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## TESTING THE POSSIBLE OCCURANCE OF A CURRENCY CRISIS IN THE SECOND DECADE OF THE 21ST CENTURY

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**Abstract:** Typically, currency crisis is linked with situation as ruined credibility of domestic economic policies. Monetary authorities must be careful in maintaining stable exchange rate regime. This means falls in real incomes, losses in output, decreases in employment, shocks which are reasons for outflow of investment and capital. In order to provide adequate explanations of disorders that occur in a financial system and collapse of the currency regime, the aim of this research is to analyze (theoretical and empirical) the possibility of currency crisis occurrence in Serbia in pre-pandemic period, from 2010 to 2019. Through empirical analyzes are used some indicators which are a sort of toolbox that may contribute for early revelation of a currency crisis.

**Keywords:** currency crisis, *exchange market pressure index*, misery index, Serbia.

### 1. INTRODUCTION

In the economic literature there is consensus that the early warning systems for currency crisis, no matter how high it is, the existence of the conditions for a currency crisis couldn't be predict in a whole. However, the economic losses that the currency crisis carries with it, such as: fiscal cost of restructuring the financial sector, the decline in economic activity, the income distortion and decline in credibility, underlines the importance of prevention from currency crises. The first plan should emphasize the use of all available methods that can help in early detection of malignant and highly permeable parts of the economic system subject to a currency crisis.

During the last fifteen years, with the development of many theoretical models of currency crises, in order to provide adequate explanations of disorders that occur in a financial system and collapse of the currency regime, there is an explosion of empirical analyzes that attempt to signal, predict and anticipate the possible existence of a currency crisis. Regarding this, the aim of this research is to analyze (theoretical and empirical) the possibility of currency crisis occurrence in Serbia in pre-pandemic period, from 2010 to 2019. Through empirical analyzes are used some indicators which are a sort of toolbox that may contribute for early detection of a currency crisis. So, the research considers two questions: were disorders in Serbia that could cause a currency crisis for the estimated pre-pandemic period, and which generation currency crises would be the closest for Serbia?

### 2. LITERATURE REVIEW

The economic literature recognizes various definitions for the term currency crisis. But one thing is certain, the currency crisis is an association for the outflow of capital, the escape of investors, the danger of currency depreciation.

The currency crisis can turn into a financial crisis, when the currency loss its stability, and thus confidence, as the amount of foreign exchange reserves is not so sufficient. Depending of the type of distortions that occur, the economic literature offers various theoretical models of currency crisis. Also, these crises reflect the distortions occurring in the financial system and the exchange rate.

Generally, the literature distinguishes three generations models of currency crisis.

The first generation model is called "speculative attack models". It explains the reasons for the occurrence of a currency crisis in Mexico and Argentina for the period from 1973 to 1982. The main reason is the conduct of an inadequate macroeconomic policy.

"Exit clause models" is the second generation model of currency crisis. According to this model, a country must have a fixed exchange rate that will be stable. But in situation with disturbances in the financial system, this is not a case for the exchange rate (Boshkov, 2018). This generation of currency crisis model reflects the disruption with the Exchange Rate Mechanism. The reason for this was the increase in the interest rates with the presence of a very low employment rate. In such a scenario, an economy considers abandoning the current exchange rate, for example, due to the benefits arising from an optimal currency area or the costs that alert the way of implementing an appropriate macroeconomic policy (Boshkov, 2018).

The possibility of transmission of the currency crisis is shown as a model of the third generation of the currency crisis. Explanations are in focus on a negative exogenous shock. Namely, the crisis is transmitted through trade as

the depreciation of the currency of one country weakens the competitiveness of another. Also, the third generation model of currency crisis contains elements of the first and second generation models of currency crisis.

### 3. INVESTIGATION OF POSSIBLE OCCURRING CURRENCY CRISIS IN SERBIA

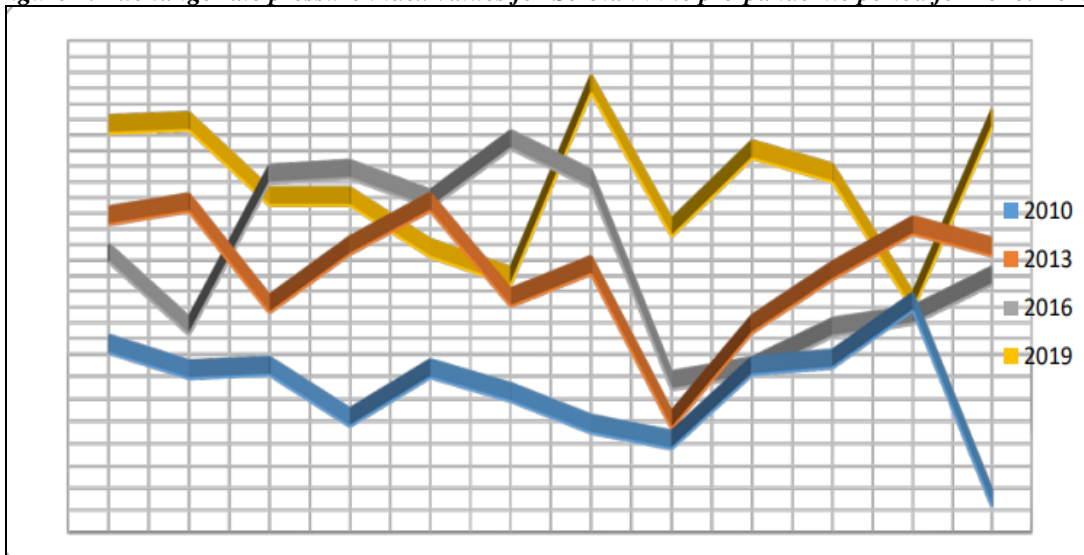
One of the indicators which are a sort of toolbox that may contribute for early detection of a currency crisis is the *exchange market pressure index*. The *exchange market pressure index* is defined as a weighted average of the monthly rates of change in the nominal exchange rate of the national currency against a stronger foreign currencies and the monthly rate of change in gross international foreign exchange reserves denominated in the stronger foreign currencies. Here we underline the necessity of taking into account the relationship of the Dinar against the Euro. The *exchange market pressure index* can be calculated using the following formula:

$$ipdt = \% \Delta e_t - \alpha \% \Delta r_t \quad (1)$$

where  $e$  denotes the exchange rate of the dinar against the euro at time  $t$ , while  $r$  refers to the amount of the gross international foreign exchange reserves denominated in euros, and  $\alpha$  is a measure of the standard deviation of changes in exchange rates and standard deviation of changes in foreign exchange reserves. The *exchange market pressure index* is defined as any increase in the depreciation of the Dinar and reduction in foreign exchange reserves, leads to an increase in the value of this index.

The paper analyzes pre-pandemic period, or the period from 2010 to 2019, stipulated by the movement of this index in the market of Serbia. Figure 1 shows the values of the index of pressure on the currency market of the Republic of Serbia in selected years on a monthly basis. The average value of the *exchange market pressure index* was about 6,82 in the analyzed period for Serbia.

**Figure 1. Exchange rate pressure index values for Serbia in the pre-pandemic period for 2010.-2019.**



Source: Author's calculation

Another indicator that could be used is *signal-to-noise ratio* - STNR, which is linked to the exchange market pressure index and supports the accuracy of its data. In fact, the STNR is used to estimate the likelihood of a currency crisis in a country. It is essential to note that the STNR actually represents the reciprocal value of the coefficient of variation, which is calculated as the ratio between the standard deviations ( $\sigma$ ) and the arithmetic mean ( $\mu$ ) of a value.

To calculate the STNR should be used the following formula:

$$STNR = \frac{\mu_a - \mu_b}{\sigma_a + \sigma_b} \quad (3)$$

To enter the country in a zone that alerts the existence of a currency crisis and its possible scenario, then is necessary STNR to be greater than 1/10, or more than 10% if we expressed as a percentage. In the case for Serbia, could be

concluded that the STNR is 15% for the months with the highest values of *ipdt*. The data support the fact that in Serbia was a chance for the emergence of a currency crisis with insignificant proportions in 2011 and 2014.

In the research we include misery index (MI), which is calculated as the difference between the sum of the unemployment rate, interest rates and inflation rates, as well as the percentage change in GDP *per capita*. High values of misery index indicate a bad economic situation and *vice versa*, countries with low values are in better position.

The formula for calculating the misery index is:

$$MI = (\text{unemployment rate} + \text{interest rate} + \text{inflation rate}) - \% \Delta BDP \text{ per capita.} \quad (4)$$

According some authors, the MI shouldn't be a simple sum of its elements, but that unemployment should carry a heavier weight. They suggested doubling the unemployment rate. So, for the first time, Hanke's 2022 Annual Misery Index is adopting double the unemployment-rate component, or,

$$HAMI = [(\text{Unemployment (\%)} * 2) + \text{Inflation (\%)} + \text{Bank-Lending Rate (\%)}] - \text{Real GDP Growth (\%)} \quad (5)$$

For this index we made comparison before pandemic, due to pandemic and post-pandemic period. According to available data, in 2019 before pandemic crisis, Serbia was ranked on 38 positions with MI of 15.8 value. Due the pandemic in 2020, the MI for Serbia was 18.4 and it was on 97 position of the rang. In 2021, the value of MI was 8.0 and it positioned Serbia on 122 of the rang. Table 1, shows that regarding the 54 position with MI of 41.1, the situation is worsened and the unemployment remains the main problem in Serbian economy.

**Table 1. Misery Index value for Serbia, 2022**

Rang	Country	Misery Index	Most influential factor
54	Serbia	41.138	Unemployment
39	Macedonia	50.4	Unemployment
84	Greece	31.128	Unemployment
18	BiH	75.9	Unemployment
98	Croatia	25.5	Unemployment
97	Albania	25.6	Unemployment
101	Bulgaria	24.6	Inflation
118	Slovenia	19.919	Unemployment
58	Hungary	40.242	Inflation
34	Montenegro	52.653	Unemployment

Source: EIU, 2022

Economic literature offers the fact that the countries in predicting currency crisis use indicators such as measures of openness of the country (MOC) and its precise modification - monetary measure of openness of the country. These indicators are based on data for international trade and international economic relations of the country. When we talk about the openness of the country, it represents the ratio between the size of a country's imports and gross domestic product (GDP) from which is subtracted the natural logarithm of the population of the country. Mathematical illustration of this index is:

$$MOC = \frac{\text{import}}{BDP} - \ln(N) \quad (6)$$

This connection leads to conclusion that a country with a larger population is less open because of it absorbs proportionally smaller amount of goods from abroad, so the country is less dependent of imports. But such a conclusion is not always exact regarding the structure of the capital and the level of technical achievements that are used in industry of the countries (Agénor et al., 2000). Therefore, the high value of this index, which for Serbia is about 1,05, can't be understood as relevant (high value of indicators in the group of countries with a similar population shows high import dependence, since the average for this group of countries slightly higher than 0, 5).

For assessing the degree of permeability of some economies on potential currency crisis scenario is used more precise indicator - monetary measure of openness of the country, which is calculated as follows:

$$MMOC = \frac{\text{foreign exchange reserves}}{\text{reserves money}} \quad (7)$$

The value of measure of monetary openness for Serbia is 229% (estimated with the same formula) and it is usually added to the average monetary openness of the country in terms of the observed group of countries (44 countries), which amounts 84.61%. It is very obvious that developing countries have much higher amounts of this indicator, which means that the economy is much more open, because the economic growth of these countries requires intensive international economic cooperation. Too much openness of the economy and international developed economic relations sometimes could be reason developing countries to be exposed on risk of excessive crisis (Sachs et al., 1996).

The research results suggest the existence of a currency crisis of the second generation for 2011 and 2014. An important feature of the second generation currency crises (exit clause models) are the expectations of private investors, which are formed on the basis of economic policy. However, the potential crisis bears some features of the first generation of the model, which explain the crisis of unsustainable movement of some fundamental macroeconomic variables, for example, expressed real appreciation of the currency or large current account deficit (Krugman, 2000). It is important to underline that many authors consider that Serbia was actually on the border between the second and third model of currency crises (also explained in the Literature Review).

Due to the occurrence of "hot money" and foreign direct investment, capital structure review which enters in the country and its purpose, is one of the priorities of the economic policy makers, in order to determine the appropriate measures to stabilize the economy. Expected changes in exchange rates will act on those variables whose alteration increases the cost of maintaining the exchange rate. When these costs become very high, policy makers may choose devaluation and thus *ex post* confirm the expectations of a currency crisis for market participants.

With high unemployment rate, the monetary authorities will be less able to defend the exchange rate with higher interest rates of speculative attacks, because this will exacerbate the problem of unemployment. Currency depreciation can be scenario due the high employment rate which isn't tolerated by the government. The high level of public debt also increases the cost of defending the exchange rate and speculative attacks. When the devaluation expectations embedded in the nominal interest rate, the higher the interest expense on the debt will lead to an increase in maintenance costs of the exchange rate. Also, speculative attack may occur if the local currency is overvalued. An overvalued currency is the cause of a current account deficit, which is sometimes the cause of deflationary pressure. The monetary authorities in the situation always estimate the costs of defending the exchange rate are higher than the benefits (Lestano and Jacobs, 2007). As could be seen, not only macroeconomic variables, but also the changes in the expectations of economic agents have crucial role in the output clause model.

**Table 2. Exchange market pressure index for Serbia**

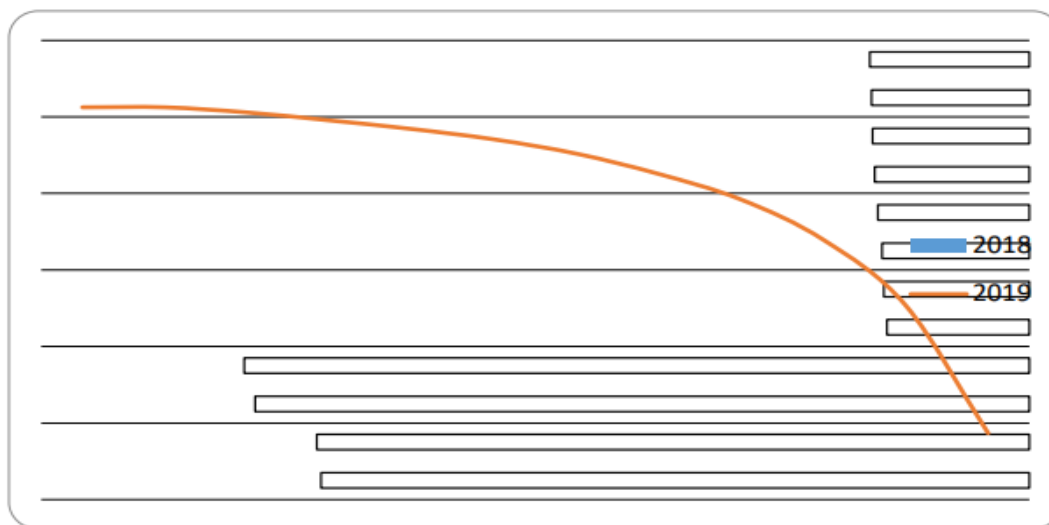
EMPI		2018		2019	
2018	2019	max	-1,73	max	-8,76
-8,60	-8,76	STNR	2,86	STNR	6,87
-8,65	-8,76				
-9,40	-9,43				
-9,53	-10,47	1.73<2.86		-8.76<6.87	
-1,73	-11,59	No crisis			
-1,77	-12,95				
-1,79	-14,82				
-1,84	-17,47				
-1,88	-20,82				
-1,91	-26,08				
-1,92	-34,66				
-1,94	-51,34				
-4,25	-18,93				
3,56	12,90				

Source: Author's calculation

The main conclusion for Serbia is that there is no currency crisis for end of the targeted period i.e. for 2018 and 2019, because the estimation shows  $1.73 < 2.86$  for 2018. The conclusion is the same for last year – 2019, because:  $-8.76 < 6.87$ .

This result we show also in a Figure 2 below:

*Figure 2. Exchange market pressure index for Serbia*



Source: Authors' estimations.

## 6. CONCLUSION

A currency crisis is known as a capital outflow crisis. Capital outflow occurs when investor confidence is broken. In this kind of situation there is an expectation to flow money out of that country. They will sell the investments denominated in the foreign exchange rate and then change those investments into foreign currency. This scenario determines disturbance of the exchange rate regime.

This paper has shown that in order to predict whether a country is at risk of a currency crisis, multiple variables are examined and multiple analyzes are performed. The most common factors that are indicated as the cause of a currency crisis are excessive current account deficits, rapid growth of the currency, excessive speculative attacks, exogenous shocks that cause distortions in the foreign exchange market.

It is important to underline that many authors consider that Serbia in one period of time was actually on the border between the second and third model of currency crises. Due to the occurrence of "hot money" and foreign direct investment, capital structure review which enters in the country and its purpose, is one of the priorities of the economic policy makers, in order to determine the appropriate measures in stabilizing the economy. Expected changes in exchange rates will act on those variables whose change increases the cost of maintaining the exchange rate. When these costs become too high, policy makers may decide for devaluation and thus ex post confirm the expectations of a currency crisis for market participants. The research results indicate that the *ipdt* for Serbia was highest in 2011 and 2014, which suggests the existence of a currency crisis of the second generation. An important feature of the second generation currency crises (exit clause models) are the expectations of private investors, which are formed on the basis of economic policy. But the results for 2018 to 2019 showed that there was not possibility for currency crisis.

Political instability in Serbia has undoubtedly acted decisively to the growth of the negative expectations of investors regarding the sustainability of the achieved level of macroeconomic stability and prospects for development of the country. Intervention on the foreign exchange market, selling the euro and raising the benchmark interest rate, the National Bank of Serbia has managed to curb the increasing depreciation of the dinar. However, one should not have illusions that the system is stabilized and that the negative expectations deflated. It should be added before starting the process of accumulation of risks of instability which is reflected in a growing current account deficit, and recently significant budgetary imbalances. Therefore, it appears that the poor results are trigger for the financial crisis. However, the potential crisis bears some features of the first generation of the model, which explain the crisis of unsustainable movement of some fundamental macroeconomic variables, for example, expressed real appreciation of the currency or large current account deficit (Krugman, 2000).

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