Economic Competitiveness and the Equilibrium Real Exchange Rate[1]

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Abstract: - This paper aims to estimate the Equilibrium Real Exchange Rate (ERRE) for Romania after having precisely established the theoretical and conceptual basis of this indicator, its connection to the competitiveness issue, and its significance for a transition economy such as the Romanian one. The essential hypothesis generating this study is represented by the significance of the ERRE as the most important indicator of the international competitiveness all that in the context of the recent economic developments in Romania.

Key-Words: Equilibrium Real Exchange Rate, competitiveness, macroeconomic equilibrium, Romania

1 Introduction

Recent economic developments in Romania raised, once more, the issue of macroeconomic equilibrium and of international competitiveness. As the two are irrevocably connected, the logic of their assessment leads to their immediate and most significant link – the Equilibrium Real Exchange Rate. This is an even more appropriate context for this debate as Romania sales in very deep and uncertain economic puzzles, is faced with exchange rate instability, with a high deficit and unemployment. As to the competitiveness issue under such circumstances, analysis tries to depict and sign in this respect from the economic reality. This wishes to be such a struggle. Obviously, the most important indicator of the international competitiveness is the equilibrium real exchange rate.

2. Theoretical and Conceptual Basis of the ERRE

According to specialized literature and to known practices, the ERER (Equilibrium Real Exchange Rate) can be defined as that certain exchange rate level that ensures both internal and external macroeconomic equilibrium. This definition has been introduced in the 90s by J. Williamson and still encounters high controversies around the concept of macroeconomic equilibrium. The internal macroeconomic equilibrium, at least as far as transition economies are concerned, has been agreed to be considered from the point of and in connection to the Non-Accelerating-Inflation Rate of Unemployment (NAIRU). In exchange, the external macroeconomic equilibrium is not so easy to establish, but it should be defined in accordance with the sustainability of the balance of payment as main indicator. Independent of the approached methodology in determining competitiveness, macroeconomic competitiveness structure is a decisive element, and as part of it, the real exchange rate due to its direct influence on exports. External competitiveness is a key issue to Romania, as the Romanian economy is a highly opened one – imports and exports play an essential part in long term economic growth. A loss in competitiveness may be rapidly transmitted and transformed into the current account. As Romania has advanced in achieving real convergence and to receive high capital inflows, the real exchange rate continued to strengthen. It was important for this strengthening to be

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accompanied by an increase in productivity and in the quality of products supplied on the external market in order to not affect competitiveness. Also, a correlation between productivity and wage levels to be maintained. The real exchange rate and competitiveness connection can be quantified by several phenomena directly through a feedback relation. Thus, we may say that the relation between the real exchange rate and competiveness is rather a multi-vocal one, rather that and univocal one. On the other hand, an increase in the real exchange rate can be seen as a loss in competitiveness, but this is only true if this over-evaluation exceeds the real equilibrium exchange rate. On contrary, this may prove wrong. In other words, if the exchange rate is situated below the equilibrium level, there may be no losses in competitiveness, but on contrary, an increase. This phenomenon takes place, especially, when the supra-evaluation of the exchange rate is the direct result of productivity in the tradable sector. Thus, knowing the real exchange rate and the action of the Balassa- Samuelson effect becomes important. (Altar et al. 2006)

Also, the fundamentals determining the equilibrium real exchange rate become very important: the relationship between the evolution of the labour productivity and the one of the real exchange rate. In this case, analysis is based on the works of Balassa (1964), Samuelson (1964), Menzi Chinn and Louis Johnston (1996), Matthew B. Canzoneri, Robert Cumby and Behzad Diba (1999) etc. An important element affecting the size of the equilibrium real exchange rate is the manifestation of the Balassa-Samuelson effect. In analyzing the influence of different factors on the equilibrium real exchange rate, first we must point out its components.

$$q = e + p^* - p \quad (1)$$

Where: p and p^* are the domestic price and its logarithm, q is the logarithm of the real exchange rate, e is the logarithm of the nominal exchange rate Is true for both tradable and non-tradable sectors. If we note with ω and the share of the non-tradable sector in the economy, on a domestic level and on an international level, the price indexes will be:

$$p = \omega p_N + (1-\omega)p_T \quad (2)$$

$$p^* = \omega^* p_N + (1-\omega^*)p_T{}^* \quad (3)$$

From (2) and (3) we have:

$$q = q_T + \bar{\omega}(p_T - p_N) - \omega^*(p_T{}^* - p_N{}^*) = (e + p_T{}^* - p_T) + \bar{\omega}(p_T - p_N) - \omega^*(p_T{}^* - p_N{}^*) \quad (4)$$

Equation (4) points out the fact that there are three potential sources that may affect the real exchange rate: The evolution of the exchange rate in the tradable sector, the evolution of relative prices in the tradable/ non-tradable sector, the evolution of the tradable share in the economy, on a domestic, and international level.

In this paper, in order to identify the factors affecting the equilibrium real exchange rate in Romania, we used Grange causality. This way, we could see the fact that there are factors mentioned above that have no influence for the real exchange rate in Romania. The above mentioned factors, on a theoretical level, can affect the equilibrium real exchange rate as following: O**penness.** This factor's influence on the equilibrium real exchange rate is largely studied in specialized literature, but still, there is controversy around quantifying it, but the common point is represented by it reflecting authorities' commercial policy and the eventual barriers in this domain. From several available options, we chose as most significant for the openness of an economy the share of the cumulated values of the export and the import from the total GDP. (Altar et al. 2006)

$$open = \frac{IMP+EXP}{GDP_{EURO}} \times 100 \quad (5)$$

Where: open = the openness of the economy; EXP=value of FOB exports in Euros; IMP= value of FOB imports in Euros; GDP_{EURO}= GDP in Euros.

3. The Connection Productivity – Equilibrium Real Exchange Rate

Balassa and Samuelson proved that the evolution of the ERRE is influenced by two essential components. First, a competitive behaviour means that the real prices in the non-tradable sector depend on the marginal costs in the two sectors – tradable and non-tradable. More than that, there are situations when the marginal costs are proportional with the marginal productivities, meaning that prices in non-tradable are proportional with marginal productivities. The second refers to Purchasing Power Parity (PPP). These two elements represented the independent and thus even more valid results and basis for the Balassa-Samuelson model – the absolute version. They identified the

productivity differential between tradable and non-tradable as the essential element to be considered when analyzing the relationship between the exchange rate and the relative prices. Models concerning the ERRE can be classified in several categories: the first is the Balassa- Samuelson model – relative non-tradable prices are determined based on supply side factors, especially by productivity; the second category of models – introduced the rigidity factors and the adjustment costs in reallocating production factors on sectors, this way, in estimating the ERRE we must consider the demand side factors; the third category – a dynamic approach where the Pontreaghin Maximum Theorem or the Dynamic programming are employed. Aiming to analyze the correlations between the ERRE and the Total Factor Productivity (TFP), we note with *e* the nominal exchange rate, and with *p* and *p** the domestic, respectively international price index. The three indicators are expressed in logarithm. If we note with *q* the real exchange rate, in logarithm, we get the following expression for the four indicators:

$$q = e + p^* - p$$

If the real exchange rate *q*, would be stationary, that would mean that the PPP theory would be true. In fact, econometric test show that *q* is not stationary. We will assume the functions of the tradable (*T*) and of the non-tradable (*NT*) first degree homogenous. Specialized literature classifies these functions as Production Functions with Constant Returns to Scale. This hypothesis for both macroeconomic national and world production functions. Thus the production functions for the non-tradable are:

$$Y_T = A_T F(K_T, L_T) \quad (6)$$

$$Y_{NT} = A_{NT} G(K_{NT}, L_{NT}) \quad (7)$$

Where: *A* is the TFP, *K* and *L* are the size of the capital and of the labour force. From the profit maximization profit and the equilibrium conditions we have the following expressions:

$$r = A_T f'(K_T) \quad (8)$$

$$w = A_T f(K_T) - A_T f'(K_T) K_T \quad (9)$$

$$r = p A_{NT} g(K_{NT}) \quad (10)$$

$$w = p A_{NT} g(K_{NT}) - p A_{NT} g'(K_{NT}) K_{NT} \quad (11)$$

Where: *w* is the wage size, *r* is the marginal efficiency of the capital (capital cost), and *p* is the price level in the non-tradable sector expressed according to the price index in the tradable sector. In case of equilibrium, we assume that the level of wages is the same in the two sectors, and the capital cost *r* is the same as the interest rate.

$$A_T f(K_T) = r K_T + w \quad (12)$$

$$p A_{NT} g(K_{NT}) = r K_{NT} + w \quad (13)$$

After derivation we get $\hat{A}_T = \frac{wL_T}{Y_T} \hat{w}$ (14)

$$\hat{p} + \hat{A}_{NT} = \frac{wL_{NT}}{pY_{NT}} \hat{w} \quad (15)$$

Where with ^ we noted the increase rhythm of that indicator and we have the following notations:

$$\mu_{LT} = \frac{wL_T}{Y_T} \quad (16)$$

$$\mu_{LNT} = \frac{wL_{NT}}{pY_{NT}} \quad (17)$$

Based on the new notations, the price level from the non-tradable sector becomes:

$$p = \frac{\mu_{LNT}}{\mu_{LT}} A_T - A_{NT} \quad (18)$$

(18) clearly shows the fact that the prices in the non-tradable sector expressed in dependence to the tradable sector prices depends on the total productivity factors in both sectors. Due to the fact that, usually, labour is more intensive in the non-tradable sector, the total productivity factor in the non-tradable sector is $\frac{\mu_{LNT}}{\mu_{LT}} > 1$. Under these circumstances, equation (18) shows an increase in the total productivity factor in the tradable sector that leads to an increase in the price level in the non-tradable sector. Under these circumstances, the real exchange rate will only depend on the relative prices in the non-tradable sector. (Altar et al. 2006)

$$Q = \frac{p^*}{p} = \frac{(p^*)^{1-\Upsilon}}{(p)^{1-\Upsilon}} \quad (19)$$

Logarithmically derivation (19) and using (11), we get the following for the growth rhythm of the real exchange rate:

$$q = (1-\Upsilon^*)p^* - (1-\Upsilon)p = (1-\Upsilon^*)\left[\frac{\hat{\mu}^*_{LNT}}{\mu^*_{LT}}\hat{A}^*_T - \hat{A}^*_{NT}\right] - (1-\Upsilon)\left[\frac{\mu_{LNT}}{\mu_{LT}}\hat{A}_T - \hat{A}_{NT}\right] \quad (20)$$

This points out clearly the way the TPF influences the real exchange rate. For example, we see that an increase in the TPF on a national level will have as effect the appreciation of the real exchange rate. Econometric estimations provide the opportunity of a quantitative evaluation of the correlation between the real exchange rate and the TPF. For a better understanding of the the mechanisms, the production function used above will be particularized to a Cobb-Douglas function in a static approach.

We consider the production functions for the two sectors. These model the supply side.

$$Y^T = A^T (L^T)^{\gamma} (K^T)^{1-\gamma} \quad (21)$$

$$Y^{NT} = A^{NT} (L^{NT})^{\delta} (K^{NT})^{1-\delta} \quad (22)$$

Y is the out-put, L is the labour force dimension, K is the capital, AT and ANT are the total productivity factors in the non-tradable and tradable sectors. From the profit maximization conditions, we deduct that the optimum level of the nominal wage (w) and of the capital cost (i) will be equal to the marginal productivity of the two factors. Finally, from the optimum conditions we have:

$$i^T = \log(1-\gamma) + a^T (k^T - l^T) \quad (23)$$

$$i^{NT} = (p^{NT} - p^T) + \log(1-\delta) + a^{NT} - \delta(k^{NT} - l^{NT}) \quad (24)$$

$$w^T = \log(\gamma) + a^T + (1-\gamma)(K^T - l^T) \quad (25)$$

$$w^{NT} = (p^{NT} - p^T) + \log(\delta) + a^{NT} + (1-\delta)(k^{NT} - l^{NT}) \quad (26)$$

As from the optimum conditions we have fewer equations than the unknowns, the price level from the tradable sector is exogenous. For the tradable sector, the profit maximization conditions provide information concerning the optimal level of the technical level of labour force (share capital-labour force), and also the optimum level of the wage. As far as the relative prices of the two sectors, their size will result from the supply side function. By derivation, the optimum conditions, we deduce the dynamics of the relative prices from the tradable and non-tradable sectors, and also the share between the growths rhythms of the productivity in the two sectors (dual productivity).

$$(\hat{p}^{NT} - \hat{p}^T) \neq (\delta/\gamma)\hat{a}^T - \hat{a}^{NT} \quad (27)$$

^ represents the growth rithm of the indicators. We may consider a similar ecuation for the world economy by deducting the two previous relations.

$$(\hat{p}^{NT} - \hat{p}^T) - (\hat{p}^{NT*} - \hat{p}^{T*}) = ((\delta/\gamma)(\hat{a}^T - \hat{a}^{NT}) - (\delta^*/\gamma^*)(\hat{a}^{NT*} - \hat{a}^{T*}) \quad (28)$$

Thus, we pointed out the fact that the relative prices' differential equals the productivity difference on a national level, and the productivity on an international level. The national and international productivity level for the tradable sector is ponderated with the share between the out-put elasticity with the labour force in the tradable, and non-tradable sectors.

The price index on a national level is the ponderated average of prices in the tradable and non-tradable sectors.

$$\hat{p} = \alpha\hat{p}^T + (1-\alpha)\hat{p}^{NT} \quad (29)$$

The relation between the real exchange rate (q) and the nominal exchange rate (e), both in logarithm is

$$\hat{q} = \hat{e} + \hat{p}^* - \hat{p} \quad (30)$$

Based on the above equations we have the following fundamental relation:

$$\hat{q} = -(1-\alpha)\left(\left(\delta/\gamma\right)\hat{a}^T - \hat{a}^{NT}\right) - \left(\left(\delta^*/\gamma^*\right)\hat{a}^{NT*} - \hat{a}^{T*}\right) \quad (31)$$

Thus we can conclude: - if dual domestic productivity is higher than dual international productivity, the real exchange rate will appreciate; when the dual domestic productivity is lower than international productivity, the real exchange rate will depreciate; - if the tradable productivity ponderated with the elasticity share δ/γ is higher than productivity indicator from the non-tradable, and the dual domestic productivity is constant, the real exchange rate will appreciate. This very model points out the Balassa- Samuelson effect and allows several conclusions concerning the way productivity influences the evolution of the real exchange rate.

4. An Estimation of the Equilibrium Exchange Rate for Romania

The importance of an accurate determination of the real equilibrium exchange rate derives from the fact that this is the key indicator in assessing the „health of an economy". It continuously signals the competitiveness of the economy and the possible imbalances that may generate foreign exchange rate crisis. In our case, this provides significant information concerning the harmonization of the convergence criteria and the real equilibrium exchange rate trends. Cointegration techniques allowed the identification of an equilibrium relation between the real equilibrium exchange rate and fundamental factors that determine it („the fundamentals"). For Romania, the model must consider the following factors according to Altar (2006): - the productivity differential between Romania and the Euro-area through which the Balassa-Samuelson effect for

Romania will also be quantified; - the net assets as share of the GDP; - the openness degree of the domestic economy – the „openness" indicator. Estimations used quarterly data 1997 first quarter – 2007 second quarter, as further data affected by the financial and economic crisis, we considered would not be relevant for a stable period of economic performance. Given the fact that from march 2003, the Romanian National Bank uses the Euro as reference currency, and since then, the ROL(RON)/USD exchange rate is determined in cross from the international market rate, the EUR/ROL (ECU/ROL) exchange rate has been used. The BEER approach involves several stages, such as: - estimating the relation between the real exchange rate and the fundamentals, usually using cointegration, given the fact that the series are first degree integrable; - the values of the fundamentals are substituted in the estimated relation, which allows to obtain the actual deviation from equilibrium; - determining the long term sustainable values for the fundamentals. This can be obtained by decomposing the series in permanent and transitory components. In this respect, either the Hodrick-Prescott filter or the Beveridge-Nelson technique, or the calibration techniques - Baffes (1999) may be used. The Granger causality testing has been selected in computing the OPEN – openness as (import+export)/GDP, NFA – net foreign assets and the differential between the productivity increase between Romania and the EU - (dif_w). The NFA represent the stock of assets and passives of o country, in a certain moment in time. The net foreign assets of the banking system has been used as a proxy for Romania's international positions. Econometric calculus determined that all the variables are first degree integrable. This allows the use of Johansen cointegration techniques in determining the long term relation between the fundamentals and the real exchange rate. Based on the cointegration estimated vector, the long term equilibrium relation between the real exchange rate and the fundamentals has been determined. The signs of the estimated coefficients are according to economic theory, these being significant from a statistical point of view. The DIF_W_SA is negative meaning that an increase of this indicator, the real exchange rate would appreciate. In fact, this is a manifestation of the Balassa – Samuelson effect. The sign of the OPEN_SA is positive and thus, an increase of the openness degree of the Romanian economy determines an increase of the exchange rate. In Romania, the free trade and the diminution of tariff and non-tariff barriers determined a deterioration of the current account through an increase in imports. Thus, huge amounts in foreign currency have been needed in order to cover imports and this lead in exchange to a depreciation of the national currency. The sign of the NFA_SA as share of the GDP indicates that an increase of the net foreign assets from the banking system generates the depreciation of the national currency.

For Romania, the equation pointed out the fact that an increase/decrease of the NFA for the banking system would determine a depreciation/appreciation on the national currency. This is supported by the „traditional balance of payments approach". The NFA increase in Romania is due mostly to the increase of the NBR reserve as a consequence of foreign currency purchase form the market. In 1998 and 2003 there have been increases in capital inflows. The NFA of the commercial banks have continuously decreased especially based on the loans from foreign banks and the deposits of foreign banks in convertible currencies. The NBR intervention on the foreign exchange market has been usually directed towards purchasing foreign currency in order to insure an optimum level of the foreign exchange rate level (about five month of imports) and in order to maintain the appreciation of the ROL/RON within reasonable limits.

Synthesizing the results of the econometric techniques, we reach the conclusion that a growth in the productivity differential between Romania and the EU appreciates the real equilibrium exchange rate and an increase in the indicator of the development of the financial sector or an increase in the net foreign assets determine a depreciation of the real equilibrium exchange rate on the long term. The level of the real equilibrium exchange rate is a trajectory that indicates its trend. In this respect, we must avoid the error of assessing the real equilibrium exchange rate as a fix value for the whole period. A very important aspect concerning the relevance of the analysis is to determine the moments in time when the real effective exchange rate has had deviations from the real equilibrium exchange rate, and also explaining the causes that

generated these deviations. In assessing the deviation of the real effective exchange rate, two methodologies are to be employed. The first is the „effective deviation" quantifying the short term deviations of the real effective exchange rate. In this respect, the coefficients form the cointegration relation is used, and also the effective values for each considered fundamentals. The second one allows computing the trend deviation – the long term deviation. The indicator – effective short term deviation, measuring the percentage deviation of the real effective exchange rate, it will be computed based on:

$$\frac{real\_effective\_exchange\_rate}{real\_equilibrium\_exchange\_rate} * 100$$

Based on the identified trend for the fundamentals, the – total deviation of the real effective exchange rate is computed using

$$\frac{real\_effective\_exchange\_rate - real\_equilibriu\_rate\_trend}{real\_equilibriu\_rate} * 100$$

This indicator has the advantage of taking into account both the deviations determined by the deviation of the real exchange rate and the trend deviations of the fundamentals. Thus, for the period 1997-2007, the ROL(RON)/EUR exchange rate has been under evaluated on average with 2,42% if considering effective deviations and with 2,38 if considering the deviations of the trends of the fundamentals. Even though the percentage deviations of the real equilibrium exchange rate have been relatively low, they indicate an under-evaluation of the national currency, which should be reflected in an increase of competitiveness, in exports; growth and imports diminution, and finally in the improvement of the current account situation. The entrance to the ERM II and the Euro adoption at an over-evaluated exchange rate would determine a loss in competitiveness for the national economy and a slowing down of the convergence process.

5. Conclusions

Aiming to enter the Euro-Zone, Romania has liberalized capital flows according to the European requirements. At its debt, this stage has not been followed by foreign exchange or macroeconomic shocks, but it might have contributed to the actual negative impact of the economic and financial crisis. The capital account liberalization, accompanied by the direct inflation targeting strategy and a coherent approach of the foreign exchange rate regime provided Romania with the appropriate basis for the EU accession and for the future ERM II accession.

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