



CBT RESEARCH NOTES IN ECONOMICS

An Evaluation of IMF External Balance Assessment Methodology and a Sensitivity Analysis on the Trade Elasticities*

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Özet: IMF, kurları değerlendirme görevini yerine getirmek üzere CGER metodunun yerine EBA metodolojisini uygulamaya başlamıştır. Bu çalışma, yeni metodolojiyi tartışıp bazı eleştiriler sıralamaktadır. Ülkelerin dış denge analizlerinin doğru bir şekilde yapılabilmesi için bu eleştirilerin hepsinin çok kritik olmasına rağmen, Türkiye ekonomisine özel vurgu yapılarak cari dengedeki açığın reel kur açığına dönüştürülmesi işlemi üzerinde durulmaktadır. Bu işlem, metodolojinin tahmin edilen cari dengedeki açığın sadece kur politikaları ile kapatılabileceği öngörüsünden dolayı özel bir öneme sahiptir. Dolayısıyla bu süreçte dış ticaretin kur esnekliklerinin çok iyi hesaplanması gerekmektedir. Ancak, bu konuda yapılmış çalışmalar Türkiye'nin ithalat ve ihracatının kur esneklikleri için çok geniş bir aralık vermektedir. Öncelikle Sürdürülebilir Dış Denge yaklaşımı kullanılarak Türkiye için norm cari denge tahmini yapılmakta ve bu tahmin doğrultusunda yakın dönem için cari dengedeki açık hesaplanmaktadır. Yapılan ticaret esnekliklerine duyarlılık analizi ise EBA yöntemiyle tahmin edilen reel kur açıklarında çok geniş bir dağılım olduğunu ortaya çıkarmaktadır. Bu nedenle, IMF'nin reel kur değerlendirmelerinin, özellikle yüksek cari açık verilen dönemlerde, çok dikkatli yorumlanması gerektiği ortaya çıkmaktadır.

Abstract: The IMF introduced the EBA, as a successor to the CGER, to fulfill its exchange rate evaluation mandate. In this study, we provide a discussion and a set of critiques on the new methodology. Although all of the critiques are very critical to be addressed for a proper examination of the external balance dynamics of the economies, in this particular study, we focus on the translation process of a current account gap into a real exchange rate gap with a specific emphasis on the Turkish economy. The process is particularly important because the methodology implies that the estimated current account gap can solely be closed by exchange rate policies. Therefore, the implementation requires a tightly estimated set of trade elasticities with respect to the real exchange rate. However, the literature reports a wide range of estimates for the trade elasticities of the Turkish exports and imports. We first obtain a current account norm and calculate the current account gaps for Turkey over the recent period according to the External Sustainability approach. A sensitivity analysis on the trade elasticities reveals that the EBA might present a huge dispersion in the estimated real exchange rate gaps. We conclude that the IMF's assessments on the real exchange rate based on the EBA should be taken very cautiously, especially during the high current account to GDP ratio times.

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1. Introduction

The judgment about the member countries' exchange rate levels being overvalued or undervalued plays an important role in the international monetary system; therefore, this task is among the core elements of the International Monetary Fund's (IMF) surveillance. To manage this task, the Consultative Group on Exchange Rate Issues (CGER), established in 1995, was assigned to conduct exchange rate assessments. The CGER had used three different approaches to assess the equilibrium level of exchange rate.¹ In an attempt to revise and improve the methods, the IMF has recently introduced the External Balance Assessment methodology (EBA).²

Building on the precursor CGER approaches, the EBA³ features a current account (CA) model, a real exchange rate (RER) model, and an external sustainability (ES) approach. The CA model estimates a CA norm based on macroeconomic fundamentals, obtaining a CA gap as the difference between the actual value of the CA and its norm value. The RER model employs a reduced-form relationship between the RER and macroeconomic fundamentals to find a measure of misalignment in the RER. Finally, the ES approach estimates a CA norm, which stabilizes the level of net foreign asset (NFA) position in the long run.

In this study, we initially provide some major critiques on the EBA. First, the EBA delivers consistently overvalued or undervalued RER for some countries over a long period. This can be due to an omitted variable problem or data and measurement problems. Second, country-specific dynamics are mostly ignored in the process, which might distort the results due to heterogeneity in the country-specific parameters. Finally, the EBA implies⁴ that the RER is the sole driver of the CA adjustment. Therefore, the trade elasticities with respect to the RER are crucial regarding the policy implications, since the translation process of the CA gap to an RER gap implicitly assumes that these elasticities can be tightly estimated. A more detailed discussion of these three critiques on the EBA is provided in the next section. Although a proper examination of the external adjustment dynamics should address all of the concerns above, in this study, we solely focus on the third critique with a specific emphasis on the Turkish economy and leave the examination of the other critiques for further research.

For the sake of exposition, we choose the ES approach of the EBA to conduct a sensitivity analysis regarding the trade elasticities. We provide the details of the ES approach along with some critiques on the assumptions made during the CA norm calculation process. Using the ES approach, we obtain an estimate of a long run structural CA balance for Turkey. Next, we show

¹ For further information on the CGER methodologies, see Isard et al. (2001), IMF (2006), Abiad et al. (2009), Medina et al. (2010), and Lee et al. (2011).

² The main goal of this study is to provide some critiques on the new methodology rather than discussing the details of it. For a detailed discussion on the technical details of the EBA, see IMF (2012).

³ The EBA includes an enriched set of explanatory variables and a set of policy variables besides the cyclical and structural variables.

⁴ In the CGER methodologies, a reduced-form empirical model directly provides an assessment on the RER. On the other hand, the counterparts of the CA model and the ES approach in the EBA use the trade elasticities to calculate the level of adjustment in the RER that is required to eliminate the estimated CA gap. The EBA also considers these alternative models within a complementary perspective. It suggests that a similar translation between the CA gap and RER misalignment is still in effect.

that alternative values of trade elasticities result in a large dispersion in the estimated RER misalignment for the 2010-2012 period. We conclude that the EBA delivers a huge uncertainty on the RER level of a floating exchange rate country; therefore, the evaluations of the Fund should be taken very cautiously. Moreover, the analysis suggests that the level of caution is directly proportional to the CA to GDP ratio.

The next section provides a general discussion and some critiques on the EBA. The following section presents the details of the ES approach. It also discusses the role played by the trade elasticities along the process. Before the final section concluding the paper, the fourth section offers some remarks on the results of a sensitivity analysis for the Turkish economy.

2. Discussion of the EBA

In this section we provide some of our major critiques on the EBA methodology. Firstly, the results of the methodology require a careful interpretation, since there may be structural changes in the economies that cannot be captured by a panel regression. This might lead to an omitted variables problem. There may also be data and measurement problems, which may seriously affect the results and hence the assessments and policy implications. The signs of such problems are observed in constantly overvalued or undervalued RER estimates for some countries over a long period. One way of overcoming these problems could be including macro-prudential policies or macro-finance indicators; such as the spread between deposit and credit rates, credit growth or the difference between the credit and deposit growths, might be incorporated into the methodology. We believe that these variables carry a lot of information about the CA balance of the economies.

Secondly, the coefficient estimates come from a pooled-sample; therefore, it reflects an average CA response to the variables; therefore, a closer examination of country specific dynamics would improve the estimates. Although it is not feasible to run the regressions for individual countries due to the sample size, it is possible to extract country specific coefficients. Considering the parameter heterogeneity across countries⁵, it would be a very useful exercise for the policymakers. Moreover, the dynamics of the advanced and emerging market economies might significantly vary due to their diverging characteristics.

Thirdly, according to the EBA, the RER is the only driver of the CA gap. The end result of the whole analysis is, thus, presented as a judgment on the RER being overvalued or undervalued. However, the adjustment of the CA gap can be made through other policy variables. Moreover, during the translation of the CA gap to an RER gap, it is implicitly assumed that the elasticities of exports and imports with respect to RER can be tightly estimated.

To properly examine the external adjustment dynamics of the economies, all of the concerns above need to be fully addressed. In this respect, we study the impact of financial indicators on

⁵ For instance, the impact of fiscal policy on the RER differs a lot across countries; see Lane and Benetrix (2009) for the details.

the CA dynamics in a companion paper. Our preliminary results suggest that the financial indicators carry a lot of information about the CA dynamics. Moreover, it is indispensable to consider the country-specific characteristics in the analysis. In this particular study, however, we focus on the third critique and for the sake of exposition we use the Turkish data over the recent period. To this end, we estimate a long run structural CA norm by using the ES approach to calculate the CA gap⁶ and conduct a sensitivity analysis on the translation process of the CA gap to an RER gap.

3. The CA Norm and RER Assessment under the ES Approach

The ES approach starts with the balance of payments identity:

$$CA_t + K_t + [H_{L,t} - H_{A,t}] + Z_t = 0 \quad (1)$$

where CA_t is the current account, K_t stands for the capital account, $[H_{L,t} - H_{A,t}]$ denotes the financial account, and Z_t represents the errors and omissions. CA_t is used to mark the inflow and outflow of goods and services where the international capital transfers are recorded under the capital account. In the financial account, international monetary flows related to the investment in business, real estate, bonds and stocks are documented.

Proceeding by normalizing all quantities by GDP⁷ and assuming that there are no errors and omissions ($z_t = 0$), no capital transfers ($k_t = 0$) and no capital gains ($kg_t = 0$), the current account norm, ca^s , that is compatible with some steady state level of NFA, b^s , can be written as

$$ca^s = \frac{n}{1+n} b^s = \frac{\pi + g(1+\pi)}{(1+g)(1+\pi)} b^s \quad (2)$$

Here, n denotes the growth rate of nominal GDP, g is the real GDP growth, and π stands for the inflation rate. Note that the composition of the assets and liabilities as well as the return of each asset class is implicitly not a relevant factor to the CA norm. Moreover, equation 2 shows that any CA level is consistent with some level of indebtedness. Countries with larger external indebtedness would have larger negative CA norms. To derive the CA norm, the approach requires further assumptions for the potential GDP growth rate, average inflation profile and a level of external indebtedness at which the NFA position will be stabilized.

In the second step, the necessary RER adjustment⁸ to clear the CA gap is calculated. The assumptions that are made for this analysis are: 1) trade balance is the only driver of the CA;

⁶ Although cyclically adjusted CA model delivers higher CA norm values for higher growth years, the reported IMF assessments share the convention of the translation process between the estimated CA gap and the required RER adjustment.

⁷ Lowercase variables are ratios to GDP for quantities such as exports, imports and CA balance. Appendix A provides the details of the derivation.

⁸ The details of transformation from a CA gap into a RER misalignment are provided in IMF (2006).

thus, other adjustment channels, such as financial linkages⁹, are not considered; 2) the export and import price elasticities can be tightly estimated. The CA identity¹⁰ is

$$CA = PX - \frac{P^*M}{e} \quad (3)$$

where X denotes the volume of exports, M is the volume of imports, e stands for the nominal exchange rate, and finally P and P^* represent the domestic and foreign price level, respectively. The nominal exchange rate is $e = \frac{\text{foreign currency}}{\text{domestic currency}}$. Thus, an increase in e represents an appreciation of the domestic currency. Normalizing the quantities with GDP, taking the first derivatives and rearranging the equation (3) give the semi-elasticity of the CA with respect to the RER as a function of the trade elasticities,¹¹

$$\delta_{\varepsilon}^{ca} = x\delta_{\varepsilon}^x - \frac{m}{\varepsilon}(\delta_{\varepsilon}^m - 1) \quad (4)$$

Here, ε represents the RER and, δ_{ε}^x and δ_{ε}^m denote the RER elasticity of the exports and imports, respectively. Given these, $\delta_{\varepsilon}^{ca}$ stands for the semi-elasticity of the CA to GDP ratio with respect to the RER. Formally, $\delta_{\varepsilon}^{ca} = \frac{d(CA/NGDP)}{d\varepsilon/\varepsilon}$.

Considering the assumption for e , the price elasticity of imports will be positive and price elasticity of exports will be negative. Finally, the evaluation of the RER relative to the CA norm is given by

$$\Delta\varepsilon = \frac{ca^u - ca^s}{\delta_{\varepsilon}^{ca}} \quad (5)$$

where ca^u and ca^s are the underlying CA and CA norm derived in the previous step, respectively.

4. Remarks for Turkey

When we closely examine the results of the EBA regarding the Turkish economy, we see that the Turkish Lira is among those currencies that are assessed to be overvalued for the whole last decade. However, this result cannot be validated by other measures, such as the index of the real effective exchange rates with respect to the peer emerging market economies (REER^{eme}) and a trend analysis by Ekinci et al. (2013). For instance, the EBA indicates a substantially overvalued Lira by the end of 2012 where REER^{eme}, plotted in Figure 1, shows no signs of overvaluation. Moreover, Ekinci et. al. (2013) finds that REER^{all} (see Figure 1), an index of RER vis-à-vis all of

⁹ Currency composition of assets and liabilities is neglected.

¹⁰ For the ease of exposition, we drop the time subscripts.

¹¹ Appendix B provides the details.

Turkey's trading partners, is close to its long-run trend value¹² by the end of 2012 according to various filtering methods.

To investigate the EBA results more thoroughly, we proceed by estimating a CA norm and calculate the RER gap for Turkey over the recent period. While deriving the CA norm, it is assumed that there are no errors and omissions, no capital transfers and no capital gains. Moreover, to obtain the norm value that is compatible with the medium term prospects, we need to make further assumptions for the potential GDP growth, an average inflation profile and the level of external indebtedness at which NFA position will be stabilized. These assumptions are prone to several questions. Although it is necessary to tackle the possible problems that these assumptions might cause, in this study we rather focus on the translation process of the CA gap¹³ to an RER gap.

Following Lee et al. (2011), we set the inflation at 2.5 percent¹⁴ and long-run GDP growth rate at 5 percent. We also plug in 2012 value of NFA to GDP ratio, -52.9 percent, as the steady state level. Using the long-run averages for export and import levels, the estimated CA norm for Turkey is -3.75 percent. Table 1 summarizes these assumptions.

Next, we focus on the assumption that the trade balance is the only driver of CA and thus the CA gap problem is pinned down to solely an RER misalignment problem. This view requires tight estimates of the trade elasticities with respect to the RER. Despite the necessity of tightly estimated values of these elasticities, the literature for the Turkish economy shows a huge dispersion. Table 2 collects the values assigned to these elasticities in the literature. If we overlook the time span used in the studies, the RER elasticity of exports can vary from 0.34 to 0.93 and that of imports can take values between 0.4 and 0.91. Therefore, we calculate the necessary RER adjustment in line with the ES approach assessment for Turkey for the years of 2010, 2011 and 2012, under alternative trade elasticities.

Table 3 reports the RER assessments of Turkey for the three years according to the ES model. The CA gap according to the model amounts to 5.95 percent in 2011. In the baseline case, Lira is found to be 39.85 percent overvalued by the end of that year. However, the dispersion of the trade elasticity estimates, reported in table 2, suggests a sensitivity analysis. In this regard, we calculate the RER gap for alternative trade elasticities and report the findings in table 3. By the end of 2011, if we assume that the trade elasticities¹⁵ are 10 percent higher

¹² Ekinci et al. (2013) estimates an average real appreciation rate around 2 percent for Lira in the REERall. A long-term appreciation in the RER possibly due to the Balassa-Samuelson effect is observed. Another reason for trend appreciation is the higher degree of quality bias in inflation compared to advanced economies; see Arslan and Ceritoğlu (2011).

¹³ The true metric of the CA balance that is used to obtain a CA gap in the ES approach is also subject to another debate. One can argue that the cyclical component of the CA balance is ignored in the approach. This issue can be tackled by a comparison between a measure of medium-run CA balance and the CA norm obtained by the ES approach. The medium-run balance can be derived by taking a rolling average or using more sophisticated methods as suggested by Kara and Sarıkaya (2013).

¹⁴ This value is consistent with the IMF's World Economic Outlook projections for the US economy over the medium term. The appropriate measure of inflation is the domestic one if external assets and liabilities are primarily denominated in domestic currency or foreign inflation if they are primarily foreign currency denominated.

¹⁵ Baseline elasticity numbers are taken from Isard and Faruqee (1998). Aydın (2010) also uses the same values for the CGER analysis. Baseline case implies that approximately 7 percent change is necessary in the RER to close a 1 percent CA gap. We consider a 10 percent change in trade elasticities. Implied semi-elasticity of the CA to GDP ratio with respect to the RER is 0.11 for lower trade elasticities and 0.19 for higher elasticities.

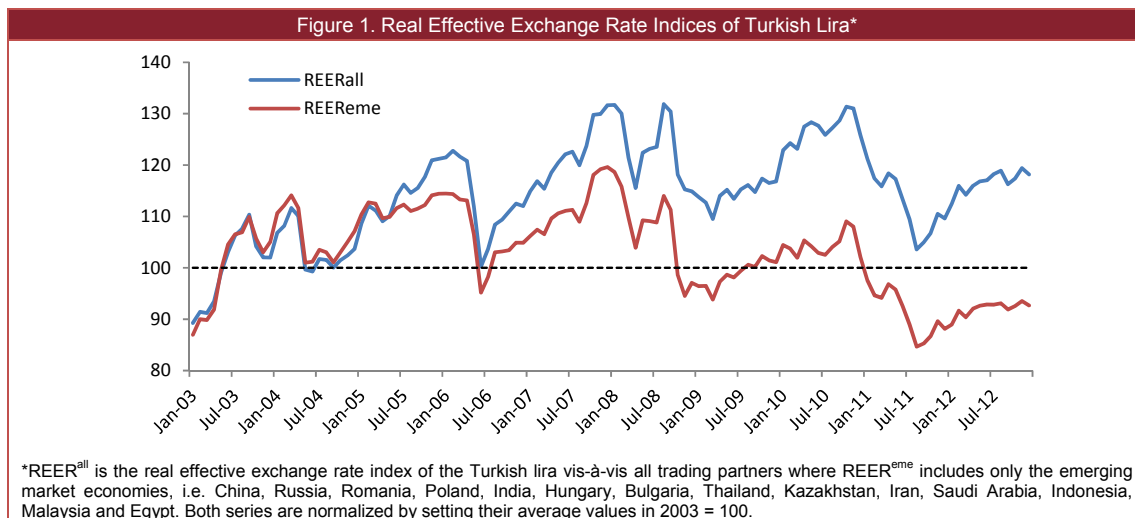
(lower) than the baseline case, we obtain 31.41 (54.51) percent overvalued Lira. The difference in the degree of estimated misalignment with alternative trade elasticities goes up to almost 23 percent due to the high level of the CA gap. 2010 and 2012 values display a lower degree of dispersion of estimates due to the lower CA deficit. However, country specific estimates in table 2 suggest that there might be a wider interval of trade elasticities to consider for the process.

5. Conclusion

Recently, the IMF introduced a successor to the CGER methodology, the EBA, featuring three corresponding approaches of its predecessor. This study initially provides a discussion and some critiques on the new methodology. Out of those important concerns, we focus on the policy implication, which suggests that the estimated CA gap can solely be closed by an RER adjustment. To underline this concern, we estimate a CA norm according to the ES approach and calculate the implied CA gap for the Turkish economy over the recent period. Then, following the methodology, we translate the CA gap into an RER gap, which critically depends on the trade elasticities with respect to RER.

The literature provides a wide range for the trade elasticities of the Turkish exports and imports. The analysis reveals that the EBA might provide a large interval for the estimated RER misalignment depending on value of the trade elasticities. The dispersion might go up to 23 percent for Turkey in 2011. Therefore, the analysis suggests that the EBA assessments on the RER should be taken very cautiously, especially during the high CA to GDP ratio times. We conclude that the RER evaluations should consider alternative measures besides EBA assessments.

6. Tables and Figures



Long-run GDP growth	5.00%
Inflation Rate	2.50%
Stabilizing NFA to GDP Ratio (2012 value)	-52.90%
Steady State Exports/GDP Ratio (1998-2012 average)	23.87%
Steady State Imports/GDP Ratio (1998-2012 average)	25.21%
CA Norm	-3.75%

Study	Time span	Export elasticity	Import elasticity
Aldan et al. (2012)	2003q1 – 2011q4		0.60
Aydin et al. (2004)	1987q1 – 2003q4		0.40
Bahmani-Oskooee and Kara (2005)	1973q1 – 1998q4	0.68	0.97
Berument and Togan (2007)	1970 – 2005	0.34	0.97
Guris and Yavuz (2006)	1982 – 2002		0.91
Neyaptı et al. (2007)	1980 – 2001	0.67	
Sahinbeyoglu and Ulasan (1999)	1987q1 – 1998q3	0.60	
Sarikaya (2004)	1989q1 – 2003q3	0.60	
Tansel and Togan (1987)	1960 – 1983	0.93	0.47

Study	2010	2011	2012
Current account deficit to GDP ratio	-6.22	-9.70%	-5.91
IMF's RER assessment	16.52%	39.85%	14.47%
Sensitivity analysis w.r.t. trade elasticities (+10%, -10%)	(13.02%, 22.60%)	(31.41%, 54.51%)	(11.40%, 19.79%)

¹⁶ Elasticities are reported in absolute values.

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Appendix A: Derivation of the CA Norm

The capital gains (KG) arising from valuation changes including the currency changes can be derived as follows:

$$KG_t = KG_{A,t} - KG_{L,t}$$

$$KG_{A,t} = A_t - A_{t-1} - H_{A,t}$$

$$KG_{L,t} = L_t - L_{t-1} - H_{L,t}$$

$$(H_{L,t} - H_{A,t}) = KG_t - (A_t - L_t) - (A_{t-1} - L_{t-1})$$

Defining the net foreign assets, B_t , as the difference between the assets, A_t , and liabilities, L_t ,

$$B_t = A_t - L_t$$

Using equation (1) and KG definition above,

$$B_t - B_{t-1} = CA_t + K_t + KG_t + Z_t$$

and dividing by nominal gross domestic product (NGDP), with $n_t \equiv \frac{NGDP_t}{NGDP_{t-1}} - 1$, we obtain the following identity:

$$ca_t + k_t + kg_t + z_t = b_t - \frac{1}{1+n_t} b_{t-1} = b_t - b_{t-1} + \frac{n_t}{1+n_t} b_{t-1}$$

Assuming that there are no errors and omissions ($z_t = 0$), no capital transfers ($k_t = 0$) and no capital gains ($kg_t = 0$), the CA norm, ca_t^s , that is compatible with some steady state level of NFA, shown by b^s , will be given by

$$ca^s = \frac{n}{1+n} b^s = \frac{\pi + g(1+\pi)}{(1+g)(1+\pi)} b^s$$

Here, g is the real GDP growth and π denotes the inflation rate.

Appendix B: Derivation of Semi-elasticity of the CA to GDP Ratio with respect to the RER

Starting with the current account identity¹⁷,

$$CA = PX - \frac{P^*M}{e}$$

where X denotes the volume of exports, M is the volume of imports, e stands for the nominal exchange rate and finally P and P^* represents the domestic price level and foreign price level,

¹⁷ For the ease of exposition, we drop the time subscripts.

respectively. Thus, the unit of the nominal exchange rate is domestic currency divided by foreign currency, i.e. $e = \frac{\text{foreign currency}}{\text{domestic currency}}$, and an increase e will represent an appreciation in the domestic currency. Dividing both sides of the equation by NGDP will yield

$$ca = x - \frac{P^*M}{eNGDP}$$

Here ca is the ratio of the current account to NGDP. We can revise the right hand side of the equation and rewrite it as

$$ca = x - \frac{m}{\varepsilon}$$

where ε represents the RER. Taking the derivative of both sides with respect to the RER yields

$$\frac{dca}{d\varepsilon} = \frac{dx}{d\varepsilon} - \frac{1}{\varepsilon} \frac{dm}{d\varepsilon} + \frac{m}{\varepsilon^2}$$

$$\delta_{\varepsilon}^{ca} = x\delta_{\varepsilon}^x - \frac{m}{\varepsilon}(\delta_{\varepsilon}^m - 1)$$

$\delta_{\varepsilon}^j, j \in (x, m)$ denotes the elasticity of the regarding variable with respect to the RER. $\delta_{\varepsilon}^{ca}$ represents the semi-elasticity of the CA to GDP ratio with respect to the RER. Formally, it is $\delta_{\varepsilon}^j = \frac{d(CA/NGDP)}{d\varepsilon/\varepsilon}$.

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