

6. EQUILIBRIUM REAL EXCHANGE RATE ASSESSMENT OF THE SERBIAN DINAR: THE MB APPROACH

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Abstract

This paper attempts to empirically estimate the equilibrium exchange rate level of the Serbian dinar. For that purpose, the macroeconomic balance approach (MB) is used, developed by the IMF's Consultative Group on Exchange Rate Issues (CGER).

The research was made by using panel data series. The testing of regression parameters variability was performed with the F test. The normal distribution assumptions were met. Current account norm was evaluated based on estimated coefficients in the model and projected values of the independent variables, and further, based on import and export elasticities, the level of exchange rate which returns current account into its equilibrium point was calculated. The results showed the dinar's overvaluation over medium term, under unchanged economic policy.

Keywords: equilibrium exchange rate, REER, current account norm, assessment, Serbia, panel estimations

JEL Classification: C33, F31, F32, F41

1. Introduction

Exchange rate has always been a current issue, especially in recent decades, in a time of dynamic growth of international trade and capital transactions, which often exceed the level of world production. Strong globalization of the world economy, as well as the liberalization of international flows of goods, services and production factors, which has resulted in stronger trade and financial integration, eliminated the concept of national

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economy. Nowadays, this individual economy is a part of the global economy, of the world market, and "plays" by rules dictated not only by the local economic authorities. The complex situation in the global marketplace requires new frameworks and models of behavior of which the development of the economic theory faces.

The prolonged and significant real exchange rate deviation from the equilibrium level (specifically, in terms of overvaluation) can lead to a deterioration of the current account and trade balance, speculation, foreign debt increase, investment decline, productivity and overall economic growth decrease.

As the equilibrium exchange rate level cannot be directly monitored, there are different methodologies for assessing the equilibrium exchange rate and, depending on the model, these concepts often yield conflicting results (Bussiere *et al.*, 2010). Particularly, there were challenges in the emerging countries and the developing economies, such as Serbia, with structural problems, data unavailability, high macroeconomic volatility.

Therefore, the aim of this paper is to empirically estimate the equilibrium exchange rate level of the Serbian dinar. For this purpose, the macroeconomic balance approach (MB) is used, developed by the IMF's Consultative Group on Exchange Rate Issues (CGER). This structural concept (internal-external balance approach) is based on the current account misalignment and the level of the exchange rate that will bring the current account back to its estimated norm (equilibrium).

This analysis first identifies the relationship between the independent fundamental variables and dependent variable such as the current account balance. Based on the evaluated current account norm, the level of exchange rate which returns the current account to its equilibrium point, is calculated. Compared to similar studies by IMF and/or national central banks, this individual research provides the latest empirical evidence in the case of Serbia.

The results of this paper point to the overvaluation of the Serbian real exchange rate over medium term, under unchanged policy.

The paper is organised as follows: Section II provides an overview of the relevant literature and conducted research related to the subject. Section III describes the methodologies and data which are used, and Section IV presents the empirical results of the exchange rate assessment. Section V concludes with the main findings, limitations and possible further research.

II. Literature Review

In the post Bretton Woods standings, there are few studies that explain the dynamics of the real exchange rate and the confirmation of the traditional theories. Due to the inability to predict the short-term real exchange rate oscillations, the research focus has shifted towards the medium and long term, and on searching the influence of fundamental variables that provide the equilibrium exchange rate assessment, as well as the real exchange rate deviation.

Driver and Westaway (2004) in their research give an overview of 14 different concepts for assessing the equilibrium exchange rate, thereby suggesting that different approaches suit different time periods.

Siregar (2011) presents comparative overview of few concepts, their theoretical framework and empirical research, as well as the results of their implementation. The same author with Rajan (2006) couple of years earlier provided an analytical overview of selected models and explored two interrelated questions: which fundamentals were used in estimating the equilibrium real exchange rate - ERER, as well as which were the main differences between the models. Also, the authors stated that PPP disadvantaged the motivate economists to look for alternative models in order to assist in the analysis (Siregar and Rajan, 2006, p.4)

Specific application to the developing countries can be found in the work of Hinkle and Montiel (1999). Available empirical methodologies for estimating equilibrium exchange rate in the developing countries were presented. Similarly, Egert, Halpern and MacDonald (2006) have conducted comprehensive research on the equilibrium exchange rate in the countries of Central and Eastern Europe, South-Eastern Europe, as well as ex-Soviet Union, and have concluded that there was no precise assessment because of model uncertainty as well as the fundamentals (Egert, Halpern and MacDonald, 2006, p. 40)

In particular, in the work of Lee *et al.* (2008) the relationship between the current account and its fundamental determinants was evaluated on the example of 54 developed and developing economies over the 1973-2004 period, by using the pooled OLS regression. The results of regression showed that the Eastern and Central Europe ran the highest CA deficit, and the norm was negative. Latin America's estimated norm was close to zero — 0.3% of GDP, while Asia's equilibrium was in suficit – 1.3%. Advanced Europe countries' current account norm was close to zero.

At the same time, Rahman (2008) provided research on 59 countries, 21 industrial and 38 developing countries (among them 10 new EU countries which ran higher deficits than other developing countries). The estimation period covered data from 1992 to 2006 for the transition economies, and from 1971 to 2006 for all the other countries, and the model included investment variable, as extension in regard to the research done by Lee *et al.* (2008). It showed that private investment has especially increased the CA deficit in the transition countries.

In the work of Bussiere *et al.* (2010) innovative solutions were introduced, such as the Bayesian averaging techniques, in order to deal “with the large uncertainties surrounding equilibrium exchange rate estimates” (Bussiere *et al.*, 2010, p.73).

The main aim of the empirical analysis is to broaden the angle of view, and to set up the model, which otherwise does not always result in successful outcomes. As a result of these efforts, there is a high number of potential factors that could affect the dynamics of changes in the current account. Some of them are: demographic factors, fiscal policy, institutional characteristics, etc.

The existing literature points out that it is difficult to evaluate the exchange rate deviation, especially in the case of transition economies, which have not still underwent structural changes and reveal high uncertainty and macroeconomic volatility, as well as short time series. However, unlike other transition countries for which there is constant research, this is not the case with Serbia.

III. Research Methodology and Data

In order to evaluate the misalignment level of the real exchange rate needed to shift the current account to its estimated sustainable (equilibrium, "norm") level, which implies economic policy that provides internal and external balance without excessive movement, the MB concept was employed.

The macroeconomic balance approach consists of three steps. The first involves the evaluation of an equilibrium relationship between the current account balance and a set of fundamental variables. Following Lee *et al.* (2008) and Bussiere *et al.* (2010), Serbian's current account balance dynamics are expected to be driven by indicators such as:

- *fiscal balance (as share of GDP)*. The increase in the budget balance leads to the growth of national savings and improves the current account balance;
- *demographic variables* - coefficient that indicates the proportion of older (over 65) to younger population (15-64 year old) - *old-age dependency ratio* and *population growth rate*. A higher percentage of inactive population reduces the national saving and decreases the current account balance. Therefore, both variables are expected to increase the current account deficit;
- *real GDP growth rate "per capita"* is included in the model only in the developing countries. Also, it is calculated as the previous variables, as a deviation from the average trading partners;
- *net foreign assets position - NFA*. NFA is represented by NFA share of GDP at the beginning of the four-year period (using the NFA records published by Lane and Milesi-Ferretti, 2011);
- *oil balance*. Higher oil prices increase the current account balance of oil exporting countries, and influence the balance reduction of import countries (IMF, 2006). The variable that is used in the work Lee *et al.* (2008) is the ratio to GDP;
- *relative income*. Indicator that serves to show the relative level of economic development. Expressed as deviation from the U.S. income, in PPP terms. It is expected the current account to be positively correlated with the relative income;
- *total investment*. Regressor added in some research, ratio to GDP.
- *economic crises*. Empirical evidence suggests that the economic crises affect the current account despite controlled macroeconomic factors.

The model is as follows:

$$\left(\frac{\text{current account}}{\text{GDP}}\right)_{it} = \alpha_i + \gamma_t + \beta_1\left(\frac{\text{fiscal balance}}{\text{GDP}}\right)_{it} + \beta_2\text{old age dependency}_{it} + \beta_3\text{population growth rate}_{it} + \beta_4\left(\frac{\text{net foreign assets}}{\text{GDP}}\right)_{it} + \beta_5\left(\frac{\text{oil balance}}{\text{GDP}}\right)_{it} + \beta_6\text{relative income}_{it} + \beta_7\text{GDP growth rate}_{it} + \beta_8\left(\frac{\text{total investment}}{\text{GDP}}\right)_{it} + \varepsilon_{it} \quad (1)$$

where: index i represents country, and index j represents an independent variable.

The research was made by using panel data series. The sample included 55 countries, and data were collected for the period 1980 – 2012 (for some variables the starting year was 1990). According to Lee *et al.* (2008), the advanced economies in the panel were:

Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Luxembourg, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, the UK, and the USA. The emerging markets were: Algeria, Argentina, Brazil, Bulgaria, Chile, China, Colombia, Costa Rica, Croatia, the Czech Republic, the Dominican Republic, Ecuador, Egypt, Estonia, Hong Kong, Hungary, India, Indonesia, Israel, Korea, Latvia, Lithuania, Malaysia, Mexico, Morocco, Pakistan, Peru, Philippines, Poland, Romania, Russia, Singapore, Slovakia, Slovenia, South Africa, Sri Lanka, Taiwan, Thailand, Tunisia, Turkey, Venezuela, and, in addition in the authors' research - Serbia.

The data used for model estimation come from various sources. Fiscal balance data as a share of GDP were taken from World Bank⁴. Data which correspond to the ratio of population older than 65 over population between 15 and 64 year old, are also drawn from World Bank's World Development Indicator (WDI) database with a difference – data source come from 1980, as the rest of used data. Data which represent the level of population growth rate, GDP growth rate and relative income (GDP per capita, PPP) come from the same source - World Bank's World Development Indicator (WDI) database. Further, data on current account balance as share of GDP, oil balance, total investment as a percentage of GDP are obtained from the IMF's World Economic Outlook database (WEO). Net foreign assets as share of GDP are taken from Lane & Milesi-Ferreti (LM) database⁵.

The model used in this paper is the LSDV model (Least squares dummy variable model). Testing of the regression parameters variability was performed with the F test. All indicators were considered as fixed effects, because they were not randomly chosen, but corresponding to the share in world trade. Parameter estimation was performed using restricted maximum likelihood – REML method. Normal distribution assumptions based on F-statistic and statistical significance were filled. To analyze the model using REML, the model with ARIMA type was applied based on the Akaike (AIC) criteria.

Cointegration analysis was not implemented, although it may be seen in the occasional survey. However, in most of the relevant papers, including the work of Lee *et al.* (2008), as well as Bussiere *et al.* (2010), unit root tests were not performed. The reason for this is the fact that the current account balance (as a percent of GDP) in most of countries is stationary time series, for a longer interval of observation.

After parameter estimation in the model, the second step of the macroeconomic approach derives the current account norm based on the estimated relationship and IMF projected values of fundamental variables up to 2018.

The last step of the MB approach consists of calculating the required exchange rate adjustment to close the gap between the estimated current account norm and the projected current account based on WEO projections. This adjustment is based on the elasticity of the current account to the real exchange rate, given by formula:

⁴ Data from 1990.

⁵ Updated and extended "External Wealth of Nations" Dataset, 1970-2011. This database contains data for the period 1970-2011 (update) and for 178 economies plus the euro area as an aggregate.

$$(\partial \text{current account} / \text{GDP}) (\partial \text{RER} / \text{RER}) = \gamma_{\text{ex}}(\text{export} / \text{GDP}) - (\gamma_{\text{im}} - 1)(\text{import} / \text{GDP}) \quad (2)$$

where: RER denotes the real exchange rate, γ_{ex} and γ_{im} refer to the export/import price elasticities, and „export“ and „import“ denote the values of exports and imports, respectively.

IV. Empirical Results

Authors' evaluation of coefficients that shows the impact of changes in the corresponding indicator on the dependent variable, as well as comparable research done by Lee *et al.* (2008) using fixed effect panel estimation, in the second column, and Rahman's (2008) using fixed effect estimation, in the third column, are given in the Table 1.

Table 1
Panel Estimation and Findings of Other Recent Studies – The MB Approach

Dependent Variable	Current Account Balance		
	This paper, FE (fixed effect)	Lee <i>et al.</i> , (2008), FE (fixed effect)	Rahman (2008), FE (fixed effect)
Banking crisis	-0.02 (0.049622) ***
Asian crisis	0.01 (0.111635)	0.07***	0.02*
Investment	-0.001 (4.527077E-5) ***	...	-0.01
Population growth	0.44 (0.336519) ***	-0.47	-2.02***
Relative income	0.00 (3.984820E-5) **	...	0.02
Old age ratio	-0.14 (0.105776) ***	-0.23***	-0.04
GDP growth	0.01 (0.049829) ***	-0.27	-0.24***
Fiscal balance	0.32 (0.046027) ***	0.32***	0.44***
Net foreign assets	0.04 (0.006152) ***	...	0.03***
Oil balance	-10.49 (17.623306)	0.31***	0.41***
Number of countries	55	54	59

Sources: 1st column – authors' calculations, 2013; 2nd column – Lee *et al.*, 2008, p.5; 3rd column – Rahman, 2008, p.9.

Notes: The dependent variable is the current account balance (percentage of GDP). In the first column all continuous variables have been smoothed using four-year moving averages to reduce measurement error. Robust standard errors are shown in parentheses.

*, **, and *** significant at 10 percent, 5 percent, and 1 percent, respectively.

The estimated coefficients are statistically significant, mostly at 1 percent level (except the oil balance and the Asian crisis dummy variable).

Rahman (2008) includes investment variable, which this research supposes that is not significant⁶, as well as relative income and old age ratio. However, on the opposite side, old age ratio is highly significant at the one percent level in authors' and research by Lee *et al.* (2008).

If we compare different estimates in the table with estimates in the first column (which represents authors' work), one may see that the results show that almost all explanatory variables demonstrate their expected signs, according to the economic theory, except for population growth and GDP growth.

An increase in the fiscal balance ratio by one percentage point predicts a current account balance higher by around 0.32 percentage points of GDP. The range of marginal effects identified in the literature for this variable is from 0.2 to 0.5 (Lee *et al.*, 2008, p.5).

Further, according to Lane and Milesi-Ferretti (2004), standard open economy macroeconomic models predict that a higher net foreign asset position (as share of GDP) is associated with a higher current account balance, as the estimation results indicate.

Relative income and GDP growth are variables which represent the economy's development level. Relative income is statistically significant at five percent level, but does not affect the current account level. In Rahman's research (2008), it seemed to be statistically insignificant, while in the estimation presented in the work of Lee *et al.* (2008) this indicator was not included in model. On the other side, in general, the GDP growth improves current account level, on long term. Therefore, the estimate shows that ten percent in GDP growth leads to a current account increase by around 0.1% of GDP. Again, in Lee's estimation the GDP growth is not statistically significant, and in Rahman's work there is opposite relationship direction (negative sign), which is explained by less developed countries, considering the medium term.

Investment as a share of GDP is statistically significant, and even contributes to minimal change in current account deficit level. This fundamental variable is not included in Lee's evaluation, and in the third example is not statistically significant.

In the next step, in order to compute the current account norm, medium-term values of fundamentals are used, except for indicators for which projections do not exist; therefore, the last recorded values are taken. The values of the fiscal balance, oil balance, relative income, investment, population growth and GDP growth rate forecast for 2018 are taken from the IMF WEO (2013), whereas the forecast of old-age dependency ratio for 2020 is calculated on the basis of population above 65 and population between 15 and 64 years (UN database, 2013). Therefore, the corresponding values are: fiscal balance -6.5%, oil balance -4.783%, relative income 13,515.167, investment 21.72%, population growth rate -0.549%, GDP growth rate 3%, old-age dependency ratio 25.717%. The ratio of foreign assets in Serbia was -74.538%

⁶ While this variable has highly negative influence on current account balance in case of subgroups estimation.

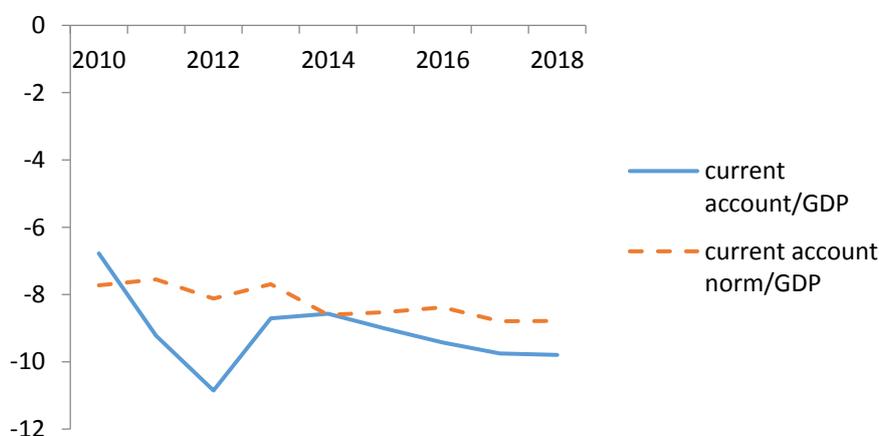
of GDP, the last recorded value taken from Lane and Milesi-Ferretti database (2011) - for which, the value at the beginning of 4-year period is used.

According to the values in the previous paragraph, estimated medium-term equilibrium current account balance was deficit -8.79% of GDP, while the IMF projection for 2018 was -9.8% share of GDP (IMF WEO, 2013).

Figure 1 shows the evaluated current account norm for Serbia (according to the model) relative to the actual balance and projected medium-term values (all in percent of GDP).

Figure 1

Results of the MB Approach – Estimated and Actual Current Account



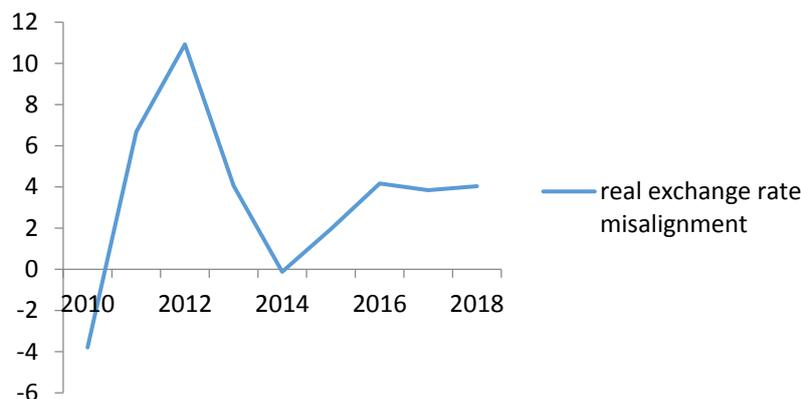
Sources: IMF, 2013; authors' calculations, 2013.

The real exchange rate gap, i.e. the gap between the current value of REER and the equilibrium REER needed to bring the current account balance to its equilibrium level, is calculated using the value of price elasticity of exports and imports according to formula (2). Given the price elasticities which IMF uses for Serbia, export (-0.71) / import (0.92), and five year average of export/import ratio to GDP – 36% and 54%, respectively, the elasticity of the current account balance ratio to GDP with respect to the REER is calculated to be -0.25.

Under all the mentioned assumptions and when the coefficients estimated in this paper are used, the Figure 2 shows the final result of the MB approach.

Figure 2

Results of the MB Approach – Real Exchange Rate Misalignment (in %)



Source: Authors' calculations, 2013.

Overall, the MB method predicts that little real exchange rate adjustment - real depreciation of 4.04% incorporated in the projected current account on the basis of existing policies - should be necessary over medium term. Also, one may see that in 2010 the REER was undervalued, and in 2012 was overvalued by around 12% (while in the IMF country report for Serbia (IMF, 2008) it was a projection for 2012 of about 16% overvalued dinar. Only in 2014 the REER seems to be close to its equilibrium (it should appreciate by 0.1%).

Another fiscal restrictive scenario was presented by the IMF in its country report in 2013 (IMF, 2013, p.45), the so called "Illustrative Medium-Term Adjustment Scenario, 2009–18", with projected values of current account and fiscal deficit of 4.6% and 0.6% as share of GDP, respectively, as well as a better net foreign asset position of -67%. Under these assumptions, the equilibrium current account level would be smaller deficit (6.6%) and the real exchange rate should appreciate by 8% over medium term, in order to eliminate the current account gap. Again, this is a scenario which assumes significant policy changes in Serbia, first of all meaning finished structural reforms.

V. Conclusion

The aim of this study was to estimate the equilibrium real exchange rate of Serbia that was still undergoing structural changes and experiences high macroeconomic volatility. This paper has empirically estimated the medium term relationship between the current account balance and macroeconomic fundamental variables according to the macroeconomic balance approach, developed by the IMF. The current account norm was evaluated according to parameters of the empirical model of the current account balance and IMF WEO projections over five years. The difference between the two balances, which is a potential indication of the real exchange rate misalignment, is 1.01%, which delivers about 4.04% real overvaluation over medium term.

As a robustness check, it is also assessed whether the coefficients' findings in this paper are similar to those based on previous researches by Rahman (2008) and Lee et al. (2008), without Serbia in sample. Also, applying estimated model to variable values from 2012 (the year for which there was an IMF evaluation for Serbia - IMF, 2008), the calculations in this paper showed lower dinar's overvaluation - around 12% instead of IMF's prediction of 16%.

Although there are different approaches, the MB concept was chosen because of the most important advantage, which is that it could be applied to any country, even one that does not have long enough time series of macroeconomic variables for the estimation of the current account regression.

However, the estimates under this concept are very sensitive to the parameters used, which vary through researches, often without reported standard deviations.

Also, the IMF medium term predictions of regressors' values could significantly change within half an year, in the case of countries like Serbia. For example, the IMF's potential scenario in the country report from 2013 (IMF, 2013), but not so realistic for Serbia, the so called "Illustrative Medium-Term Adjustment Scenario, 2009–18", is very restrictive in the fiscal sense. Also, there were introduced changes in the NFA, which lead to different norm with current account gap of 2% and dinar's undervaluation, according to the estimated econometric model.

Even the IMF uses general price elasticities of exports and imports for countries which were not in the sample, the fact is that these values are maybe not applicable for assessing equilibrium real exchange rate of particular country, and, again, could lead to incorrect REER misalignment estimates.

Finally, results indicate precisely unsatisfactory mix of economic policy, i.e. that the structural changes were not implemented. Fiscal policy should be "lean", and in this case would take off the burden monetary authorities, that is, would enable the implementation of less restrictive monetary policy. Untight monetary policy should facilitate the decrease in net external indebtedness and economic growth in the longer term through the real exchange rate. The price of that would be higher inflation. As the results of this survey show, the dinar should depreciate, and thus affects the reducing of the current account deficit and the exports growth. Likewise, the weakened dinar would enable more competitive domestic demand, which could further independently (of the export growth) contribute to the increase in employment and economic activity growth overall.

Some issues for further research could be pointed out. First, panel estimation can be expanded by creating subgroups consisting of countries with similar characteristics /region. Finally, key indicators and relationships between them can be evaluated by using the range of different methodologies, among which is the extended IMF research, the so-called EBA (External Balance Assessment) methodology which in addition includes fundamentals such as: the social aspect of the country, the risk environment, etc.

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