TEME, Vol. XLIX, Nº 1, January – March 2025, pp. 129–141

Review article
Received: November 4, 2023
Revised: June 22, 2024
Accepted: June 22, 2024

https://doi.org/10.22190/TEME231104008S
UDC 336.748

THE RELIABILITY OF THE MONETARY TRILEMMA THEORY ON THE EXAMPLE OF TRANSITION COUNTRIES

Milica Simić, Lidija Madžar, Suzana Balaban*

Alfa BK University, Belgrade, Serbia

ORCID iDs: Milica Simić https://orcid.org/0000-0002-0652-3799
Lidija Madžar https://orcid.org/0000-0002-1708-5683
Suzana Balaban https://orcid.org/0000-0001-8132-9120

Abstract

The purpose of this paper is to evaluate the reliability of the monetary trilemma theory in selected transition countries (Albania, Armenia, Russia, Serbia and Ukraine) in the period between 2007 and 2021. The paper tests the validity of the monetary trilemma theory, which implies that it is impossible to concurrently achieve exchange rate stability, independent monetary policy and financial integration, i.e. free capital flows. Bearing in mind that financial integrations represent a cornerstone of contemporary world functioning, the initial hypothesis is defined in such a way that the choice of a nation's exchange rate arrangement affects the degree of its monetary policy autonomy. The validity of the monetary trilemma hypothesis was assessed by an intuitive linear regression model proposed by the authors Aizenman et al. (2013). However, the obtained results did not support the validity of the monetary trilemma theory on the example of the five analysed transition countries in the given period. This fact points to the conclusion that the choice of foreign exchange arrangement does not affect the level of the observed countries' monetary policy independence.

Key words: monetary trilemma, monetary autonomy, exchange rate, free capital mobility, transition countries.

ВЕРОДОСТОЈНОСТ ТЕОРИЈЕ МОНЕТАРНЕ ТРИЛЕМЕ НА ПРИМЕРУ ЗЕМАЉА У ТРАНЗИЦИЈИ

Апстракт

Сврха овог рада јесте да оцени поузданост, односно валидност теорије монетарне трилеме у одабраним земљама у транзицији (Албанији, Јерменији, Русији, Србији и Украјини) у периоду од 2007. до 2021. године. У раду се тестира веродостој-

* Corresponding author: Suzana Balaban, Alfa BK University, Palmira Toljatija 3, New 11070 Belgrade, Serbia, suzana.balaban@alfa.edu.rs

ност теорије монетарне трилеме која подразумева да није могуће истовремено водити политику стабилног девизног курса, аутономне монетарне политике и финансијске интеграције, односно слободног кретања капитала. Имајући у виду да финансијске интеграције свакако представљају камен темељац функционисања савременог света, у чланку се полази од претпоставке да избор режима девизног курса од стране дате земље утиче на степен њене монетарне аутономије. Валидност хипотезе о монетарној трилеми је процењена интуитивним моделом линеарне регресије који су предложили аутори Aizenman и др. (2013). Међутим, добијени резултати нису потврдили валидност теорије монетарне трилеме на примеру пет анализираних земаља у транзицији у датом периоду, указујући и на закључак да избор девизног режима не утиче на ниво независности монетарне политике посматраних земаља.

Кључне речи: монетарна трилема, монетарна независност, девизни курс, слободан проток капитала, земље у транзицији.

INTRODUCTION

Trilemma explains the way in which free capital flows and a fixed exchange rate regime limit the autonomy of monetary policy, emphasising that, at a given point in time, only two of these three options are possible (see Figure 1). In accordance with monetary trilemma hypothesis in the recent conditions of growing financial integration, it can be concluded that in the absence of capital flow restrictions, monetary policy can be independent only in a flexible exchange rate arrangement. Following the traditional approach to the interpretation of the monetary trilemma theory in the regime of a fixed exchange rate and in the conditions of free capital flows, domestic interest rates cannot be formed independently; in other words, it can be said that in these circumstances the domestic country's monetary authorities are not independent. Monetary independence can be interpreted as the ability of a country's monetary authorities to set interest rates independently (Goczek, & Mycielska, 2019). In the case in which

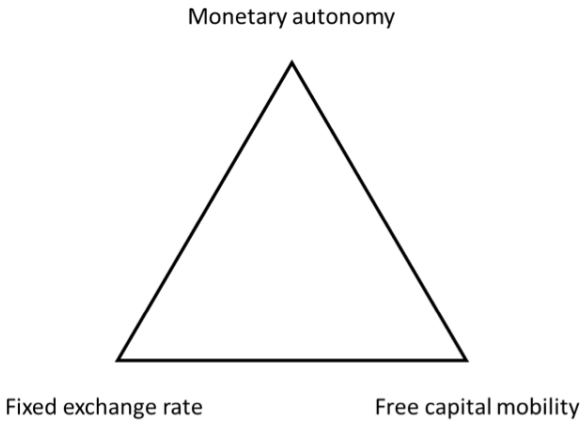


Figure 1. The policy trilemma

the movements of the domestic interest rate are influenced to a greater or lesser extent by the interest rate of the base country, it is said that the monetary policy of the domestic country is not independent.

Hausmann, Panizza and Stein (2001), and Calvo and Reinhart (2002) suggested that the fear of floating prevents certain countries with *de jure* flexible exchange rate regimes from allowing the exchange rates of their national currencies to move freely. Frankel, Schmukler and Servén (2004), and Shambaugh (2004) state that in more flexible exchange rate regimes, domestic interest rates follow the interest rates of the base countries to a lesser extent. More recently, Aizenman, Chinn and Ito (2010) concluded that the validity of the trilemma theory in developing countries depends on the nature of external financing and the level of financial development. Based on the example of 126 countries, Bleaney, Lee and Lloyd (2013) conclude that countries with a credible exchange rate arrangement that do not apply any capital restrictions are not monetarily independent since their interest rates follow foreign ones, regardless of the exchange rate arrangement. Analysing the case of three small Latin American countries with flexible exchange rates, Edwards (2015) notes that if there is a fear of fluctuations, local monetary authorities will raise base interest rates to avoid the devaluation of their national currency regardless of the exchange rate arrangement. Ray (2014) considers that external shocks can be imported even in developed economies with freely flexible exchange rate regimes and developed domestic financial markets, such as Sweden, Canada, New Zealand and Great Britain. According to Rey (2015), monetary autonomy does not ensure a country's isolation from global economic shocks. Instead, monetary policy in countries with a floating exchange rate or strong control of international capital flows is more resistant to external shocks. Finally, Obstfeld and Taylor (2017) synthesised the previous explanations into one theory called the Monetary Policy Trilemma, which states that a country can simultaneously achieve only two of the following three goals: exchange rate stability, free capital mobility, and the implementation of monetary policy based on domestic goals. These authors also emphasise that during the last decades, many countries have switched their exchange rate arrangement to floating ones in order to achieve free capital mobility and an independent monetary policy.

By conducting research on the sample of over 110 developing and industrial countries for the period between 1973 and 2000, Shambaugh (2004) did not confirm the validity of the monetary trilemma theory, while Aizenman, Chinn and Ito (2013) confirmed the validity of the monetary trilemma theory on the example of 184 countries for the period between 1970 and 2010. Popper, Mandilaras and Bird (2013), and Herwartz and Roestel (2017) found that trilemma policy stability is highly connected with the level of FE reserves. Ihnatov and Căpraru (2014) concluded that free capital mobility has led to monetary autonomy in the CEE coun-

tries in the period between 1999 and 2010. On the other hand, Han and Wei (2018) argued that, without capital restrictions, a floating exchange rate arrangement may provide monetary autonomy. The mentioned authors observed the U.S. and 28 other countries in the period between 1990 and 2014. On the example of 161 countries during the period between 1970 and 2013, Ligonniere (2018) drew a conclusion that the validity of the monetary trilemma depends on global financial cycles. Rohit, Kumar and Dash (2019) also confirmed this conclusion, but only for a short time horizon. Milošević, Bjelica and Balaban (2020) showed that the monetary trilemma theory was valid only for 9 new members of the European Union, and for the period between 2000 and 2018. Finally, on the example of 180 analysed countries during the period between 1970 and 2020, Aizenman, Chinn and Ito (2023) drew a conclusion that the validity of the monetary trilemma depends on economic conditions, bearing in mind the fact that countries have applied policy mixes that varied over time.

MATERIALS AND METHODS

The analysed data panel consists of the following five transition countries for which it was possible to collect data on the money market rate: Albania, Armenia, Russia, Serbia and Ukraine, and covers the period between 2007 and 2021. For the purpose of this analysis, the data was obtained from the regular International Monetary Fund's (IMF) Annual Reports on Exchange Arrangements and Exchange Restrictions (AREAER), IMF's International Financial Statistics database, as well as the websites of relevant national central banks. The authors estimate the reliability of the monetary trilemma theory by applying the intuitive, i.e. simple linear functional equation proposed by Aizenman et al. (2013):

$$\alpha MI_{i,t} + \beta ERS_{i,t} + \delta KAOPEN_{i,t} = 1,$$

where $MI_{i,t}$ – is the Index of monetary independence, $ERS_{i,t}$ – is the Index of exchange rate stability, while $KAOPEN_{i,t}$ – is the Capital controls index.

The simple linear form of the monetary trilemma theory indicate that the weighted sum of three observed variables is constant and amounts to one, which further means that a growth in one variable should be followed by a decreasing sum of the other two. Bearing in mind the fact that financial integrations have grown into a certainty of the contemporary world, the papers' initial assumption is defined in such a way that the choice of exchange rate regime by a certain country has implications on the degree of its monetary policy independence.

According to the methodology used by Aizenman et al. (2013), the Index of monetary independence (*MI*) is measured by the following formula:

$$MI = 1 - \frac{corr(i_i, i_j) + 1}{2},$$

Where i_i represents the interest rate of the home country's money market rate, while i_j represents the interest rate of the base country's money market rate. The authors defined the base country in accordance with the approach of Shambaug (2004), and Cevik and Zhu (2019). The values of the MI index range from 0 to 1, where its lower values imply a lower monetary independence, while its higher values imply greater monetary autonomy. It is worth mentioning that all observed countries have applied the inflation-targeting monetary policy frameworks (see Table 1). At the same time, monetary independence implies that the observed country can implement a monetary policy in accordance with its domestic economic goals (Obstfeld, Shambough, & Taylor, 2004). On the other hand, Montes, Silva, Bastos and Batista (2022) consider that, in recent times, when there are stable exchange rate and free capital mobility, the level of independence of monetary policy has been reduced.

Table 1. Monetary policy framework and EXR arrangement of observed transition countries

Country	Monetary policy framework	EXR arrangement
Albania	Inflation-targeting framework	Floating
Armenia	Inflation-targeting framework	Floating
Russia	Inflation-targeting framework	Free floating
Serbia	Inflation-targeting framework	Stabilised arrangement
Ukraine	Inflation-targeting framework	Floating

Source: Annual Report on Exchange Arrangement and Exchange Restrictions (2022)

The exchange rate stability in the observed countries is measured by the Index of the exchange rate stability (*ERS*), which is based on the deviations of the monthly exchange rate of the domestic currency in relation to the currency of the base country, and it is calculated by the following formula (Aizenman et al., 2013):

$$ERS = \frac{0.01}{0.01 + SD(\Delta(\log(exr\_rate)))}$$

The ERS index ranges from 0 to 1, where its higher values indicate a greater stability of the exchange rate, and vice versa. Ilzetzki, Reinhart and Rogoff (2019) argued that most countries try to stabilise their exchange rates in the conditions of declining capital controls.

It is worth to mention that from the analysed sample countries, Albania, Armenia, Russia and Ukraine have applied the floating exchange rate arrangements, while Serbia used the stabilized exchange rate arrangement (see Table 1).

The Capital control index, $KAOPEN_{i,t}$, is calculated according to the methodology proposed by Chin and Ito (2008), on the basis of data taken from the IMF's Annual Reports on Exchange Arrangements and Exchange Restrictions (2006-2022). $KAOPEN_{i,t}$ includes the following measures:

k_{1t} – existence of dual or multiple exchange rate structures;

k_{2t} – restrictions on the current account transactions of the balance of payments;

k_{3t} – restrictions on capital account transactions; and

k_{4t} – repatriation requirements and surrender requirements.

To emphasise financial liberalisation, the authors introduced a dummy variable that takes a value of 1 for the absence of restrictions, and 0 everywhere else. Finally, for calculating $KAOPEN_{i,t}$, Principal component analysis (PCA) was applied to all of the mentioned variables. For calculating this indicator, data was also derived from the IMF's Annual Reports on Exchange Arrangement and Exchange Restrictions (2006-2022). Stevanović, Marković and Lepojević (2022) consider that FDI inflows are the key component of country openness, while Balaban, Živkov and Milenković (2019), and Veselinović, Despotović and Stevanović (2022) showed that it contributes to economic development in small transition economies. Aizenman and Ito (2010) showed that emerging economies applied managed exchange rate arrangements, followed by middle monetary autonomy and controlled capital mobility. Finally, Madžar (2018) suggests that small countries are, among other things, characterised by the openness of the economy, a relatively narrow and shallow financial sector, difficult access to capital sources, and the flexibility of their exchange rate.

RESULTS AND DISCUSSION

Of all the observed countries, Russia had the highest level of monetary autonomy during the period between 2007 and 2021 (the average level of the MI index was 0.538998), followed by Armenia, whose average level of the MI index was 0.527115. The average level of the MI index in Serbia was 0.446797, while its value in Ukraine amounted to 0.439436 in the observed period. The least level of monetary autonomy was recorded in Albania (the average level of the MI index was 0.336598) during the observed period.

Albania and Serbia had the most stable exchange rate in the observed period. Namely, average value of the ERS index in Albania was 0.75, while its value was 0.70 in Serbia. Contrary to that, Russia and Ukraine had the least stable exchange rate during the period between 2007 and 2021. The average value of the ERS index in Russia was 0.41, while its value was 0.40 in Ukraine. The only currency that strengthened its value (3.11%) in the observed period was The Albanian lek (ALL).

The Ukrainian hryvnia (UAH) recorded an almost fivefold (4.72) decrease in its value, while the Russian rubble (RUB) fell by 180%, the Serbian dinar (RSD) by 48.84% and the Armenian dram (AMD), to a lesser extent, by 33.61%.

According to the calculated $KAOPEN_{i,t}$ indices, Ukraine was the country with the most capital restrictions during the period between 2007 and 2021. Albania, Russia and Serbia did not apply the dual or multiple exchange rate arrangement (k_{1t}), while Armenia and Ukraine did. In terms of restrictions on current capital account transactions (k_{2t}), the most liberal countries were Armenia and Russia (no capital restrictions introduced), while Serbia and Ukraine had permanent restrictions on current capital account transactions in the observed period. The most intense and extensive restrictions on capital account transactions (k_{3t}) were introduced in Ukraine (0.02) and Serbia (0.11), while the most liberal countries in this regard were Armenia (0.66) and Russia (0.47). Finally, Armenia was the only country that did not introduce repatriation and surrender requirements (k_{4t}).Table 2 provides data on the descriptive statistics of the monetary trilemma variables used in this research.

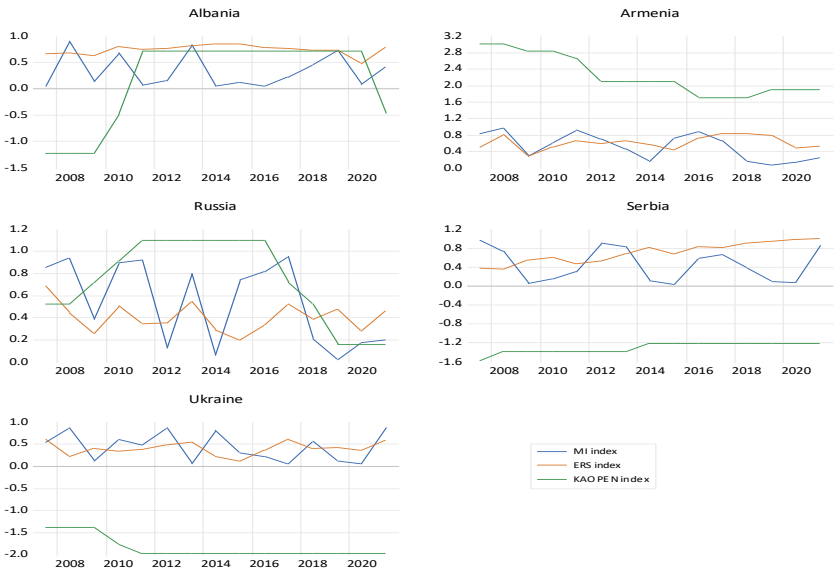
Table 2. Descriptive statistics of the used variables

	MI index	ERS index	$KAOPEN_t$ index
Mean	0.457788	0.575761	1.80E-15
Median	0.424017	0.552382	0.159090
Maximum	0.964709	0.996150	3.019498
Minimum	0.016268	0.115070	-1.969702
Standard deviation	0.337067	0.210858	1.542989
Jarque-Bera	8.440527	2.483208	5.359975
Probability	0.014695	0.288920	0.068564

Source: Authors' calculations

The monetary trilemma indices for all observed transition countries during the period between 2007 and 2021 are presented in Graph 1, simultaneously pointing to the colourful landscape of the monetary policy trilemma triangle apexes.

After conducting a correlation analysis that indicated that there was no multicollinearity among the observed predictors (see next Table 3 for details), as well as that none of the correlations were statistically significant, the authors approached the estimation of the validity of the monetary trilemma theory by using the simple linear functional equation form proposed by Aizenman et al. (2013).



Graph 1. Monetary trilemma indices for observed transition countries from 2007 to 2021

Source: Authors'calculation based on Annual Report on Exchange Arrangement and Exchange Restrictions (2022)

Table 3. The results of the conducted correlation analysis

Pearson correlation coefficient	MI index	ERS index	$KAOPEN_t$ index
MI index	1.000000		
ERS index	-0.085544	1.000000	
$KAOPEN_t$ index	0.119245	0.094424	1.000000

Source: Authors' calculations

Namely, according to Aizenman et al. (2013) the greater the R squared is, the greater the support for the reliability of the monetary trilemma theory. However, the obtained results suggest that the linear functional form is not an appropriate one for testing the reliability of the monetary trilemma theory in the observed transition countries during the period between 2007 and 2021, bearing in mind the fact that the coefficient of determination, R squared, is not valid for nonlinear regression. As robustness checks, Aizenman (2013) proposed a regression of $MI_{i,t}$ on $ERS_{i,t}$ and $KAOPEN_{i,t}$. However, the obtained results (a negative value of R squared) also suggest that the monetary trilemma theory in the observed transition countries was not valid during the period between 2007 and 2021 (see Table 4).

Table 4. The results of the intuitive linear regression analysis

Variables	Coefficient	Standard error	t-Statistic	Prob.
C	0.547686	0.114500	4.783301	0.0000
ERS index	-0.156137	0.186982	-0.835038	0.4065
$KAOPEN_t$ index	0.028064	0.025552	1.098294	0.2757
R-squared	0.023675			
Adj. R-squared	-0.003445			
S.E. of regression	0.337647			
F-statistic	0.872955			
Prob. (F-statistic)	0.422089			
Durbin-Watson	1.964387			

Source: Authors' calculations

CONCLUSIONS

The article tests the reliability of the monetary trilemma theory, which implies the impossibility of countries simultaneously achieving exchange rate stability, conducting independent monetary policy and obtaining free capital movements in contemporaneity. Considering the comprehensive and pervasive presence of financial integration in the modern world, the paper starts from the assumption that the choice of exchange rate regime by a certain country affects the level of its monetary policy independence. The paper considers a panel of data from five selected transition countries (Albania, Armenia, Russia, Serbia and Ukraine) in the period between 2007 and 2021, for which it was possible to obtain data on money market rates.

In the observed period, Russia was the most monetarily independent country measured by the MI index, followed by Armenia, Serbia, Ukraine and finally Albania, as the country with the most intensive observed binding of its domestic money market rate to the Eurozone money market rate. While Albania and Serbia had the most stable exchange rate in the observed time frame, Russia and Ukraine experienced the least stability of their exchange rate, with pronounced devaluations of their national currency. Unlike the Albanian currency, which remained relatively stable, Ukraine experienced an almost five-fold devaluation of its national currency, followed by its weakening in Russia (by 180%), Serbia (by 48.84%) and Armenia (by 33.61%).

Finally, the analysis showed that Armenia was the most liberal, while Ukraine was the most protected country from the perspective of all four constructors of the $KAOPEN_{i,t}$ indices. While Armenia and Ukraine had dual and multiple exchange rates, Albania, Russia and Serbia were exceptions in this respect. From the perspective of restrictions on capital current account transactions, the most liberal were Armenia and Russia, and to a lesser extent Albania, while Serbia and Ukraine had constant re-

strictions of this type in the observed period. Unlike other countries, Armenia was the only nation that did not introduce requirements for income repatriation and surrender of export proceeds. Finally, Ukraine and Serbia recorded the most intensive and extensive restrictions on their capital account transactions, followed by Albania, while Armenia and Russia had the most liberal regime in this regard.

In this paper, the authors estimate the reliability of the monetary trilemma theory by intuitive, i.e. simple linear functional equation proposed by Aizenman et al. (2013). Namely, according to Aizenman et al. (2013) the greater the coefficient of determination, R squared, the greater the support for the reliability of the monetary trilemma theory. However, the obtained results suggest that the linear functional form is not appropriate for testing the reliability of the monetary trilemma theory in the observed transition countries during the period between 2007 and 2021, bearing in mind the fact that R squared is not valid for nonlinear regression. As robustness checks, Aizenman (2013) proposed conducting a regression of $MI_{i,t}$ on $ERS_{i,t}$ and $KAOPEN_{i,t}$. However, the obtained results (a negative value of R squared) also suggest that the monetary trilemma theory in the observed transition countries was not valid during the period between 2007 and 2021.

The main limitations of this research are related to the lack of data for countries in transition due to the turbulent events from their past, from the disintegration of the former Yugoslavia and the emergence of new states, through their war conflicts and ethnical tensions, all the way to the emergence of hyperinflation and general economic instability. It is recommended that future research test the validity of the monetary trilemma theory through nonlinear functional forms on a larger sample of data, bearing in mind the obtained results and the limitations of this analysis.

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ВЕРОДОСТОЈНОСТ ТЕОРИЈЕ МОНЕТАРНЕ ТРИЛЕМЕ НА ПРИМЕРУ ЗЕМАЉА У ТРАНЗИЦИЈИ

Милица Симић, Лидија Мађар, Сузана Балабан
Алфа БК Универзитет, Београд, Србија

Резиме

Сврха овог рада јесте оцена поузданости, односно валидности теорије монетарне трилеме у одабраним земљама у транзицији у периоду од 2007. до 2021. године. Теорија монетарне трилеме указује на немогућност истовременог постизања три основна циља монетарне политике: (1) стабилности девизног курса, (2) независне монетарне политике и (3) слободног протока капитала. Трилема заправо објашњава како слободни токови капитала и режим фиксног девизног курса ограничавају аутономију монетарне политике, наглашавајући да су у датом тренутку могуће само две од ове три опције. У складу са хипотезом монетарне трилеме у новијим условима растуће финансијске интеграције, може се закључити да у одсуству ограничења токова капитала, монетарна политика може бити независна само у флексибилном аранжману девизног курса. Будући да су финансијске интеграције нужност савремених глобалних кретања, може се поставити почетна хипотеза у смислу да избор адекватног девизног режима одређене земље у значајној мери утиче на ниво независности њене монетарне политике. Поузданост, односно валидност трилеме оцењена је једноставним лине-

арним функционалним обликом који су предложили Aizenman и др. (2013), а која се међутим у овом случају није показала као адекватна. Наиме, према Aizenman и др. (2013) виши ниво показатеља коефицијента детерминације (P на квадрат) указује на бољу спецификацију модела, што у овом случају није било потврђено. Такође, исти аутори у виду провере робусности добијеног модела сугеришу регресију показатеља MIi,t на ERSi,t и KAOPENi,t . У овом би случају висок ниво коефицијента детерминације такође сугерисао да је теорију монетарне трилеме могуће потврдити. Међутим, као и у преходном случају, негативна вредност P на квадрат потврђује претходно добијене закључке. Коначно, може се извући закључак да добијени резултати не иду у прилог применљивости теорије монетарне трилеме на примеру разматраних пет транзиционих земаља у периоду од 2007. до 2021. године, што указује на чињеницу да избор девизног режима не утиче на ниво независности монетарне политике посматраних земаља. Као основно ограничење спроведеног истраживања, аутори наводе недостатак података за земље у транзицији због турбулетних догађаја које су их задесили у прошлости, од распада бивше Југославије, настанка нових држава, ратова и етничких тензија, па све до појаве хиперинфлације и опште привредне нестабилности. За будућа истраживања препоручује се тестирање теорије валидности монетарне трилеме путем нелинераних функционалних форми на већем узорку података.