4% and 37.7%, respectively as of the end of 2019. According to the measure used in our study - share of household deposits in foreign currency to M4, euroization in North Macedonia, as of the end of 2019, is lower and amounted to 27.7%. All metrics show a decreasing trend in deposit euroization in the last decade, which besides macroeconomic stability, is also a result of many factors and measures employed, as well (including impact of the euro area crisis, higher return on denar deposits, differentiation in banks' reserve requirements ratio by currency)[4].

Figure 1 Deposit euroization in North Macedonia



Source: National Bank of the Republic of North Macedonia

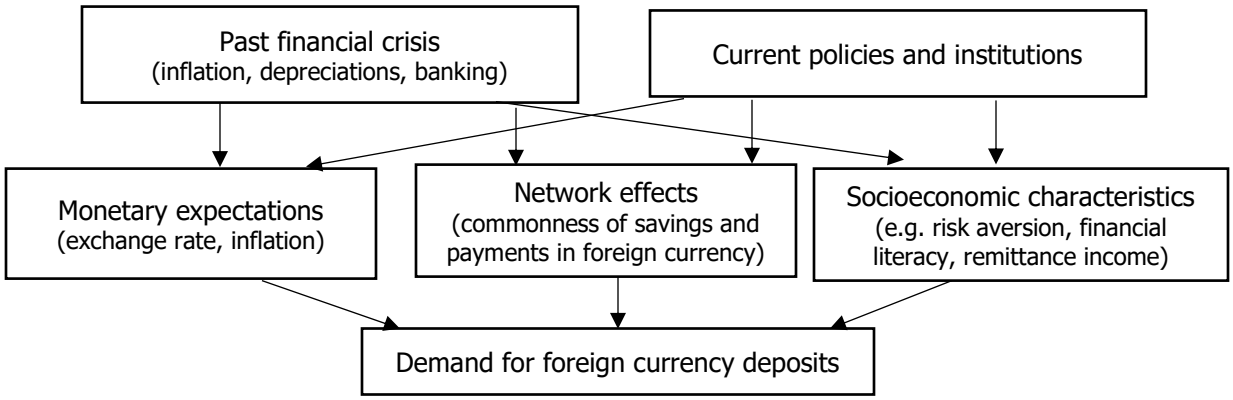
The households' euroization in North Macedonia is mostly related to memories from the past, from the early transition period, when the Macedonian economy faced hyperinflation and high exchange rate volatility, and also from the unfavorable experience with the "frozen" foreign currency savings from the previous system[5]. Furthermore, the external and domestic shocks of economic and non-economic nature, followed by an increase in uncertainty, have always been the trigger for change in currency preferences for household savings, although to a various degree. Additional factor for euroization, which is a kind of country - specific characteristic, is the relatively high inflows of private transfers from abroad, which over

[4] For more details of measures employed by policy makers in the past and planned activities in the period ahead, please see "Denarization Strategy" (https://www.nbrm.mk/strategii-pub.nspx).

[5] The term "frozen" currency deposits comes from the period of transition/disintegration from Yugoslavia, when banks were unable to service part of deposits (in foreign currency) thus they have remained "frozen" in their balance sheets. Since the early 1990s, as a result of a loss of confidence in the banking system, part of the savings of the general public were kept "under the mattress". *Source: Banking reforms in South East Europe (2002), edited by Zeljko Sevic.*

the years have a generally growing trend. All these factors are part of the empirical framework for root causes of euroization set by Brown and Stix (2014), illustrated below.

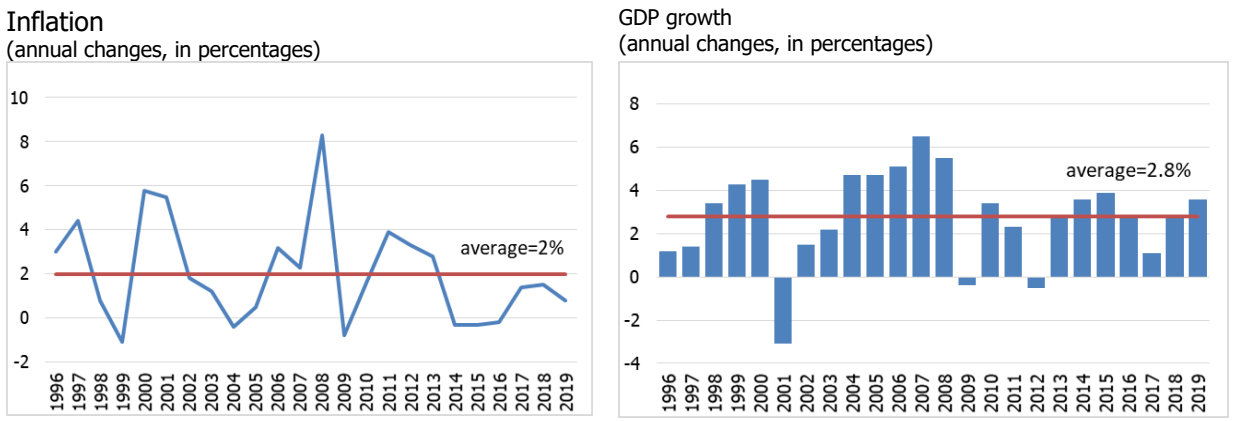
Figure 2. Empirical framework - root causes of euroization



Source: Brown and Stix (2014)

Looking from the policy perspective, North Macedonia has a good record of macroeconomic stability. Price stability is the main legally defined objective of the National Bank's monetary policy. Since October 1995, the nominal exchange rate of the Denar is pegged (against the Euro, and previously against the Deutsche Mark). Thus, de facto fixed exchange rate, has played a major role in stabilizing inflation expectations, permitting the National Bank to maintain low and stable inflation for more than two decades. Average annual inflation from 1996 to 2019 amounted to 2%, which is close to the average level of inflation in EU countries and GDP growth in the same period was also solid, amounting to almost 3%, on average.

Figure 3 Macroeconomic indicators



Source: National Bank of the Republic of North Macedonia and State Statistical Office

The macroeconomic and financial stability was successfully maintained even during stress times. As a small and open economy with close trade linkages with EU countries, financial flows' openness and the prevalent share of euro area banks in the ownership structure of the domestic banking system, North Macedonia is

directly exposed to risks arising from the external environment. By delivering low inflation environment, this strategy, reinforced with macro-prudential standards, demonstrates high credibility of the central bank in meeting its price and financial stability objectives.

4. The empirical approach applied for assessing determinants, forecasts and equilibrium (optimal) households' euroization

The empirical framework for assessing the households' euroization, will be based on macroeconomic factors and their respective effects, for the case of North Macedonia. Regressions will be estimated by applying Vector Error Cointegration Methodology (VECM), with an aim to assess the effect of the determinants on the households' euroization as dependent variable, for the period from 2003q1 to 2018q4. Evaluation of the reliability of the estimated regressions will be checked by making in-sample and out-of-sample forecasts for the dependent variable, by including the mentioned period and further extending it up to 2021q3[6]. The in-sample and out-of-sample forecasts should indicate whether the regressions explain closely the movement of the estimated households' euroization compared to the actual observed data up to 2021q3. If the forecasts made for the households' euroization move closely to the actual data up to 2021q3, then the regressions will be considered as reliable.

The NBRNM's forecasts made in October 2020, as latest during the period of writing the paper, were used in order to extend the determinants and fill the gaps with data unavailability up to 2021q3 and make in-sample and out-of-sample forecasts of the households' euroization. Furthermore, in-sample and out-of-sample forecasts of the households' euroization will be compared to the equilibrium (optimal) levels. The equilibrium (optimal) levels of the households' euroization will be assessed for the period from 2003q1 to 2021q3, in order to consider its optimal level dependable upon the determinants that move on the potential approximated by the Hodrick-Prescott trend[7]. This optimal or equilibrium level should serve as an indicative guideline for the policy-maker's perceptions concerning the households' euroization level, that should not be exceeded in the future. Namely, above-optimal level of euroization might impede the credit-monetary transmission (Della Valle et al, 2018). Hence, higher euroization might entail restrictive monetary policy that would increase the interest rates on denar deposits with an aim to make denarization more attractive, and moreover higher denar deposit interest rates affect positively the lending interest rates, and thus making the loans more expensive. The Macedonian economy experienced such situation in 2009, when the Global Financial Crisis entailed economic uncertainty in the country and foreign currency deposits as risk-mitigation assets were more desirable compared to domestic currency deposits. Consequently, the

[6] During the writing of this paper, the actual data on households' euroization were covering the period from 2003q1 to 2021q3.

[7] NBRNM's forecasts made in October 2020, as latest during the period of writing the paper, were used in order to extend the determinants, in order to account for the end-sample bias of the Hodrick-Prescot trend.

monetary policy tightened causing the banks to increase both deposit and lending interest rates and moreover to restrict loan supply.

The purpose of comparing the in-sample and out-of-sample forecasted values of households' euroization with the equilibrium values, is to observe to what degree they are aligned or deviate from each other. Thus, by doing so, the policy-makers will have an insight in the future movements of the households' euroization relative to the equilibrium levels and could timely prepare themselves, if the estimations suggest an increase of the forecasted euroization compared to the equilibrium level.

The data

Table 1 contains the variables used to investigate the determinants of households' euroization in the case of North Macedonia. The independent variables taken in this analysis are representing the income capacity of the households and the macroeconomic environment. The choice of the variables is based upon the study by Della Valle et al (2018) and more concretely, the variables used in this paper are pertinent only to the households' euroization. Namely, households need to have domestic income in order to buy foreign currency (real GDP per capita) or foreign source (private transfers or compensation) of money in foreign currency. Some variables used in the study by Della Valle et al. (2018) such as: trade openness and capital account openness would be more appropriate to be used when investigating the determinants of total euroization (households and companies) or companies' euroization because companies are mainly involved in the export and import activities as well as tackled by the free/restricted capital flows to finance their work. As this paper aims to explain the determinants relevant to the households' euroization only, thus the trade openness and capital account openness variables will not be taken in the further analysis, because they are more important for explaining the companies' euroization.

Furthermore, Della Valle et al (2018) track the effect of policy variables on euroization such as: inflation and exchange rate volatility. The disadvantage of using such policy variables is the fact that they are objectives of the monetary policy, not affected only by the central banks' instruments as policy creator, but they are outcome affected by other factors as well, such as: supply and demand shocks concerning the inflation and foreign competitiveness shocks concerning the exchange rate variability. Thus, these variables do not concretely trace and measure the effect of the central banks as policy makers in reducing or increasing the households' euroization, because they are broadly defined and affected by other factors not directly controlled by the central banks. Therefore, this paper will not use such policy variables as in Della Valle et al (2018), and hence, the monetary instruments as directly controllable variable will be used for assessing the contribution of the NBRNM to managing the households' euroization. Thus, by narrowing the choice of the variables used in the econometric analysis, the intention of this paper is to estimate small

models with great explanatory power of the households' euroization, or stated differently, the models used in this paper are parsimonious[8].

Table 1: Definition of the variables and data sources

Name	Dependent/ independent variable	Description	Period	Source
Households' euroization as share of M4[9]	Dependent variable	Household deposits in foreign currency (foreign currency and in denars with foreign clause) as % of the monetary aggregate M4	2003q1 to 2018q4	National Bank of the Republic of North Macedonia
Log of real GDP per capita	Independent variable	Quarterly real Gross Domestic Product (GDP) at 2005 prices, in millions of denars, divided by the number of population; taken as natural logarithm	2003q1 to 2018q4	State Statistical Office
Private transfers + compensation of employees as share of GDP	Independent variable	Quarterly private transfers from the secondary income + compensation of employees from primary income as % of annual nominal Gross Domestic Product (GDP); The quarterly figures have been annualized	2003q1 to 2018q4	National Bank of the Republic of North Macedonia and State Statistical Office
Monetary instruments as share of GDP	Independent variable	Monetary instruments are represented by the amount of banks' placements at Central Bank (CB) Bills + standard Deposit Facilities (overnight and 7 days) as % of the nominal Gross Domestic Product	2003q1 to 2018q4	National Bank of the Republic of North Macedonia and State Statistical Office
Dummy variable for the Global Financial Crisis	Independent variable	Variable to account for the unexpected effects of the Global Financial Crisis and takes values of 1 for the period from 2008q4 to 2010q2		

The effects expected from the independent variables on the households' euroization are the following:

[8] Many regressions were estimated by including other regressors such as: inflation, domestic and foreign currency deposit interest rates and deposit interest rate differential during the writing of this paper, but the results were not satisfactory and were economically illogical, most probably because of the behavioral factors that influence households decisions to keep their deposits in domestic or foreign currency. Therefore, it would be a good idea for surveys to be conducted on the sample of the households that keep deposits in foreign currency and obtaining answers concerning the behavioral factors behind the households' euroization, but this would overburden the paper that aims to econometrically assess the euroization determinants. Thus, the paper considers only the effect of the variables included in Table 1.

[9] Such defined dependent variable is not perfectly comprehensive measure of the households' euroization, having in mind that denominator M4 encompasses domestic currency in circulation only (foreign currency in circulation is unmeasurable variable), and thus might underestimate the whole euroization. It should be noted that euroization's measures that include official foreign currency deposits, domestic deposits and monetary aggregates are usually proxies for the partial euroization, and are not perfect indicators. Namely, they are always underestimated due to the exclusion of the foreign currency in circulation that is unobservable or because of the exclusion of other financial instruments such as government securities held in Denars with foreign currency clause, etc. However, the advantage of such defined households' euroization in Table 1, is measuring the whole scope to what extent the household deposits are euroized in the economy relative to the M4 as the broadest money aggregate in the economy used for both payment and saving and influenced by the central bank's instruments.

- Log of Real GDP per capita should exert a negative influence on the dependent variable. Higher real GDP per capita means higher income of the households in domestic currency. Thus, it is expected a decline in the households' euroization as people could save more in domestic currency relative to foreign currency savings.
- Private transfers + compensation of employees as share of GDP should affect positively the households' euroization. As private transfers and compensation of income received from abroad rise, consequently households' income in foreign currency increases. Therefore, the households' euroization is expected to increase.
- Monetary instruments as share of GDP should have positive long-run coefficient indicating positive influence on the regressand. Higher banks' placements at Central Bank Bills and Deposit Facilities (overnight and 7 days) indicates restrictive monetary policy because the quantity of the banks' reserves shrinks and consequently the liquidity is withdrawn from the banks and placed in the NBRNM affecting the quantity of the monetary base to tighten. Thus, as the monetary instruments become restrictive and tighten the monetary base, then the broad money supply shrinks as well, by having in mind the money multiplier process. The dependent variable has M4 as denominator and therefore as its quantity shrinks, it causes an increment of the overall households' euroization as relative indicator, by assuming unchanged numerator (foreign currency deposits). The central bank can certainly boost or restrict the broad money supply (M4) taken as denominator and thus directly affect the relative level of the households' euroization. Moreover, the restrictive or expansionary monetary policy requires from the banks to raise or lower the overall deposit interest rates including the foreign currency deposits' interest rates. Hence, the depositors would be stimulated to save more or less in the foreign currency deposits (numerator) driven by the adjusted deposit yield and thus, the overall households' euroization would additionally increase or decrease.

  Furthermore, the monetary instruments defined as sum of the banks' placements in Central Bank Bills and Deposit Facilities are comprehensive monetary policy variable as it includes two instruments that capture or release the banks liquidity in denars and thus affecting the currency structure of the broad money supply. Namely, the Central Bank Bills and the Deposit Facilities are banks' denar placements[10] in the NBRNM and as they loosen or restrict, accordingly they finally reflect on the denar composition of the broad money, as well. Hence, having in mind this effect of the monetary instruments on the currency structure of the broad money, makes them appropriate and relevant for testing the effect on the households' euroization. The interest rate on CB bills as basic and reference monetary policy rate in North Macedonia, is mainly used by the NBRNM as signaling instrument for setting the banks' interest rates, but has limited effectiveness on the overall

[10] Occasionally, the NBRNM conducted foreign currency deposits auctions, but the amounts placed are not as significant as the deposit facilities in denars (overnight and 7-day).

economy because the banks have liquidity surplus (Jovanovic et al, 2015). According to the NBRM (2015), the interest-monetary transmission tests suggest that the reference interest rate has an appropriate positive effect on the denar and foreign currency deposits' interest rates (NBRM, 2015), but as implied by the results in Jovanovic et al (2015), the NBRNM's management of the banks' liquidity by using all available instruments has higher effect on the economy. Having in mind the paper by Jovanovic et al (2015) and the suggestion that the liquidity-management monetary instruments together have a higher effect compared to the effect of the reference interest rate, then it clearly appears that the monetary instruments defined in such manner (amounts of CB bills + amounts of deposit facilities) are more appropriate as they affect both the liquidity of the banks and the broad money - M4. Considered from comparative aspect between the CB bills and the deposit facilities (overnight and 7-day), the NBRNM has a direct effect on the banks' liquidity by changing tender type[11] or offered amount of the CB bills auctions, while the placements in the deposit facilities are directly under the control of the banks' decisions as they, self-initiatively place funds with the NBRNM. However, this does not mean that the Deposit Facilities should be excluded in this analysis as monetary instrument, because they eventually reflect the balance sheet of the NBRNM or more concretely the reserves and monetary base. Although, the Deposit Facilities are directly controllable variable by the banks, yet the NBRNM indirectly affects these banks' holdings as a result of a change of the offered amounts or the tender-type of the Central Bank Bills[12]. Moreover, the inclusion of the Deposit Facilities as monetary instrument allows for dynamic movement in the variable, unlike taking only the Central Bank Bills that most of the analyzed period moved within relatively narrow range from 21,000 to 30,000 millions of denars. The dynamics that the Deposit Facilities add on the Central Bank Bills is desirable from econometric point of view as the overall monetary instruments become non-stationary variable that is appropriate for cointegration testing in the next sections.

Figures 4 and 5 below, depict the movement of the variables through the period taken in the analysis. All series are seasonally adjusted by using the additive Census X12 option in EViews 10 software.

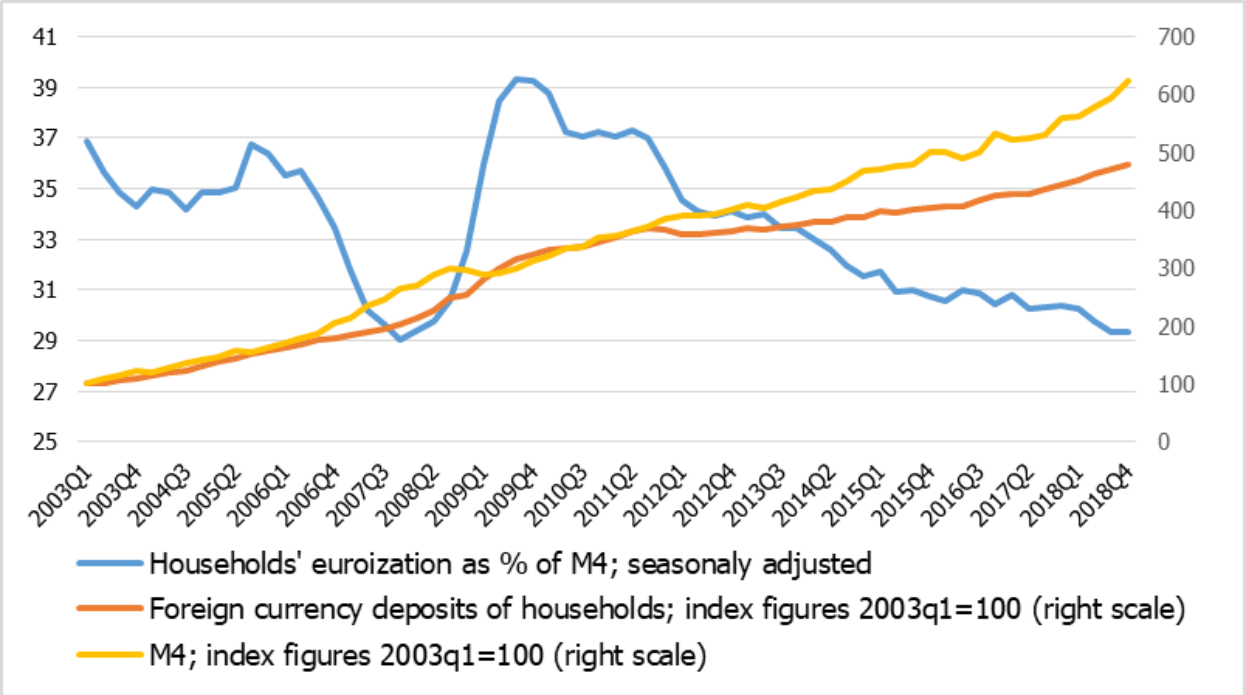
Figure 4 indicates volatile movement of the households' euroization up to 2009q4 and visible decreasing trend afterwards. The Strategy for Denarization of the Republic of Macedonia (2018) explains that the macroeconomic stability, the stable banking sector and the high yields of denar deposits contributed to the decreasing trend of the euroization up to 2007. The favorable movement of the euroization was interrupted by the Global Financial Crisis (GFC) of 2007-2008 that affected the households to increase their euroization

[11] Interest tender and volume tender of the Central Bank Bills auctions.
[12] Please see more on the following link
https://www.nbrm.mk/content/Timeline_changes_in_setup_of_monetary_instruments_National_Bank_1-13_9-20.pdf

sharply in order to protect themselves from the economic insecurity. As the GFC was overcome and macroeconomic stability reestablished, then the households' euroization returned to decreasing path, supported by targeted measures.

Also, Figure 4 clearly indicates the movement of the components of the households' euroization as relative indicators composed of: household deposits in foreign currency (numerator) and M4 (denominator). The household foreign currency deposits rose with an upward trend for the period from 2003 to 2018, with an intense increase in 2009 due to the uncertainty caused by the GFC. As the uncertainty declined, the foreign currency deposits rose moderately to 2018. Additionally, the upward trend of the M4 is steeper over the period 2003-2018 which is in line with accommodative monetary policy pursued[13], positive economic growth and expansionary capital inflows.

Figure 4: Graphical overview of the dependent variable used



Furthermore, Figure 5 indicates that private transfers and compensation of employees have been having a changing trend (increasing and decreasing) throughout the period considered, and yet they remained robust covering around 96% of the trade deficit throughout the period considered. This income from abroad (private transfers and compensation of employees) was not immune to the GFC and they decreased in 2009, but bounced back after the crisis with peak in 2012 and a modest declining trend afterwards. The

[13] Exception is 2009 when the NBRNM tightened the monetary policy in order to decrease the pressures from the foreign exchange market and gain control of the banks' denar liquidity.

peak in 2012 is due to the uncertainty of the Euro caused by the consequent debt crisis of some member states of the euro area. Namely, this subsequent debt crisis in the euro area affected the people to convert the cash[14] kept in foreign currencies, on the domestic foreign exchange market and increase the demand for the Macedonian denar (NBRM, 2013). As the uncertainty in the euro area declined, the private transfers and compensation of employees recorded a modest declining trend up to 2018.

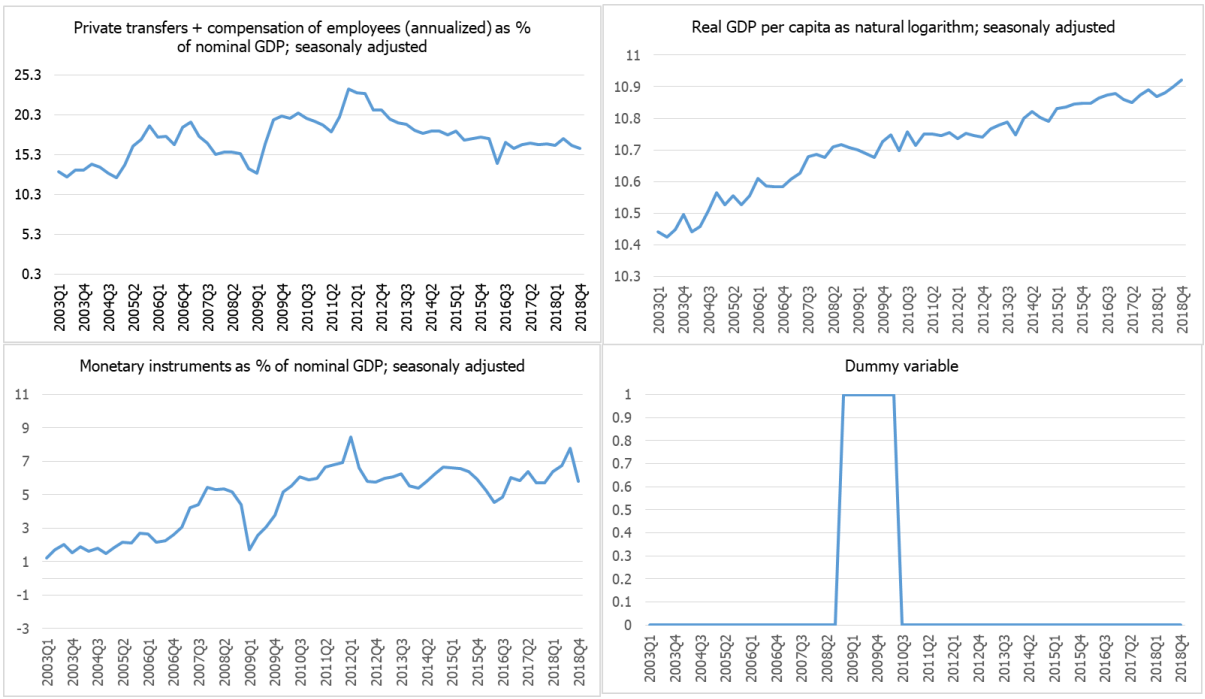
The real GDP per capita is upward trending variable reflecting the proper aggregate demand and aggregate supply management causing it to rise continually. The Macedonian economy recorded moderate growth for the whole period, and relatively well overcome external shocks like the GFC from 2009 and subsequent euro area debt crisis from 2011-2012.

The stock of monetary policy instruments in general registered an upward trend driven by the liquidity surplus in the system, mostly created by the foreign capital inflows. In 2009, decrease in the export demand, worsening of the expectations of the economic agents and decrease in the capital inflows, resulted in a sharp decrease in monetary policy instruments stock. In order to increase the attractiveness for CB bills, the NBRNM increased the CB bills interest rate (main policy rate) up to 9% and changed the CB bills auction from interest rate to volume tender with unlimited amount. Consequently, the domestic banks were attracted to place funds in the NBRNM and hence, the monetary policy instruments started trending upward again. After 2009, the NBRNM eased the monetary policy by decreasing the policy rate on several occasions to 2.5% by the end of 2018. In the second quarter of 2012, the NBRNM replaced the unlimited amount volume tender of CB bills with interest rate tender and implemented standard deposit facilities in order to help banks to smooth short-term liquidity fluctuations (Petrovska and Georgievska, 2015).

From statistical point of view, Figure 5 clearly depicts that variables used in the analysis have nonstationary features that would affect the choice of econometric methodology applied further in this paper.

[14] Cash foreign currency transactions carried out between households and the banks or exchange offices, encompass great part of the private transfers.

Figure 5: Graphical overview of the independent variables used



Source: National Bank of the Republic of North Macedonia and State Statistical Office, authors' calculations.

Estimation methodology

Vector Error Correction Model (VECM or Johansen cointegration technique) has been used to estimate the effect of determinants on the household euroization. Having variables with same integrative features, is a prerequisite for applying the VECM technique. Furthermore, this technique starts by estimating Vector Autoregression (VAR) model with an aim to choose the optimal lag order of the variables included in the model. By including lags, the Johansen cointegration technique avoids the endogeneity problem that could lead to biased results (Haris and Sollis, 2003). Finally, this technique tests the cointegration among the variables and quantifies the long-run (equilibrium) and short-run coefficients as well as the error correction mechanism (ECM) which indicates the speed of adjustment of short-run disequilibrium towards long-run equilibrium.

The variables are allowing construction of parsimonious models for assessing the determinants of the households' euroization. It should be noted, that many regressions were estimated and tested, but many of them did not meet the criteria in a sense of obtained cointegrating vectors, statistical significance of coefficients and error-correction mechanism. Therefore, the results of three regressions will be presented that yielded results that met the mentioned criteria. Moreover, the dummy variable is taken as exogenous

variable in the econometric testing to account for the effects of the Global Financial Crisis, while all other independent variables are taken as endogenous variables. Therefore, the dummy variable is not presented in the regressions (1) to (3).

$$Households'euroization\ as\ share\ of\ M4_t = f(\ Log\ real\ GDP\ per\ capita_t) \quad (1)$$

$$Households'euroization\ as\ share\ of\ M4_t = f(\ Log\ real\ GDP\ per\ capita_t,\ Private\ transfers + Compensation\ of\ employees\ as\ share\ of\ GDP_t) \quad (2)$$

$$Households'euroization\ as\ share\ of\ M4_t = f(\ Log\ real\ GDP\ per\ capita_t,\ Private\ transfers + Compensation\ of\ employees\ as\ share\ of\ GDP_t,\ Monetary\ instruments\ as\ share\ of\ GDP_t) \quad (3)$$

Augmented Dickey-Fuller test and Phillips-Perron tests were employed for checking the order of integration of the variables used in the model. The results[15] from the tests indicate that all the variables used are non-stationary in the level and that are becoming stationary after the first difference i.e. they are integrated of order one (I(1)).

As the VECM starts with the VAR model, therefore the lag length criteria were considered to decide the number of lags or so-called order of the VAR. The majority of the criteria indicate VAR order of 3, 4, and 4 lags for the respective regressions, from (1) to (3). The VAR order for all regressions is optimal for all estimations in a sense that avoids over-parameterization of the model due to the limited sample size, and yet it includes sufficient lags in order to ensure the statistical validity. The Trace of the Stochastic Matrix and Maximal Eigenvalue tests were considered for testing the existence of cointegration. Both tests suggested one cointegrating relationship among the variables in the estimated regressions. Finally, the cointegrating relationship was normalized on the household euroization as a dependent variable to -1. The overall VECM analysis was conducted in EViews software.

Results

This study presents and explains the estimated long-run coefficients[16] because they are referring to the long-run relationship and error correction mechanism as a term that corrects the short-term deviations within the estimated regressions. Furthermore, for the purpose of the estimations presented below in Table

[15] The results are not presented in order to save space and are available upon request.
[16] The short-run coefficients are not presented in order to save space and are available upon request.

2, the period covering for the independent variables has deliberately been shortened to 2018q4 (see Table 1), although data available were within the period 2019q1-2021q3, during the writing of this paper. The purpose of shortening the sample was to consider the stability of the results as shown in the next section concerning the in-sample and out-of-sample forecasts of the households' euroization.

The initial estimations suggested either statistically insignificant coefficient or relatively high negative long-run coefficient in front of the variable defined as private transfers plus compensation of employees[17]. Having obtained this illogicality, the long-run coefficient of the private transfers + compensation of employees was restricted to positive size of 0.1. The size of 0.1 is taken from the study by Petreski and Jovanovic (2016) concerning the utilization of remittances. Namely, this study implies that households save on average 10% of the remittances received (Petreski and Jovanovic, 2016, p.p. 12). Since the remittances are part of the private transfers, hence this percentage of 10% used for savings will be taken as restriction on the coefficient in front of the variable defined as private transfers + compensation of employees. The VECM methodology allows for restricting long-run coefficients in order to test their proper size. The size of 0.1 restricted for the coefficient in front of the "private transfers + compensation of employees" in this study, makes more logic because it indicates that households' euroization increases by 0.1 percentage point (the remaining of 0.9 percentage points is spent), on average, when the private transfers + compensation of employees go up by 1 percentage point. Table 2 below contains the results and they are in accordance with the expected effect explained in Table 1.

[17] The results are not presented in order to save space and are available upon request.

Table 2: Estimated long-run coefficients and ECM term for the regressions (1) to (3)

	Dependent variable is households' euroization (normalization of households' euroization to -1)		
	Regression (1)	Regression (2)	Regression (3)
		Restriction on the long-run coefficient in front of "private transfers+compensation of employees"; (the probability obtained by likelihood ratio (LR) test is 0.92)***	Restriction on the long-run coefficient in front of "private transfers+compensation of employees"; (the probability obtained by likelihood ratio (LR) test is 0.05)***
Independent variables and error correction mechanism (ECM)	**Estimated long-run coefficients in front of the independent variables and the error correction mechanism (ECM)**		
Real GDP per capita in natural logarithm	-0.16*	-0.21*	-0.36*
Private transfers + compensation of employees as a share of GDP		0.1 (restriction imposed)	0.1 (restriction imposed)
Monetary instruments as a share of GDP			1.54*
Constant	2.10	2.61	4.07
ECM	-0.11*	-0.08*	-0.13*
Dummy variable for the global financial crisis (2008q4 to 2010q2=1)	0.007**	0.008**	0.007**
* and ** indicate statistically significant coefficient at 1% and 5% level of significance (H0: coefficient=0);			
*** Probability higher than 0.01 indicates non-rejection at 1% statistical level of the following null hypothesis: Restriction on the coefficient in front of the private transfers + compensation of employees at value of 0.1.			
Diagnostic tests			
No serial correlation (probability obtained by Lagrange multiplier (LM) test) ***	0.10	0.07	0.09
Normality (probability obtained by Jarque-Bera test)***	0.81	0.77	0.08
Homoscedasticity (probability obtained by White Heteroscedasticity test-no cross terms)***	0.19	0.18	0.70
*** Probability higher than 0.01 indicates non-rejection at 1% statistical level of the following null hypothesis: (1) no serial correlation in the residuals at the first order, (2) normality in the residuals and (3) homoscedastic residuals.			

Source: Authors' calculations

The results in Table 2 indicate non-rejection of the assumed size of 0.1 for the long-run coefficient in front of the private transfers + compensation of employees. The real GDP per capita has a negative effect on the dependent variable, indicating that an increase in the income capacity by 1 percent lowers the households' euroization within range from 0.16 to 0.36 percentage points, on average, ceteris paribus. Furthermore, the rise of the monetary instruments by 1 percentage point restricts the money supply (denominator) and increases the relative indicator of households' euroization by 1.54 percentage points, on average, ceteris paribus.

Regarding the restricted size of the long-run coefficient of the private transfers + compensation of employees at level of 0.1 percentage points, an explanation was provided above. The size of the long-run coefficient in front of the real GDP is similar across the estimated specifications from (1) to (3), indicating a modest effect. The effect of the monetary instruments is above 1 and this size indicates the significance of the monetary policy as tool for increasing or decreasing the households' euroization. The above unity size of this long-run coefficient, makes logic as this coefficient acts in a sense of the money multiplier and as it is implied by the theory, the money multiplier is always above 1. Namely, as the monetary instruments restrict/loosen and directly affect the quantity of the reserves of the banks, consequently the quantity of the monetary base shrinks/expands in parallel. Furthermore, the adjustment of the monetary base, via the money multiplier process, accordingly affects the broad money - M4, that is denominator in the households' euroization variable used in this paper. Hence, as the monetary instruments directly change the monetary base, then the long-run coefficient in front of this variable acts as money multiplier and its size has to be above 1. Moreover, as the monetary instruments restrict/loosen and banks raise/lower the foreign currency deposits' interest rates, then the foreign currency savings (the numerator) increase/decrease as well contributing to higher than 1 effect on the overall households' euroization. The ECM term is negative, as expected, and suggests correction of the short-run disequilibrium towards the long-run relationship. The effect of the dummy variable for the global economic crisis is positive with low effect of 0.007 percentage points on average. Finally, the diagnostic tests do not imply problem in the residuals and thus the long-run coefficients obtained are reliable.

In-sample and out-of-sample forecasts

The purpose of in-sample and out-of-sample forecasts is to check the reliability of the estimated regressions. Namely, the results obtained in the previous section and presented in Table 2, employ data for the period from 2003q1 to 2018q4. During the writing of this paper, the data available for the households' euroization and the independent variables were within the interval from 2019q1-2021q3, but depending on the period of writing, some data were not available because of the different publishing period and different time of making the estimations and forecasts. Hence, there were data gaps for the households'

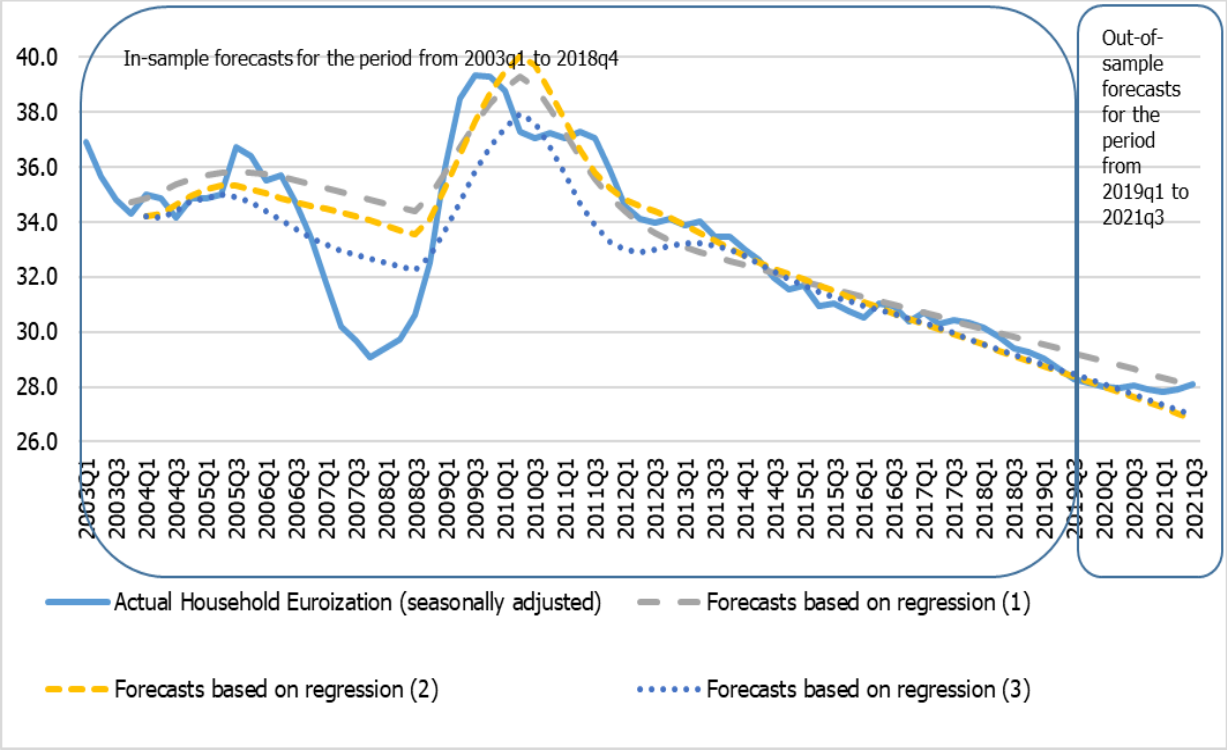
euroization and independent variables for the period from 2019q1-2021q3. For example, quarterly GDP has been published in different time unlike the other banking data such as FX deposits, money supply and monetary instruments that are published more frequently and that is every month. Therefore, the NBRNM's forecasts made in October 2020, as latest during the period of writing the paper, were used in order to extend the determinants and fill the gaps with data unavailability up to 2021q3 and make in-sample and out-of-sample forecasts of the households' euroization. Furthermore, as it was mentioned in the previous section for the purpose of the estimations in Table 2, the period covering for the independent variables has deliberately been shortened to 2018q4, in order to consider the stability of the results when applied to forecasting in a period that has not been included (2019q1-2021q3).

The stability of the results in Table 2 will be implied, if the in-sample forecasts[18] of the households' euroization for the period from 2003q1 to 2018q4, closely follow its actual data. Also, the out-of-sample forecasts[19] and actual households' euroization will be compared for the period that was not included in the estimation, from 2019q1 to 2021q3, with an aim of further checking the stability of the results in Table 2. Hence, if the in-sample and out-of-sample forecasts move closely with the actual data for the overall available period from 2003q1 to 2021q3, then there is an argument that the estimated regressions in Table 2 yield stable results.

Gattini and Hiebert (2010) and Kuo (2016) provide theoretical and empirical support for using VECM as forecasting procedure and assess the accuracy of the in-sample and out-of-sample forecasts. Gattini and Hiebert (2010) imply that the VECM model has extraordinary forecasting performance of real house prices in the euro area with a greater degree of accuracy. Furthermore, Kuo (2016) emphasizes the advantages of the VECM's in-sample and out-of-sample forecasts of the Taiwanese stock prices, unlike the forecasts produced by other time–series methodologies such as: Ordinary Least Squares, Vector autoregression, Random walk models. The Kuo indicates that VECM forecasts outperform the other time-series methodologies. According to the knowledge of the authors of this study, there is no study that utilizes VECM methodology for forecasting households' euroization, but it has been done in this study because the household deposits in foreign currency are assets similarly as the real houses and stocks taken for analysis in the Gattini and Hiebert (2010) and Kuo (2016). Since these studies praise the advantages of the VECM for forecasting, therefore this study relies on the VECM methodology for in-sample and out-of-sample forecasting of the households' euroization.

[18] The in-sample forecasts for the period 2003q1-2018q4, were technically made in EViews software by making a model of the estimated VECM equations in Table 2 and solving it with Deterministic Simulation type and the option of Dynamic Solution.
[19] The out-of-sample forecasts for the period 2019q1-2021q3, were technically made in EViews software by making a model of the estimated VECM equations in Table 2 and solving it with Deterministic Simulation type and the option of Dynamic Solution.

Figure 6: Graphical overview of the in-sample forecasts (2003q1-2018q4) and out-of-sample forecasts (2019q1-2021q3) for the households' euroization, in %



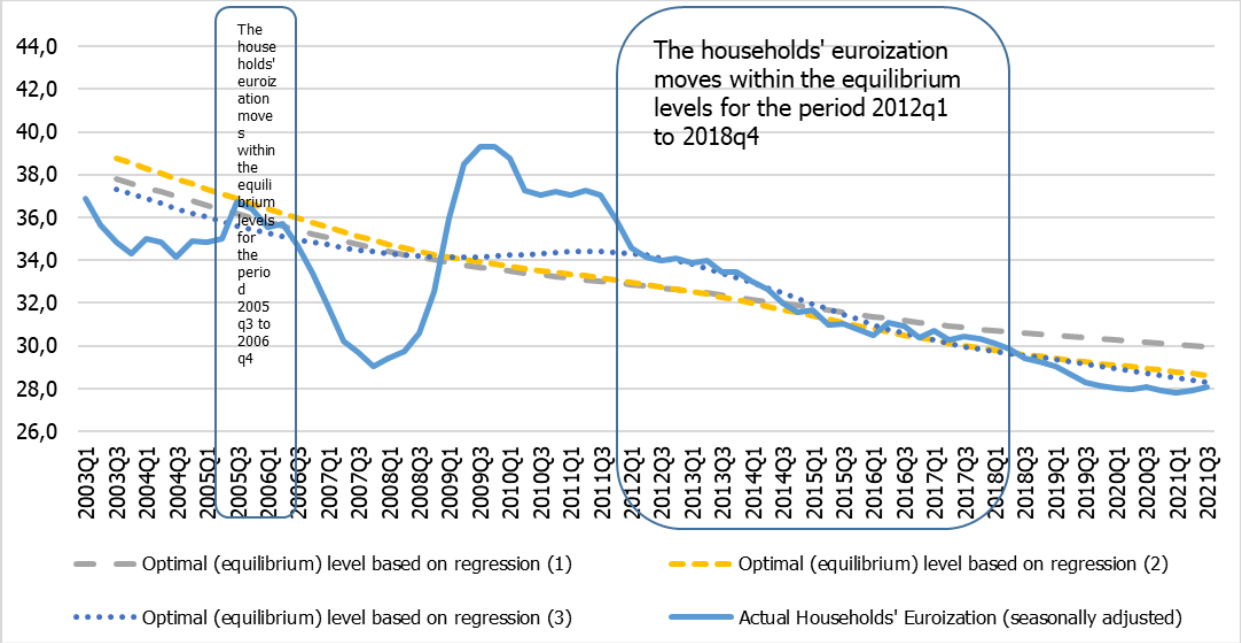
Source: Authors' estimates

Figure 6 clearly indicates that in-sample and out-of-sample forecasts (dash-dotted lines) move very closely with the actual households' euroization (solid blue line), especially for the period after 2009 up to 2021q3. It is important to note that out-of-sample forecasts for the period not included in Table 2, from 2019q1 to 2021q3, do not deviate much, from the actual households' euroization. Thus, the estimations provided in Table 2 could be considered as reliable and stable as they correctly predict the variable of interest. Moreover, the aligned movement of the actual and forecasted values in Figure 6, is an argument of the confirmed forecasting accuracy of the VECM methodology as implied in Gattini and Hiebert (2010) and Kuo (2016).

5. Calculating optimal (equilibrium) households' euroization and comparison with in-sample and out-of-sample forecasts

The optimal (equilibrium) values of the households' euroization were calculated by following the approach applied in Jovanovic et al. (2017). Therefore, trend values of the independent variables were calculated by employing the Hodrick-Prescott (HP) filter[20] in order to approximate their potential movement i.e. the HP trend is approximation for the optimal capacity of the economy. Thus, similarly as it was done in Jovanovic et al. (2017), trend values of the independent variables were obtained for the period 2003q3-2022q2. The independent variable series were extended up to 2022q2 in order to overcome the end sample bias of the HP filter. The NBRNM's forecasts made in October 2020 were used in order to extend the determinants up to 2022q2[21]. Afterwards, the HP trends for each determinant were multiplied by the respective long-run coefficients from the regressions (1) to (3) in Table 2, and the results are presented in Figure 7. Hence, the equilibrium level of the households' euroization is presented for the period from 2003q3 to 2021q3.

Figure 7: Graphical overview of the optimal (equilibrium) and the actual households' euroization, in %



Source: Authors' estimates

The actual households' euroization was moving within the equilibriums for a considerable period of time, as indicated by the frames within Figure 7. Exception is the period from 2006q4 to 2011q4 when

[20] Lambda is 1,600.
[21] During the writing of the paper, the latest data available for the independent variables were within the period from 2019q1-2021q3. The NBRNM's forecasts made in October 2020 were available and considered for projecting the future values of the independent variables. Due to that, the sample was extended by using the forecasted values of the independent variables and therefore mitigate the end sample bias of the HP filter.

misalignment is clearly visible. Within this period of misalignment, 2009 was especially specific when due to the economic uncertainty caused by the GFC, the households' euroization increased to 39%, much higher compared to the optimal (equilibrium) levels. This above-optimal increase of households' euroization entailed restrictive monetary policy to maintain the attractiveness of the denar deposits for the households. Furthermore, other misalignment is visible for the recent period from 2019q1 to 2021q3 when the households' euroization went below the optimal levels due to the crisis caused by the COVID-19 pandemic, but the gap is not very large. The reason for this close misalignment is the proper economic policy response. In order to deal with this crisis, the NBRNM loosened the monetary policy i.e. decreased the interest rate on Central Bank Bills to a level of 1.25% during 2021 and reduced offered amounts for Central Bank Bills that along with the increased government spending, affected positively the broad money - M4 and decreased the households' euroization as relative indicator. Additionally, the M4 rose as a result of the increase in the denar currency in circulation as the most liquid and autonomously driven component. Most probably, the economic agents expanded the currency in circulation, as precaution of the liquidity preferences given the uncertainty caused by the COVID-19 pandemic. Also, the pandemic crisis and consecutive uncertainty, triggered an increase in the foreign currency deposits for the households as risk-mitigation assets. Therefore, as of 2021q3 the foreign currency deposits rose by 8.3% annually, while the M4 recorded an annual growth of 8.2% and the relative indicator of households' euroization ended at around 28%. The optimal (equilibrium) levels of the euroization have been estimated within range from 28.3% to 30.0% for 2021q3, slightly higher than the respective actual (seasonaly adjusted) level of 28.1%. Hence, it could be considered that the misalignment is very close. The below-optimal movement of the households' euroization experienced during the ongoing COVID-19 crisis, has not implied any misbalance particularly for the banking sector.

6. Conclusion

This research investigates the determinants of the households' euroization and to what degree they explain its developments. The households are considered because they are the largest sector - holder of deposits in the Macedonian banks as well as one of the major contributors to the overall euroization. VECM analysis was utilized to explore what factors determine and by what size affect the households' euroization. According to the results obtained, increase in private transfers + compensation of employees and monetary instruments increases the euroization, while the increase in real GDP per capita decreases the euroization. The results concerning the estimated coefficients are in accordance with the expected effect.

In order to consider to what degree the determinants explain the households' euroization, in-sample and out-of-sample forecasts were made in this paper. The results of the forecasts indicate that actual

households' euroization moves quite close with the movement of the forecasted series as explained by the independent variables.

Furthermore, the optimal (equilibrium) levels of the households' euroization were calculated by employing HP filter on the independent variables and multiplying by the respective long-run coefficients estimated in this analysis. The actual households' euroization was mostly moving within the equilibriums for a considerable period of time.

In order to overcome the deficiencies of this paper, the future papers dealing with this issue should consider the effects of the inflation as well as the deposit interest rate differential on the households' euroization. Also, surveys could be conducted on the sample of the households that keep deposits in foreign currency and obtaining answers concerning the behavioral factors behind the households' euroization.

7. References

Barajas, A., Chami, R., Ebeke, C., and Oeking, A., (2016), What's Different about Monetary Policy Transmission in Remittance-Dependent Countries?, IMF, Working paper 16/44.

Beckmann, E. and Scheiber, T., (2012) "The Impact of Memories of High Inflation on Households' Trust in Currencies", *Focus on European Economic Integration Q4/12*, Oesterreichische Nationalbank, pp. 80–93.

Brown, M. and Stix, H., (2014), "The euroisation of bank deposits in Eastern Europe", paper prepared for the 59th panel meeting of economic policy.

Catao, L.A.V. and Terrones, M. E., (2016), "Financial De-dollarization: A global perspective and the Peruvian Experience", IMF, Working Paper 16/97.

Valle, G., Kota, V., Veyrune, R., Cabezon, E., and Guo, S., (2018), "Euroization Drivers and Effective Policy Response: An Application to the case of Albania", IMF, Working Paper 18/21.

EBRD (2010), Transition report, Chapter 3 "Developing local currency finance".

Gattini, L., and Hiebert, P., (2010), "Forecasting and assessing Euro area house prices through the lens of key fundamentals", European Central Bank, Working Paper, No. 1249.

Geng, N., Scutaru, T. and Wiegand, J., (2018) "Carry trade versus deposit driven euroisation" IMF Working paper 18/58.

Harris, H. and Sollis, R., (2003). "Applied time series modelling and forecasting". Wiley, West Sussex.

Jovanovic, B., Hani, E. and Georgievska, L., (2017). "Post-crisis credit slowdown in South-East Europe: Return to normality?", *Empirica*, 44(4), pp 733-780.

Jovanovic, B., Krstevska, A. and Popovska-Kamnar, N., (2015), "Can Monetary Policy Affect Economic Activity under Surplus Liquidity? Some Evidence from Macedonia", National Bank of the Republic of Macedonia, Research Paper.

Kokenyne, A., Ley, J. and Veyrune, R., (2010), "Dedollarization", IMF Working paper 10/188.

Kuo, CY., (2016), "Does the vector error correction model perform better than others in forecasting stock price? An application of residual income valuation theory", *Economic Modelling*, 52, pp. 772-789.

NBRM, (2010), "Annual Report 2009" . National Bank of the Republic of Macedonia.

NBRM, (2013), "Annual Report 2012" . National Bank of the Republic of Macedonia.

NBRM, (2019), "Annual Report 2018" . National Bank of the Republic of Macedonia.

NBRM, (2015), "Quarterly Report August 2015". National Bank of the Republic of Macedonia.

Scheiber, T. and H. Stix. (2009), Euroization in Central, Eastern and Southeastern Europe – New Evidence on Its Extent and Some Evidence on Its Causes, OeNB Working Paper 159.

H. Stix. (2008), "Euroization: What Factors drive its Persistence? Household Data Evidence for Croatia, Slovenia and Slovakia", OeNB Working Paper 43.

Orszaghova, L., (2015), "EU Enlargement: Euroisation in the Western Balkans (Part III)".

Petrovska, M. and Georgievska, Lj., (2015), "Alternative indicator of monetary policy stance for Macedonia", National Bank of the Republic of Macedonia, Research Paper.

Petreski, M. and Jovanovic, B., (2016), "Do Remittances Reduce Social Disparities in Macedonia?", In book: Diversity of Migration in South East Europe, Publisher: RRP.

Scheiber, T. and Wörz, J., (2018), "How are reduced interest rate differentials affecting euroization in Southeastern Europe? Evidence from the OeNB Euro Survey", *Focus on European Economic Integration Q1/18*, Oesterreichische Nationalbank, pp.48-60.

Windischbauer, U., (2016), "Strengthening the role of local currencies in EU candidate and potential candidate countries, ECB Occasional Paper, No. 170.