

Review paper

UDC: 338.23:336.74
doi:10.5937/ekonhor1902161M

IMPLICATIONS OF THE APPLICATION OF DOLLARIZATION FOR MACROECONOMIC STABILITY

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The aim of this paper is to present the costs and benefits of applying dollarization. The most common reason for accepting, in whole or in part, a foreign currency is the presence of a high and volatile inflation rate, which is followed by the significant volatility of the exchange rate, as well as a distorted confidence in its own currency. Likewise, highly dollarized countries most often characterized by a lower level of the development of the financial market. Dollarization contributes to lowering the costs of transactions in international trade and to achieving the price and financial stability, as import inflation is lower than domestic. On the other hand, the presence of full dollarization means a loss of seigniorage as the monetary authorities' revenue from the printing of money, as well as the limitation of the implementation of the lender's function in the last instance. The results of the analysis indicate that, in the dollarized countries, there was a decrease in the inflation rate, macroeconomic stability was established, and financial integration was present as well. The analysis also showed that the loss of income from seigniorage, measured as a share in the gross domestic product, is not negligible, while the lender's function in the latter instance can be compensated through the formation of stabilization funds and the conclusion of contracts with financial institutions.

Keywords: dollarization, lender of last resort, seigniorage, integration of financial markets

JEL Classification: E42, E44, E58

INTRODUCTION

Dollarization can be defined as the official or unofficial use of a foreign currency in a country's transactions. Most often, higher trust in a foreign currency in comparison with the domestic currency is mentioned as the reason for the application of dollarization.

This has a direct impact on the limited effect of the monetary policy through a greater influence of the transmission of the exchange rate channel compared to the interest rate channel, which should have a dominant influence in the inflation targeting regime in those central banks that have chosen to target inflation as a monetary strategy. At the same time, foreign interest rates, such as Euribor and Libor, have a greater impact on the cost of borrowing compared to interest rates related to borrowing costs in domestic currency.

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The aim of the paper is to present the costs and benefits of the application of dollarization. Benefits from the application of dollarization are a reduction in transaction costs in trade exchange, the presence of import inflation, which is usually lower than domestic inflation, as well as the absence of the volatility of the exchange rate due to the acceptance of a foreign currency as its own. On the other hand, it should be noted that there are shortcomings in the use of dollarization, such as seigniorage, which basically represents the central bank's income from printing money, as well as the impossibility of applying the lender of last resort function last resort.

Dollarized countries and the implications that dollarization, either full or partial, has on the functioning of the economies of these countries are the subject matter of the research study done in this paper. The most common reasons for the application of dollarization are the presence of long-term instability

at the macroeconomic level, which is reflected through a high and unstable inflation rate, then a significant exchange-rate volatility, as well as a lack of confidence in the domestic currency. In such circumstances, a foreign currency takes over the primacy and is used as a means of payment, a unit of measure, but there are also higher foreign currency savings compared to savings in the domestic currency.

The following both inductive and deductive research methods are used in this paper: the analysis and synthesis methods, the classification method, and the comparison methods. These methods are used in order to conduct a comparability analysis and make comparisons between the different countries applying dollarization, and also in order to understand the reasons for using a foreign currency as the domestic one, and gain an insight into the results after accepting a foreign currency (lower inflation, the absence of the volatility of the exchange rate due to the

Table 1 Historical overview of the application of dollarization

Country	Period	Country	Period
American Samoa	?-currently	Dominica	1938-1951
Albania*	1912-1925	Dominican Republic*	1899-1947
Andorra*	?-currently	Ecuador*	2000-currently
Angola	1938-1951	Egypt*	1856-1898
Bahrain	1920-1965	El Salvador	2001-currently
Bhutan*	1968-1974	Gambia	1800-1969
Botswana*	1950-1976		1902-1913
Brunei*	1945-1951	Ghana	1896-1913
Cameroon	1910-1916	Gibraltar	1888-1927
Cayman Island	?-1972	Grenada	1838-1951
Cuba*	1902-1934	Honduras*	1912-1950
Cyprus	1880-1914	Indonesia	1974-1807
Kuwait	1942-1961	Iraq	1917-1932
Liechtenstein*	?-currently/Israel		1917-1927
Libya	1912-1943	Jordan	1917-1927
Malta	1903-1939	Kenya	1896-1898
Monaco*	1865-currently	Nigeria	1891-1913
Montenegro	1999-currently	Peru	1887-1914
Marocco	1897-1907	Qatar	1949-1966
	1800-1969	Tunisia*	1873-1904
San Marino*	1897-currently	Uganda	1906-1920
Saudi Arabia*	1918-1952	United Arab Emirates*	1946-1973
Singapore	1840-1849	Vatican City*	1929-currently
Switzerland	1921-1974	Vietnam	1862-1876

Note: The asterisk (*) indicates the countries that were independent in some or in all of the dollarization episodes, and the question mark (?) indicates that the author did not specify the beginning of the dollarization in the specified countries.

Source: Schuler, 2005, 121-123

application of full dollarization). Such an analytical approach constitutes a good basis for observing the countries of the varying levels of economic and financial development, which allows a possibility of giving recommendations to the domestic monetary authorities regarding the continued application of measures in order to increase the level of dinarization in the Republic of Serbia (RS).

The hypothesis we proceed from in the analysis is

H: There is high interdependence between the dollarization scope (in the case of the Republic of Serbia, the euroization) and the inflation rate, measured as the index of consumer prices on a year-on-year basis.

These variables were selected because a high degree of dollarization should be linked to the lowering of the inflation rate due to the presence of import inflation, which is usually lower in comparison with the domestic inflation rate. In order to test this hypothesis, a correlation coefficient is used, and the calculation is based on data in RS.

Monetary authorities should be aware of the fact that the process of restoring confidence in the domestic currency is long, bearing in mind the fact that the roots of dollarization are deep. Any attempt to reduce the level of dollarization should be accompanied by the maintenance of financial and price stability, and applied deduction measures are long-term sustainable and adapted to the characteristics of the domestic economy (economic and financial development phases, the degree of the development of the financial market, the exchange-rate regime, etc.). Solving the dollarization problem should be permanent and sustainable, and monetary and fiscal policy holders, including the representatives of the non-financial sector, should be included in finding a solution to it. This would provide a comprehensive strategy based on micro- and macroprudential measures.

The paper is structured as follows: in the first part, the concept and the types of dollarization are presented, which is followed by the presentation of the dollarization measuring method and the advantages and disadvantages of the application of dollarization,

the focus of the analysis being on the role of the lender of last resort, seigniorage and the stability and integration of the financial market. In this paper, euroization in RS is also given an account of, and the dinarization strategy implemented in order to promote a higher use of the dinar in the economy is demonstrated. In conclusion, the main results of the analysis carried out in this paper is summarized, the key contributions of the research study are pointed out, and recommendations are given for further research into this highly empirical topic. In conclusions, the recommendations are given to the monetary authorities in RS how to increase the level of dinarization.

DOLLARIZATION DEFINITION AND TYPES

Dollarization is the introduction of the dollar or some other foreign currency into the domestic economy, such a currency operating in parallel with or instead of the domestic currency. Table 1 shows the selected historical episodes of the application of dollarization.

The literature offers a possibility of analyzing a large number of the definitions of the concept of dollarization, which indicates that the research potential of this topic is really important. A large number of the definitions of dollarization points to the existence of different forms of this strategy in different countries. This part of the paper is focused on the presentation of the dollarization forms and their definition.

According to S. Heysen (2005), dollarization can be viewed as either full, i.e. official dollarization, or as partial dollarization. Full, i.e. official dollarization exists in a situation when a foreign currency, usually the dollar, is accepted in a country as a legal tender. Partial or *de facto* dollarization exists in the country that keeps its local currency in circulation, simultaneously enabling payments and transactions making freely in dollars.

A. Ize and A. A. Powell (2004) made a distinction between the four types of dollarization in their analysis. The first type is the so-called macroeconomic

hedging dollarization, which is the ability of investors to limit the exposure of their portfolio to the volatility of inflation and the exchange rate, where portfolio is simultaneously invested in a foreign and the domestic currencies. The second type is the market imperfections dollarization, which occurs when there is a less efficient regulation of the domestic foreign-exchange market, which makes the possession of the domestic currency more expensive than the possession of foreign currencies. The third type is default dollarization, which occurs in a situation where there is a high likelihood that the holder of income (such as earnings) will not ensure the payment of its obligations, and this dollarization type is existent in a situation when there is the dominant ownership of a foreign currency relative to the domestic one. The fourth type is moral hazard dollarization, which is present in a situation where there is a possibility that the lender will not pay its obligations, which may consequently lead to the same behavior pattern being transferred to the bank. If depositors are protected by the application of a deposit insurance scheme, the conclusion of a contract in dollars provides banks and their borrowers with a possibility of recording lower borrowing rates if there is no devaluation of the domestic currency.

According to L. I. Jácome and A. Lönnberg (2010), there are several prerequisites that need to be met in order to apply full, i.e. official dollarization. These prerequisites are as follows:

- a prudent financial system and strong financial supervision in order to reduce the likelihood of reporting a banking crisis in the event it does not exist or the effect of the lender of last resort function last resort is diminished;
- regulating the public finance that give sufficient confidence to market participants that the fiscal policy measures will be applied; and
- a regulated labor market, which will be an absorber of external shocks and which will achieve a macroeconomic adjustment.

It is very important to distinguish between the three types of dollarization:

- payment dollarization, which occurs when the dollar or another foreign currency is predominantly used as a means of payment;
- financial dollarization, which happens in a situation when residents hold their financial assets in dollars or in some other foreign currency; and
- real dollarization, which exists when domestic prices and/or earnings are denominated in dollars or some other foreign currency.

According to G. Ortiz (1983), the dollarization concept is very frequently linked to the currency substitution concept. The said author opines that a monetary policy will be inefficient in the country where a foreign currency is a good substitute for the domestic currency. That substitutability between the domestic currency and a foreign currency will increase in the period of a rise in the exchange-rate fluctuation, and an increase in the currency risk based on that, too, is a very important consequence arising from this view. According to K. Forbes, V. Sebastian, C. Mapingure, M. Charity, M. Kumbirai, C. Felistus and M. Rumbidzai (2013), in addition to currency substitution, the notion of dollarization is also associated with the substitution of assets. Ž. Bogetić (2000) draws our attention to the fact that it is necessary a distinction between currency substitution, which, according to him, implies the primary use of a foreign currency and foreign currency deposits as a means of payment, on the one hand, and the substitution of assets, which involves the primary use of a foreign currency in the function of storing value, on the other, should be made. On the other hand, K. Schuler (2005) considers that dollarization is another form of the fixed exchange rate. According to this author, dollarization is used to indicate the wide use of a foreign currency as a means of payment or a unit of measure.

A distinction should be made between the three forms of dollarization, which include unofficial, semi-official and official dollarization (Makochekanwa, 2010). Full, i.e. official dollarization arises in a situation where a particular country begins to use a foreign currency as a means of payment and consequently reduces the use of the domestic currency. According to Ž. Bogetić (2000), there is no currency risk in such

a currency system, nor is there any risk of a currency crisis, either. There are variations in the application of full, i.e. official dollarization, which are called semi-official dollarization or the bi-monetary system. The bi-monetary system occurs when a foreign currency (or foreign currencies) is (are) used as a means of payment and has (have) a dominant role in the currency structure of bank deposits, but has a secondary role in comparison with the domestic currency that is primarily used for transactions, such as salaries and taxes, and daily transactions, such as transport services. The countries that apply semi-official dollarization have their own central bank or monetary authorities that implement their own monetary policy. Unofficial dollarization occurs when the residents of a given country hold a large part of their assets in a foreign currency, even though the foreign currency is not an official payment instrument according to the monetary or financial regulations of that country. In this case, the dollar (or the euro, or yet another foreign currency) will be used largely in private transactions as the unit of measure, the means of exchange and the measure of value. Ž. Bogetić (2000) points out the fact that the concept of unofficial dollarization may take several forms, namely:

- the possession of foreign-currency deposits in domestic banks;
- the possession of foreign-currency deposits in foreign banks;
- the holding of bonds denominated in a foreign currency or other non-monetary assets; and

- the holding of a foreign currency regardless of whether the same is held in a legal or illegal manner.

Once the different forms of dollarization have been defined, the manners of measuring the dollarization degree in the remainder of this paper will be presented. While in the simplest manner dollarization can be defined as a greater share (full or partial) of a foreign currency in relation to the domestic currency, the identification of the actual dollarization level is not easy. Certainly, the method of measurement depends on the available data, as well as on the form of dollarization in a particular country.

DOLLARIZATION LEVEL MEASURING

Since there are a large number of dollarization definitions, numerous studies also differently measure the degree of dollarization. The most common degree of dollarization is measured through deposit dollarization, which is accounted as the amount of foreign-currency deposits against the money supply or the total deposit level. The central bank most often publishes and keeps records of data on foreign-currency deposits, as well as monetary aggregates. In contrast to monetary aggregates published in a local currency, foreign-currency deposits are expressed in various foreign currencies, and by applying corresponding inter-currency relations, they can be converted into the national currency. This conversion of foreign-currency deposits from the original foreign

Table 2 The types of dollarization

	The share of foreign currency debt of the private sector in the total public debt is 10% or more	The share of foreign currency debt of the private sector in the total public debt is less than 10%
The share of foreign currency government debt in public debt is 10% or more	Type 1	Type 2
The share of foreign currency government debt in public debt is below 10%	Type 3	Type 4

Source: Reinhart, Rogoff & Savastano, 2003, 9

currency into the domestic currency may lead to a large oscillation of the value of deposit dollarization, especially if there is a significant depreciation of the domestic currency. For this reason, the authors like N. Mwase and F. Kumah (2015) suggest that the level of dollarization should be measured in real terms by using the so-called custom foreign-currency deposit, which is converted into a deposit in the domestic currency by using appropriate inter-currency relationships.

On the other hand, the authors like A. Ize and E. L. Yeyati (2003) differently define the indicator of real dollarization, which represents the level at which prices and wages are denominated in foreign currencies, and this indicator shows the pass-through effect of the exchange rate. This analytical approach is also present in the paper by M. Garcia-Escribano and S. Sosa (2011), who use the ratio between foreign-currency deposits (loans) and the total deposits (loans) at the current exchange rate instead of displaying these variables at a constant foreign-exchange rate.

After defining deposit dollarization, it is necessary to explain loan dollarization. The authors like L. Cattao and M. Terrones (2000) point out the fact that it is imperative to simultaneously observe the dollarization of both deposits and loans so as to concurrently analyze the currency and maturity structure of the balance sheet positions of the bank, as well as of other economic entities with a currency and maturity mismatch between generating revenue and payments of expenditures. According to these authors, the degree of the dollarization of deposits and loans depends on the interconnection between banking costs, the credit market structure, and macroeconomic shocks.

On the other hand, C. Reinhart, K. Rogoff and M. Savastano (2003) developed the following dollarization indicators:

- The composite dollarization index for each country in the sample that was analyzed. The analyzed sample is divided into a shorter and a longer series of data. The short series includes 90 countries with annual observations in creating the composite dollar index in the period 1996-2001.

The longer series of data is based on the analysis of 48 countries with annual observations in creating the composite dollar index in the period 1980-2011.

- Each analyzed country is grouped into one of the four categories, depending on the type of dollarization it belongs to. The above-mentioned authors defined the composite index of dollarization as a share of the public debt in the gross domestic product, then as a share of the total bank foreign-currency deposits in some monetary aggregates, and as a share of the government debt denominated in a foreign currency in the total debt of the government. All of the three aforementioned components constitute the composite index that takes a value ranging from 0 to 10. The calculated composite index gives us a possibility of measuring the degree of dollarization for each analyzed country from the sample, and has a value ranging from 0 to 30.

Based on the following two criteria, the type of dollarization is defined by:

- the level of domestic dollarization, and
- by the level of a foreign-currency borrowing by the private sector.

In this analysis, domestic dollarization is defined as the participation of the government's foreign-currency debt in the total public debt. Based on this participation, the analyzed countries are divided into two groups: those with a participation below 10%, and those whose participation exceeds 10%. The indicators of the foreign-currency indebtedness of the private sector are divided into two groups: those with a participation below 10%, and those whose participation exceeds 10%. These two criteria allow the dollarized countries to be divided into four categories, i.e. four types of dollarization, as shown in Table 2. The countries with a similar level of dollarization from both domestic and foreign sources (above 10%) are classified as Type 1; the countries in which dollarization is predominated by foreign sources are classified as Type 2; the countries where the source of dollarization is predominantly a domestic source are classified as Type 3; finally, the countries where dollarization is low (i.e. below 10%)

and based on domestic and foreign dollarization are classified into Type 4.

According to the above-mentioned authors, the advantages of this approach in measuring the degree of dollarization reflect in the ability to measure the level of domestic and foreign dollarization for each analyzed country. The benefits of this approach are also the easiness of calculating these quantitative indicators and the legerity of their understanding.

BENEFITS AND COSTS OF THE APPLICATION OF DOLLARIZATION

Lender of Last Resort

If a country renounces the use of the national currency, it also simultaneously renounces a possibility of pursuing an independent monetary policy, i.e. there is a risk in this case that a common monetary policy (in the case of a monetary union) or a foreign monetary policy (in the case of dollarization) will not correspond to the interests of the observed country at a given moment (Stanisic, 2012). The full dollarization concept eliminates the risk of the volatility of a foreign-currency exchange rate and a rapid devaluation and appreciation of the domestic currency against a foreign currency. The full dollarization convention signifies the elimination of the lender of last resort function last resort, whereby the central bank loses the ability to react to disruptions in the domestic and international financial systems by providing short-term liquidity to the financial system.

G. Calvo (2002) points out the fact that it is a mistake to link the lender of last resort function last resort to the capability of the central bank to issue money. According to this author, there are alternative ways through which a central bank can provide liquidity. First of all, it is for example thought that the central bank and the ministry of finance can: create a stabilization fund, or make contracts for credit lines with private banks.

On the other hand, A. Berg and E. Borensztein (2000) emphasize the need to make a distinction between the role of the central bank to provide short-term liquidity to commercial banks from its role as the ultimate guarantor of the stability of financial and payment transactions in the event of a banking crisis. Dollarization should not greatly impede the ability of the monetary authorities to provide short-term liquidity to the entire banking system or to individual banks faced with business problems. These decisions are available if the central bank pre-secures necessary assistance funds or concludes credit lines with international financial organizations. The country that applies full dollarization may have a problem with a rapid withdrawal of deposits, as well as the ability to guarantee the full operability of the payment system. The appropriate reaction of the central bank to the withdrawal of bank deposits in a dollarized economy depends on the cause for this withdrawal. If a withdrawal implies a transfer of a deposit from one bank to another, the withdrawal of liquidity from banks with stronger liquidity and the provision of liquidity to weaker institutions could be the appropriate action of the monetary authorities. However, if a withdrawal of deposits arises at the level of the entire banking system, the monetary authorities should have a fair amount of liquid assets. In this case, there is a need for a deposit insurance scheme, which would mean a certain degree of security for depositors. In their further analysis, the above-mentioned authors point out the fact that, in a dollarized economy, it is less likely that a withdrawal of deposits is due to the fact that all banking assets are denominated in dollars (or expressed in some other currency other than the dollar) and that the currency match of the balance sheet positions has been reached by the banks. Consequently, the risk of a weakened role of the lender of last resort function last resort is diminished.

In a situation where confidence in the banking system and in the overall financial system is reduced, a withdrawal of deposits may be significant in terms of amounts, which directly threatens the liquidity of the entire system. In the event that the central bank has the ability to exercise the lender of last resort function last resort, this liquidity crisis can be

avoided. According to C. Broda and E. L. Yeyati (2002), the very existence of the lender of last resort function gives an opportunity to provide an elastic supply of reserves that can preventively act in impeding a liquidity crisis. In addition, these authors emphasize the importance of the preventive role of the existence of a deposit insurance scheme. In analyzing the lender of last resort function last resort, the level of stress or instability in the banking system should be taken into account. According to C. Garcia-de-Andoain, F. Heider, M. Hoerova and S. Manganelli (2016), the degree of the stability of the banking system directly affects the level of the funds banks are willing to borrow on the interbank market, as well as the level of demand for the central bank's funds. In the case of instability, potential lenders may be less willing to provide liquidity, either because of the counterparty risk or because they want to keep liquidity for themselves for precautionary purposes.

The authors like O. Jeanne and C. Wyplosz (2001) consider the role of the lender of last resort in two ways: as a possibility of preventing a banking crisis, in the case of a significant outflow of deposits, on the one hand, and as a way of preventing a currency crisis, on the other. These authors offered two arrangements in order to prevent the emergence of a liquidity crisis: the one implying that by using the lender of last resort function last resort at an international level the central bank ensures liquidity on the international financial market, and the other implying restoring the security of and confidence in the domestic financial system through the implementation of the lender in the last instance. Both proposed arrangements entail a change in the financial architecture on a global scale: the first arrangement recommends the establishment of a global central bank, which will be able to issue an international currency, whereas the second arrangement could function as an international banking fund that would supervise the domestic banking system.

Of course, the other measures available to the central bank in order for it to deal with the withdrawal of deposits, such as a higher level of reserves requirements, improvements in the system of supervision and control of banks' operations and a ready set of measures for the preservation and improvement of financial stability, should be pointed

out. Of course, the listed measures should not only be isolated in order to apply to a fully-dollarized economy, but also to those at a lower dollarization level.

Seigniorage

Seigniorage is essentially an income of the central bank generated from printing money. According to M. J. M. Neumann (1992), there are three concepts of seigniorage: opportunity-cost seigniorage, monetary seigniorage, and extended monetary seigniorage. The opportunity cost of seigniorage observes seigniorage as an overall opportunity cost of the money holder. This approach stems from the question that additional real income would be generated for individuals if they had assets on the basis that would earn interest, instead of holding money that does not generate interest. The real opportunity cost of the seigniorage is calculated on the basis of the following calculation:

$$s_o = rB/P$$

where:

r - the nominal rate of return on other assets other than money,

B - the total amount of the money an individual owns, and

P - the level of consumer prices measured by the consumer price index.

The presented concept of defining seigniorage is adequate from the aspect of theoretical analysis. The analytical advantage of this approach is that the value of seigniorage is calculated based on the values that money functions have for the individuals who own it. At the same time, this concept does not identify a seigniorage with the interest income that such individuals could achieve if they had some other assets that would generate some form of income instead of having money. In order for this concept to be adapted for the purpose of an empirical analysis, M. J. M. Neumann (1992) points to the possibility of using the yield rate instead of using the nominal rate of return to other assets other than money,

simultaneously suggesting in his paper that this may be an average yield on government bonds or the rate of return on shares. Depending on the selected rate of yield, the level of seigniorage will be different. It should be noted that this concept of measuring seigniorage contains in itself a conceptual problem because the opportunity cost of the seigniorage is not equal to the real income of the monetary authorities from the printing of money because the structure of the portfolio owned by such monetary authorities significantly differs from the structure of the assets held by individuals, and consequently the opportunity cost of seigniorage does not provide a measure of revenue for the monetary authorities on the basis of money creation.

The concept of monetary seigniorage is defined as the ratio of the net change in money and the consumer price levels:

$$sM^* = AB/P$$

where:

AB - the net change in money supply, and

P - the level of consumer prices, measured by the consumer price index.

Monetary seigniorage in the definition of seigniorage starts from the measurement of the value of the transactions of the non-monetary assets used by money holders to trade in order to achieve the desired increase in the money supply level (AB). This approach to measuring seigniorage is a clear model from the aspect of theoretical analysis and the data necessary for his calculation are easy to collect. However, the very concept of monetary seigniorage does not provide a complete calculation of the value of the revenues which the monetary authorities derive from printing money. The two components constitute the total income from seigniorage. The first component is the real value of the non-monetary assets that the central bank generates in exchange for an increase in money supply. This component is measured by the traditional concept of monetary seigniorage, which has previously been defined. The second component of income from seigniorage is the interest earned by the central bank on the basis of the

possession of a non-government debt, i.e. the debt relating to domestic and foreign debtors. The central bank may occasionally realize capital gains (losses) by selling assets on the market at a higher (lower) price than the price it paid for the given asset.

Expanded monetary seigniorage is calculated in the following manner:

$$sM = sM^* + (dD + fF + GR) / P$$

where:

sM^* - monetary seigniorage,

dD - interest on the debt held by domestic debtors,

fF - interest on the debt held by foreign debtors,

GR - a capital gain (loss), and

P - the level of the consumer prices measured by the consumer price index.

S. Fischer (1982) distinguishes between active and passive seigniorage. Active seigniorage refers to the countries that have a high inflation rate, whereas passive seigniorage is present in fast-growing countries. In the case of passive seigniorage, this revenue is realized by the fact that money issuing is associated with a high level of economic growth, without any simultaneous occurrence of a high inflation rate.

According to G. N. Mankiw (1987), actual revenue seigniorage can be calculated as follows:

$$\dot{M}/P = \dot{M}/M * M/P = (\pi + g)kY$$

where:

$\pi = \dot{P}/P$ inflation rate,

$g = \dot{Y}/Y$ rate of output growth (the author does not specify which output is being analyzed), and

k - the constant.

G. N. Mankiw (1987) explains the theory of optimal seigniorage by the fact that the rate of an increase in money supply, inflation and nominal interest rates are

determined on the basis of the required revenues that the government of one country needs to realize. The theory of optimal seigniorage tries to test whether a higher tax rate is associated with a higher inflation rate and a higher nominal interest rate over time. The author carried out the above-mentioned testing on the data in the United States in the period 1951-1985, in which the three-month Treasury Bill Rate was taken so as to approximate the nominal interest rate, whereas when the average tax rate is concerned, government revenues were used as a percentage of the gross national product (GNP). The gross national product in the USA was used to determine the total economic activity until 1991, when the gross domestic product started being used. The conducted analysis showed that, in the mentioned period, the increase in the federal tax revenues of 1% had caused an increase in the nominal interest rate of 1.43%. The author thus showed that the influence of the growth of federal revenues, hence the tax rates, was positive and significant at the nominal interest rate. J. H. Haslag (1998) used data in the period 1965-1994 and calculated that, in the US economy, income from seigniorage measured as the ratio of earnings from seigniorage and the gross national product averaged about 2%, while income from taxes had a share of 22% in the gross national product. Thus, this author demonstrated that, when the US economy is concerned, the share of income from seniors in the gross national product is not negligible.

STABILITY AND INTEGRATION OF FINANCIAL MARKETS

When dollarization as a phenomenon in which a country accepts another currency as its own is concerned, it is necessary that analysis should be focused on the stability and integration of financial markets. In their work, R. Rennhack and M. Nozaki (2006), as well as I. Asel (2010), showed that, at the beginning of the 2000s, transition economies began to use more foreign exchange instead of the domestic currency due to general macroeconomic instability. The authors analyzed financial dollarization and

pointed out the fact that there had been a significant reduction in the inflation rate in the countries that had accepted a foreign currency. In the analyzed African countries (Angola, Ghana, Nigeria, South Africa, and Zambia), the average inflation rate in the period 1995-1999 decreased from 127% to 37.6% in the period 2000-2003; in the analyzed Asian countries (Indonesia, Laos, Korea, The Philippines, Thailand, and Vietnam), the average inflation rate decreased from 11.2% to 4.4%, respectively; in Latin American countries (Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Paraguay, Peru, Uruguay, and Venezuela), it decreased from 14.8% to 9.3%, respectively, whereas in the transition countries, that rate decreased from 44.1% to 10.4%, respectively. Since the year 2001, the level of financial dollarization has been reduced in some Latin American countries. For example, Argentina has affected its residents to convert their foreign currency deposits into pesos, which significantly lowered the level of dollarization. Bolivia, Peru and Uruguay have experienced a modest decrease in the share of foreign currency deposits in the total deposits, while the level of financial dollarization in Paraguay has been considerably reduced.

When inflation reduction due to the growth of financial dollarization is in question, further analysis should indicate the fact that the rational decision made by residents will be to have their deposits converted from the national currency to a foreign currency in order to protect their assets from the risks of a possible further inflation growth and loss of the value of these deposits. This analytical approach was applied by A. Ize and E. L. Yeyati (2003), who pointed to the importance of relative volatility in inflation in determining the degree of financial dollarization. The authors point out the fact that residents prefer to hold foreign-currency deposits especially if there is a high risk of developing a high inflation rate. If the inflation rate and the exchange rate are more volatile, residents hold the bulk of their foreign-currency portfolio and perceive the volatility of inflation in the context of a change in the real exchange rate. In this situation, the real value of foreign-currency-denominated assets

measured by domestic purchasing power shows a higher level of stability than in a situation in which a property is expressed in the domestic currency. If, on the other hand, the domestic inflation rate and the real exchange rate are stable, it will affect residents to consider domestic-currency assets as a better value guard. A. Ize and E. Parrado (2002) indicate that real and financial dollarization tend to increase due to the growth of the volatility of domestic inflation (which further affects the volatility of earnings and the rate of return on investments in the domestic currency), but they also decrease due to the growth of the foreign-exchange rate volatility (which increases the volatility of earnings indexed in the dollar, or the rate of return).

When speaking about the level of dollarization, it is necessary to point out the credibility of the monetary policy and the strength of institutions' operations (Jakšić, 2013; Jakšić & Jakšić, 2013). The institutions that are weak may just endanger the credibility of the work done by the monetary authorities because in this situation residents fear that the government, by their decisions, will endanger the value of their financial assets by implementing high inflation rates in the country. A. De la Torre and S. Schmukler (2004) point out the fact that weak institutions can increase uncertainty about the consistency of the application of a contract, thus encouraging residents to prematurely disclose their deposits or carry out such transactions in the countries that have a more secure legal system. In order to analyze the success of the work, institutions may use the World Bank's analysis for 215 countries in the framework of the Worldwide Governance Indicators (WGI) Project for the period 1996-2014. The subject matter of the analysis is the six dimensions that measure the level of global management indicators for each country, namely: the voice and accountability; political stability and the absence of violence; the government effectiveness; the quality of the regulatory bodies; the rule of law; and control of corruption.

Previous studies indicate that financial dollarization is a rational response to uncertainty about the level of the inflation rate. Financial dollarization will be at a high level in the countries with unstable and

high domestic inflation, in which institutions may also endanger confidence in the future movement of inflation. L. Chițu (2012) dealt with the analysis of the impact of unofficial dollarization on the major global financial crisis in the period 2007-2009 on the example of developing countries. The study showed that loan dollarization was a good indicator that could have predicted a reduction in the real gross domestic product (GDP) between 2007 and 2009, on a sample of about 60 developing countries. On average, it is estimated that the fall in the real GDP amounted to about 0.84 p.p. in those economies where the level of loan dollarization was higher than 10 p.p.

When speaking about the integration of financial markets on the example of the Russian Federation, the level of the integration and stability of financial markets within the framework of the existing financial dollarization, M. Brown, R. De Haas and V. Sokolov (2013) measure it by applying the following three indicators: the participation of domestic banks in the total number of banks in the country; the participation of the branches of domestic banks in the total number of the branches of the entire banking sector; and the participation of the foreign liabilities of domestic banks in the total liabilities of the banking sector. In this manner, the authors try to measure the extent to which the domestic banking sector is integrated with the rest of the financial sector. In a further analysis, this study seeks to find out whether the impact of domestic inflation on financial dollarization depends on whether the banking sector is integrated into the overall financial sector or not, and to what extent this integration is existent. If the banking sector is less integrated into the overall financial sector, banks cannot allocate their foreign assets to external markets or to international capital markets. This means that if a bank wants to neutralize the currency mismatch of its balance sheet position, it must necessarily use domestic-currency deposits for domestic-currency placements. When full dollarization is in question, reducing costs of borrowing is an additional advantage to financial integration. The use of the US dollar eliminates the risk of devaluation in the domestic currency zone, and should lower the level of interest rates on borrowing.

Table 3 The correlation of the inflation rate and euroization in Serbia

Year	Consumer price index in December of the observed year (in%)	Share of foreign currency placements in total placements of corporate and household (in%)	The share of foreign currency deposits in total corporate and household deposits (in%)
2011	7.00	70.70	78.50
2012	11.90	72.00	80.70
2013	2.20	73.20	76.70
2014	1.70	68.80	75.40
2015	1.50	71.40	72.80
2016	1.60	68.80	71.20
2017	3.00	67.00	69.20
2018	2.00	67.00	67.80
Koeficijent korelacije		0,38	0,72

Source: Author

Other studies, however, suggest that the integration of financial markets should take place before dollarization. For example, V. Bencivenga, E. Huybens and B. D. Smith (2001) have shown that dollarization has a different impact, which depends on the degree of the integration of the financial markets of the two economies. These authors have shown that dollarization has its benefits when markets are well-integrated, and this utility depends on the degree of dollarization. Otherwise, dollarization can be a source of instability in an economy.

EUROIZATION IN THE REPUBLIC OF SERBIA

In the literature, dollarization is the term more frequently used than the term euroization because pegs to the dollar are more widespread than pegs to the euro. This is why the term dollarization was used in the previous parts of this paper, whereas in the case of RS, the term euroization will be used. Only through a greater share of the dinar and the improved currency and the maturity match of the sources and the placements of the banking and non-banking sector could the level of currency risk be decreased, which would lead to the improvement of financial stability and an increase in the efficiency of the monetary policy.

The Serbian financial sector is euroized, with the high levels of both deposit and credit euroization. According to the data presented in the Report on the Dinarization of the Serbian Financial System from December 2018, at the end of the fourth quarter of the year 2018, the participation of the total receivables of the corporate and household sectors in the total receivables in dinars amounted to 33%, and this indicator increased by 0.2% compared to the previous quarter (National bank of Serbia, 2018a). The share of the dinar deposits in the total deposits of the corporate and household sectors at the end of the fourth quarter of the year 2018 was 32.2%, which was an increase by 1.2% compared to the end of the previous quarter. The dinar savings of households (residents and non-residents) deposited with banks in RS amounted to RSD 61.1 billion at the end of December 2018, which was an increase by RSD 4.6 billion compared to the end of September. The share of the dinar savings in the total savings amounted to 4.9% (at the end of September, they were 4.7%) at the end of 2018, which has been the highest level of participation so far.

In order to either accept or reject the initial hypothesis, correlation analysis will be applied on the data from the period between the years 2011 and 2018. The data contained in the Report on the Dinarization of the Serbian Financial System have been available since 2011. The data to be used for the purpose of the analysis is the inflation rate in RS measured

as the consumer price index, whereas the annual inflation rate in December in each of the observed years will be taken for the purpose of this analysis. In order to measure the degree of euroization in RS, two indicators will be used: the participation of foreign-exchange placements in the total placements to the corporate and household sectors, and a share of the foreign-currency deposits in the total deposits to the corporate and household sectors. For both indicators of the degree of euroization, their value as of December in each analyzed year will be used.

A correlation analysis is applied in order to determine whether there is a quantitative agreement between the above indicators or not, and if there is one, to what degree such agreement is. In the case of the two variables, simple correlation is in question, and in the case of multiple variables, there is multiple correlation. The simple linear correlation problem is to show that there is a simple straight-line relationship between the two variations. The correlation coefficient represents an indicator of the degree of the quantitative relationship between the variables. The coefficient of simple linear correlation is denoted by ρ in the population of the data, and in the sample with r , it can take values only in the interval from -1 to 1, i.e. $-1 \leq \rho \leq 1$ and $-1 \leq r \leq 1$.

Based on the data presented in Table 3, it is possible to conclude that there is a low correlation between the movement of the inflation rate and the participation of foreign-exchange placements in the total placements of the corporate and household sectors, which is 0.38. On the other hand, the degree of the correlation between the inflation rate and the share of the foreign-currency deposits of the corporate and household sectors in the total deposits is high, amounting to 0.72. This result can be explained by the fact that there is a higher prevalence of foreign currency deposits in comparison with foreign-currency placements in the total deposits/placements of the corporate and household sectors. On the basis of the presented results of the analysis, the hypothesis that there is a high interdependence between the rate of inflation and euroization measured as a share of foreign-currency deposits in the total deposits of the corporate and household sectors, whereas this interdependence

is low if the indicator used for euroization is a share of foreign-currency placements in the total placements of the corporate and household sectors, can partially be accepted.

In an environment characterized by a high euroization level, the National Bank of Serbia prevents the excessive short-term volatility of the exchange rate by intervening on the foreign-exchange market, bearing in mind the effects of the dinar exchange rate fluctuations on debtors' ability to repay their foreign-exchange liabilities. At the same time, inflation is within the target tolerance band, the financial system as a whole is stable, as well as the dinar exchange rate is, while the key policy rate is at its lowest level since inflation targeting was introduced (3% at this moment), leading to a stronger decrease in dinar lending rates and an increase in demand for dinar loans.

Bearing in mind the fact that macroeconomic stability and enhanced financial stability had been maintained since the introduction of the strategy of dinarization in 2012, a new Memorandum on the Strategy of Dinarization was signed between the Government and the National Bank of Serbia in December 2018 (National bank of Serbia, 2018b). The new Memorandum examined the results of the implementation of the dinarization strategy so far and proposed new measures so as to increase the use of the dinar in the financial system of RS, which is related to encouraging banks to use more funds in the domestic currency in order to increase the lending activity in dinars, working on a further development of the dinar securities market, as well as a further promotion of instruments for protection against foreign-currency risk (hedging instruments such as forwards, options, swaps).

CONCLUSION

Dollarization most frequently occurs in the countries exposed to a high inflation rate, a volatile exchange rate, and a reduced confidence in the domestic currency over a longer period of time. In such

circumstances, the acceptance of a foreign currency, either in whole or in part, implies that the foreign currency is used as a means of payment, a unit of measurement and savings. In addition to the said, wages and prices, as well as assets of greater value, such as apartments, houses and cars, are expressed in the foreign currency.

The overview of the main costs and benefits of applying dollarization is the key contribution of this paper. This is reflected in the lowering of the inflation rate, as import inflation is present, which is lower in comparison with the rate within the domestic frameworks. By lowering the inflation rate, the price and financial stability are achieved, which is an important prerequisite for the growth and development of an economy. In addition, dollarization contributes to the integration of financial markets and a reduction in transaction costs in trade. On the other hand, it should be noted that in the event of full dollarization, there is a loss of seigniorage, which in general can be defined as the monetary authority's revenue generated from printing money. Likewise, there is a possibility of losing the implementation of the lender of last resort function last resort, which limits the central bank's ability to provide liquidity in the short run. However, the other ways of securing liquidity to the banking sector and the entire financial sector should be highlighted through the creation of stabilization funds, as well as the conclusion of credit lines with international financial organizations.

By using the correlation coefficient between the year-on-year basis inflation rate measured as the consumer price index and the indicators of euroization in RS, that there is a high correlation between the rate of inflation and euroization measured as a share of foreign-currency deposits in the total deposits of the corporate and household sectors (0.72) has been proven. This interdependence is low if a share of foreign-currency placements in the total placements of the corporate and household sectors (0.38) is used. This means that the initial hypothesis is partially accepted, which can be explained by the fact that, in RS, there is a higher degree of euroization on the deposits side than on the placements side.

The paper also provides a brief overview of the current situation in the implementation of the dinarization strategy in RS, whose goal is to increase the use of the dinar in Serbia's financial system. Foreign-exchange risk, which is often materialized through a high level of non-performing loans based on foreign-exchange risk spreading to credit risk, will be reduced through a greater representation of dinar sources and placements. In order to prevent this, it is necessary for the monetary authorities, together with the representatives of the fiscal policy, to work in order to reduce the level of euroization in Serbia and to actively promote dinar savings, dinar loans and investments in dinar securities. In order to restore confidence in the national currency, it is necessary to maintain the achieved macroeconomic stability measured through low, stable and predictable inflation, maintain the relative stability of the foreign-exchange rate of the dinar against the euro, and promote dinar savings, which have a more favorable tax treatment in relation to savings in a foreign currency. The process of restoring confidence in the domestic currency is not an easy task to do, nor is it possible to do in a short time, because euroization in RS is deeply rooted.

As the topic of dollarization or euroization is actual and present in many countries not only inside our region, but also globally, this fact opens a possibility of the further analysis of this issue. The analysis may be aimed at showing the causes of dollarization and the reasons why highly dollarized countries have accepted a foreign currency as their own, measures in a struggle to reduce the level of dollarization (market, regulatory), as well as the sustainability of the results of these measures in the medium and long run. When the domestic frameworks are concerned, further analysis could be aimed at presenting the efficiency of the measures having been taken by the National Bank of Serbia and the Government of the Republic of Serbia so far, presenting the current situation regarding the level of dinarization by various indicators (the dinarization of deposits, the dinarization of loans, savings in dinars), and offering future measures.

A high degree of dollarization affects the efficiency of the monetary and fiscal policies, thus influencing the overall effects of economic policies on macroeconomic and financial stability, especially when the volatility of the domestic currency is expressed. The countries with a high level of dollarization also have a high passthrough effect of the exchange rate on inflation, i.e. the depreciation of the domestic currency is assumed to be spilling faster on the inflation rate. In such circumstances, the role of the monetary authorities is hampered to achieve and preserve the price and financial stability. For this reason, the representatives of the monetary authorities are aware of the fact that joint efforts with the representatives of the fiscal policy and the non-financial sector should resolve the high level of dollarization, and that the proposed solution is sustainable and efficient in the long run. This solution should be customized to each country individually and should be in line with the characteristics of the economy itself.

REFERENCES

- Asel, I. (2010). Financial sector development and dollarization in the economies of Central Asia. *Global Development Network Regional Research Competition Grant No. RRC IX-69*, 1-34.
- Bencivenga, V., Huybens, E., & Smith, B. D. (2001). Dollarization and the integration of international capital markets: A contribution to the theory of optimal currency areas. *Journal of Money, Credit and Banking*, 33(2), 548-589. doi:10.2307/2673916
- Berg, A., & Borensztein, E. (2000). The pros and cons of full dollarization. *IMF Working Paper*, WP/00/50, 1-33.
- Bogetić, Ž. (2000). Official dollarization: Current experiences and issues. *Cato Journal*, 20(2), 179-213.
- Broda, C., & Yeyati, E. L. (2002). Dollarization and the Lender of Last Resort. *MIT Press*, 1-55.
- Brown, M., De Haas, R., & Sokolov, V. (2013). Regional inflation and financial dollarization. *EBRD, Working Paper No. 163*, 1-22.
- Calvo, G. (2002). On dollarization. *The Economics of Transition and Institutional Change*, 10(2), 1-18. 393-403. doi.org/10.1111/1468-0351.00117
- Catao, L., & Terrones, M. (2016). Financial de-dollarization: A global perspective and the peruvian experience. *IMF Working Paper*, WP/16/97, 1-25.
- Chițu, L. (2012). Was unofficial dollarisation/euroisation an amplifier of the 'Great Recession' of 2007-09 in emerging economies? *ECB, Working paper series No 1473*, 1-45.
- De la Torre, A., & Schmukler, S. (2004). Coping with risk through mismatches: Domestic and international financial contracts for emerging economies. *World Bank Policy Research, Working Paper No. 3212*, 1-41.
- Fischer, S. (1982). Seigniorage and the case for a national money. *Journal of Political Economy*, 90(2), 295-313. doi.org/10.1086/261057
- Forbes, K., Sebastian, V., Mapingure, C., Charity, M., Kumbirai, M., Felistus, C., & Rumbidzai, M. (2013). Employee perceptions of dollarisation and the hospitality industry performance. *Australian Journal of Business and Management Research*, 2(10), 31-37.
- Garcia-de-Andoain, C., Heider, F., Hoerova, M., & Manganelli, S. (2016). Lending-of-last-resort is as lending-of-last-resort does: Central bank liquidity provision and interbank market functioning in the euro area. *ECB Working Paper Series*, No 1886, 1-62.
- Garcia-Escribano, M., & Sosa, S. (2011). What is driving financial de-dollarization in Latin America? *IMF Working Paper*, WP/11/10, 1-23.
- Haslag, J. H. (1998). Seigniorage revenue and monetary policy. Federal Reserve Bank of Dallas, *Economic Review*, 10-20.
- Heysen, S. (2005). Dollarization. *Finance & Development*, 44-45.
- Ize, A., & Parrado, E. (2002). Dollarization, monetary policy and the pass-through. *IMF Working Paper*, WP/02/188, 1-34.
- Ize, A., & Powell, A. (2004). Prudential Responses to De Facto Dollarization. *IMF Working Paper*, WP/04/66, 1-42.
- Ize, A., & Yeyati, E. L. (2003). Financial dollarization. *Journal of International Economics*, 59(2), 323-347. doi.org/10.1016/S0022-1996(02)00017-X
- Jácome, L. I., & Lönnberg, Å. (2010). Implementing official dollarization. *IMF Working Paper*, WP/10/106, 1-32.

- Jakšić, M. (2013). Makroekonomija i realni svet. *Ekonomске ideje i praksa*, 8, 25-34.
- Jakšić, M., & Jakšić, M. (2013). Political macroeconomy: The case of Serbia. *Economics & Economy*, 1(2), 77-90.
- Jeanne, O., & Wyplosz, C. (2001). The international lender of last resort: How large is large enough? *IMF Working Paper, WP/01/76*, 1-38.
- Makochehanwa, A. (2010). Zimbabwe's currency crisis: Which currency to adopt in the aftermath of the multi-currency regime? Munich Personal RePEc Archive, *MPRA Paper No. 22463*, 1-38.
- Mankiw, G. N. (1987). The optimal collection of seigniorage: Theory and evidence. *NBER, Working Paper No. 2270*, 1-27.
- Mwase, N., & Kumah, F. (2015). Revisiting the concept of dollarization: The global financial crisis and dollarization in low-income countries. *IMF Working Paper, WP/15/12*, 1-30.
- National bank of Serbia. (2018a). *Report On Dinarisation Of The Serbian Financial System*. Retrieved March 21, 2019, from http://www.nbs.rs/static/nbs_site/gen/english/90/dinarizacija/din_09_18.pdf
- National bank of Serbia. (2018b). *Memorandum on the Dinarisation Strategy*. Retrieved March 21, 2019, from http://www.nbs.rs/static/nbs_site/gen/english/90/dinarizacija/din_12_18.pdf
- Neumann, M. J. M. (1992). Seigniorage in the United States: How much does the U.S. government make from money production? Federal Reserve bank of St. Louis, *Review Journal*, March 1, 29-40.
- Ortiz, G. (1983). Dollarization in Mexico: Causes and Consequences. *Financial Policies and the World Capital Market: The Problem of Latin American Countries*, 71-106.
- Reinhart, C., Rogoff, K., & Savastano, M. (2003). Addicted to dollars. *NBER Working Paper 10015*, 1-67.
- Rennhack, R., & Nozaki, M. (2006). Financial Dollarization in Latin America. *IMF Working Paper, WP/06/7*, 1-36.
- Schuler, K. (2005). Some theory and history of dollarization. *Cato Journal*, 25(1), 115-125.
- Stanisic, N. (2012). Effects of international monetary integration on inflation, economic growth and current account. *Economic Horizons*, 14(1), 3-13. doi:10.5937/ekonhor1201003S

Received on 24th February 2019,
after revision,
accepted for publication on 20th August 2019
Published online on 23rd August 2019

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