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Exchange Rate Misalignment in Turkey: Overvalution of the Turkish Lira

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Abstract

In 2001, Modern Turkey experienced the most severe financial collapse in its history during the implementation of an anti-inflationary, fixed-exchange-rate-based stabilisation program. An important part of critisms following this collapse focused on the exchange rates. The main argument was that the program overlooked the fact that Turkish Lira was highly overvalued during the implementation of the stabilisation program. The currency of a country would be overvalued if its realized values against other currencies persistently stayed over the long-term equilibrium trend. Overvalution of a currency is an important matter for any country because the exchange rates are decisive on the external balance of a country, the stability of financial system, and the internal prices and hence on the allocation of resources. Plus, the two recent financial crises in Turkey, in 1994 and 2001, broke out after significant overvaluations in the Turkish Lira. This study found significant overvaluations in cumulative terms in the Turkish Lira for the period after 2001. Although, Turkey might have gained some resilience to exchange rate misalignments after 2001 due to political and economic changes in the country, the high level of overvaluation in the Turkish Lira should nevertheless be seen as a risk factor.

Keywords: Exchange rate misalignment, state space models, kalman filter, wiener-kolmogorov filter

Introduction

In 2001, Turkey experienced the most severe financial collapse in its history. Leadign to that collapse was an anti-inflationary, fixed-exchange-rate-based stabilisation program which was initiated in December 1999. This IMF-supported program which relied on an exchange rate basket as the nominal anchor and fiscal austerity came to an end in February 2001 with a sharp devaluation of the national currency. As a result, the currency mismatches in the assets and liabilities sides of the balance sheets of banking and non-banking sectors in Turkey surfaced and so the country tumbled into a severe economic crisis (Yeldan and Özlale 2002). An important part of critisms following the collapse focused on the exchange rates. The main argument was that the program overlooked the fact that Turkish Lira was highly overvalued during the implementation of the program (Civcir, 2003). Atasoy and Saxena (2006) finds that the Turkish Lira was overvalued not only before the 2001 crisis but also before the 1994 crisis, another crisis year in recent past of Turkey. Yeldan and Özlale (2002) stresses that the episodes of

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currency crises witnessed among the emerging economies throughout the 1990s underlined the need for avoiding exchange rates that are incompatible with maintaining sustainable external accounts. Recently, the discussions on whether the Turkish Lira is overvalued or not restarted. The Peterson Institute of International Economics declared Turkish Lira highly overvalued in May 2012 and some columnist in major newspapers wrote on this issue.

In fact, in the aftermath of the 2001 crisis, Turkey abondaned the fixed exchange rate regime and shifted to a free float exchange rate regime. This policy switch designates a point of structural change in exchange rate market in Turkish economy. It is well known that the Turkish Lira devalued not only in nominal terms but also in real terms vis-a-vis major currencies in 2001. But given the high inflation environment in Turkey and the stationarity of the nominal exchanges after 2001, the question of whether Turkish Lira became overvalued again in the years following the 2001 crisis stems as a crucial question. Therefore, the recent discussions have a valid point.

Furthermore, the question on the possible misalignment of a currency is an important question in any context because the exchange rates are indicative variables for the external balance of a country (this effect takes place through the foreign trade), the stability of financial system (because a highly misaligned currency against the foreign currencies might need a sharp correction at some point in time), and the internal prices (through the inflation pass-through from the imported goods). Hence, this paper asks whether the Turkish lira is misaligned and, if so, by how much.

Rest of the paper is organized as follows. The real exchange misalignment concept is discussed and the model is introduced in section two. Estimation results are in section three. Concluding remarks are in section four.

Exchange Rate Misalignment: the Definition and Ways to Estimate It

The real exchange rate is said to be misaligned if its realized value exhibits a persistent departure from the long-term equilibrium trend. The overvaluation of a currency means that the realized values persistenly happen to be over the long-term equilibrium trend. The most challenging problem confronted in the calculations of the misalignment is that the long-term equilibrium is not an observable value (Kibritçioğlu and Kibritçioğlu 2004).

To calculate the misalignment in Turkish Lira, a time-varying mean-reverting state space model is employed in this study. In the literature two approaches are extensively used. The first approach relies on Purchasing Power Parity (PPP). As well known, PPP is based on the law of one price. The law of one price claims that the exchange rates of the currencies leave no room for trade arbitrage, assuming that there cannot be two distinct prices for the same good in the world. Thus the changes in the exchange rates will be equal to the inflation differential between the countries. PPP has its own deficiencies in a world where goods are hardly homogenous, there are the distortionary effects of trade policies and transportation is not without costs. But the main deficiency of PPP is that it assumes the exchange rates are determined in a way to

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equalize the prices of the goods on all over the world, however, today the foreign exchange market has a very weak link with the real goods or commodities markets. The real impetus determining the relative prices of currencies in the market should have financial motives behind. As a striking example, one can note that the daily turnover in the global exchange market in 2010 is reported by the Bank for International Settlements as $4.0 trillion while the volume of annual trade in the same year is reported as $15.2 trillion by World Trade Organization. Then, assuming a year of 220 business days, the annual turnover in the global exchange market would sum up to $880 trillion, a figure which dwarfs the annual trade volume of $15.2 trillion. Clearly, national currencies are traded without the motive of trading on real goods but for making profits on foreign exchange arbitrage and yield differences of international financial assets.

The second approach in literature is to use econometric techniques to predict the equilibrium level of the real exchange rates to compute the variation of the actual values from the predicted equilibrium values. As aforesaid, the main difficulty is that the equilibrium level is unobservable. An appropriate way to deal with this problem is to use the state space models. State space models are econometric models comprising of two main notations. The first notation, namely the signal fuction, is a stochastic equation for the variables that are themselves unobservable and that's why substituted with a proxy. In this paper, consumer price index based real currency index of the Central Bank of Turkey (real currency index hereafter) is taken to be the proxy for the unobservable real currency path. The second notation of the general model is called the state function and implies the deviations of the coefficients of the regressors from their sample means. The model can be denoted as follows:

(1)

(2)

In this spesification; in equation (1) is the real exchange rate level, X_t is a vector that includes the regressors which are thought to affect the real exchange rate level, is the coefficients matrix and is the disturbance term. Equation (1) is the signal function of the model.

Equation (2), as already said, is the state function determining the coefficients matrix as an AR(1) process. Note that it is also possible to generalize the state equation to higher orders of autoregressive processes. The rationale in this paper for assuming an AR(1) process for the state equation is that in an environment where the coefficients of the regressors on the real exchange rates change dynamically, the coefficients today are the meaningful estimators for the coefficients tomorrow because it is very common in the literature to assume the dynamic movement of the exchange rates are explainable by Brownian motion. That is to say, the impacts of innovations (in our case we can assume the innovations are the daily surprise news affecting the currencies) can change the relative impacts of different regressors from time to time. With an AR(1) process, we assume the impacts of daily news are temporary and fades away in relatively short term (the partial autocorrelation dies out in the second consecutive

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period) underscoring a mean reverting coefficients structure for our model. is the disturbance term of the state equation.

Kalman filter, which is a recursive algorithm minimizing the error squares, is used to compute the time-varying estimators. The system matrix required for Kalman filtering is defined as $\boldsymbol{\theta} = \{\boldsymbol{a_t}, \boldsymbol{X_t}, \boldsymbol{T_t}, \boldsymbol{Var}($. Denoting and respectively as and matrices and as matrix, we need to replace these unknowns in the system with their forecasts. Therefore, assuming and are white-noise processes, the conditional distributions of estimators are found. Assuming that at time , information until time is available, is the estimator complying with the minimum squared errors criterion. Hence, conditional variance at time is . If $s = t-1$, would be the one period ahead signal forecast and would be the one period ahead error. Once we call the variances of all these errors as , we find $\boldsymbol{F_{t|t-1}} = \boldsymbol{Var}$ Kalman filter, which we will use to find the time-varying estimates is an algoritm which recursively minimizes the signal forecast errors (i.e. the w terms). If we call the time-varying parameters as , under the assumption of normally and independently distributed w and v's, Kalman filter will provide the Maksimum Likelihood estimates of 's, that is the results from the maximization of the following log-likelihood equation.[1]

$$LogL(\varphi) = -\frac{T}{2}log2\pi - \frac{1}{2}\sum_t log|F_t(\varphi)| - \frac{1}{2}\sum_t \bar{w}'_t(\varphi)F_t(\varphi)^{-1}\bar{w}_t(\varphi)$$

The real currency index of the Central Bank of Turkey has been chosen as a proxy for the unobservable equilibrium path of the real exchange rates. In the next section a highly descriptive equation will be specified with regressors explaining the real currency index. That equation will be the signal function for the real exchange rates. β estimates will be estimated from this signal. Then, they will be filtered using the Kalman filter and become time-varying. The regressors in the signal function will also be filtered. Their long-term trend values will be found using a Wiener-Kolmogorov filter. In the final phase of all these, a new time series for the real currency will have been calculated by simply multiplying the filtered regressors with the time-varying coefficients. A noteworthy feature of this technique is that the time-varying nature of the coefficients enable different periods to have different impacts on the dependent variable. That is why, in the next section the signal function does not include dummy variables for the crisis years of the Turkish economy, namely 1994 and 2001, and the recent global recession. On the other hand, because the new index is calculated by using the long-term trend values of regressors, the new index will be accepted as the long-term equilibrium path of the real currency[2].

[1] Kalman filter is run using E-Views 5.0 package with maksimum 500 iterations and 0.001 convergence.

[2] In fact the equilibrium path of the real currency is the locus of points in time that at such values of the currency the internal and external equilibria of the economy were achieved

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Estimation Results

The model that is constructed in accordance with the explanations in the first section is a multivariable model as follows;

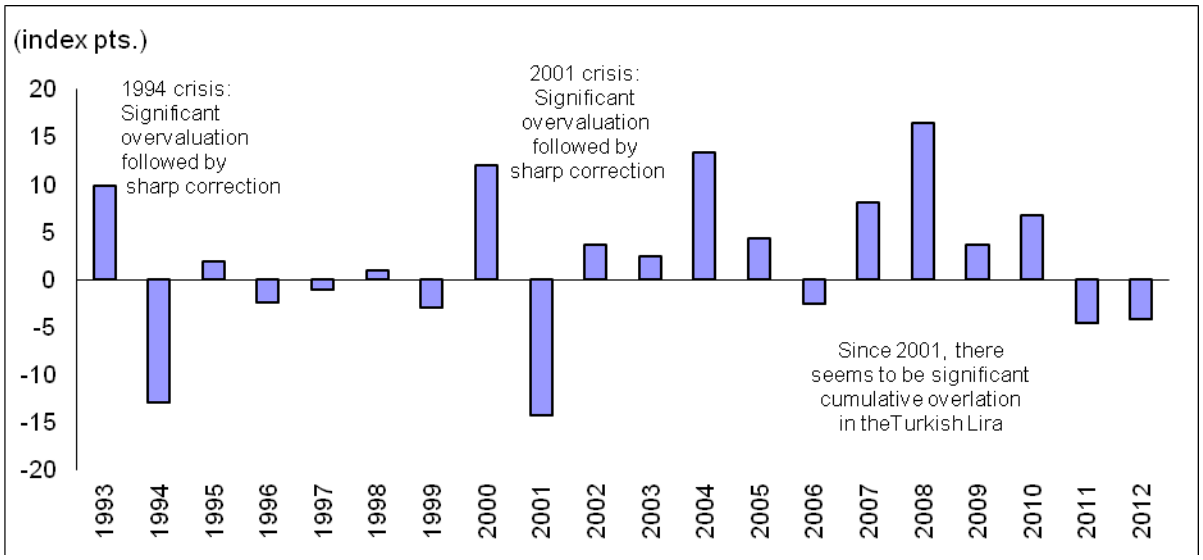
$$RC_t = \alpha_t + \beta_{1t}RC_{t-1} + \beta_{2t}RC_{t-2} + \beta_{3t}IP_t + \beta_{4t}CPI_t + \beta_{5t}CPI_{t-1} + \beta_{6t}SL_{t-1} + \beta_{7t}Dvol_t + \beta_{8t}Dvol_{t-1} + \varepsilon_t$$

where, *RC* stands for the consumer price index based real currency index estimated by the Central Bank of Turkey. In this paper, as *RC* observations, 1995=100 index is used until 2003, and 2003=100 is used from 2003 to the end of 2012. The observations used in this study span the monthly data on each variable from 1993:1 to 2012:12. *IP* is the industrial production index. Again, different *IP* indices had to be stacked since the index has been reestimated three times by the Turkish Statistical Agency over 1993-2012 period. *CPI* refers to the consumer price index, *SL* refers to the short term portfolio liabilities of banking and nonbanking sectors in the balance of payments account. Dvol is volatility of the US Dollar (standar deviation of each 12 months). Finally, ε is the error term.

The above regressors are selected from a set of numerous regressors according to their positive contribution to the $\bar{R}^2$. Their lags in the models is determined according to AIC and SC. The equation is free from autocorrelation problem but not from heteroskedasticity. The significance of the model is controlled by using White's heteroskedasticity consistent variance-covariance values. Using that model, a new real currency index is calculated as explained in the previous section. By subtracting the calculated index values from the index values of the Central Bank of Turkey the deviations in the real currency is derived. If the index of the Central Bank exceeds the equilibrium values then the real exchanges are said to become overvalued. Undervalued otherwise. Figure (1) shows the sum of the monthly deviations from January to December each year.

simultaneously. The internal equilibrium satisfies the clearing of the domestic labour market and nontrable goods market while the external equilibrium satisfies the sustainability of the current accounts of the balance of payment. For the detailed discussion, see Kibritçioğlu and Kibritçioğlu (2004). Our technique, on the other hand, assumes the long-term trends of explanatory variables in a structural model can be combined to calculate the long-term equilibrium of the dependent variable in a composite way.

Figure 1. Annual Appreciation of Turkish Lira (sum of the monthly deviations over 12 months)



As a result of this study, it is found that Turkish Lira was overvalued before the 1994 and 2001 crises in Turkey. However, the cumulative overvalution in Turkish Lira has been the largest in the period after the 2001 crisis. However, Turkey did not experience a severe crisis since 2001 due to the exchange rate misalignment. That might be reflecting the success of free exchange rate regime put in place after the collapse in 2001. Secondly, the Turkish economy might have become more resilient to shock thanks to the structural reforms that have been undertaken as a response to the 2001 crisis such as granting autonomy to the Central Bank, enforcing risk management practises in banks, supervising and regulating banks through a newly-created state body called the Banking Supervision and Regulation Agency. Thirdly, Turkey has been ruled by a single-party since 2002 elections. Previously, the coalition governments were the norm for Turkey, hence, this one-party rule must have increased the political and economic stability as well. Plus, the fiscal discipline imposed by the government in this period should have contributed positively to the stability and the strength of the Turkish economy.

To be more precise, in October 1993 the deviation was +1.9 point (i.e. the index of the Central Bank of Turkey had to be 1.9 point lower) and was indicating an overvaluation in Turkish Lira. In November and December, the deviations from the equilibrium levels were +3.7 and +4.3, respectively. In January 1994, the deviation was +2. In February, a correction of –1.8 point was seen. In March the deviation was –0.9. In April 1994, Turkey underwent an economic crisis. In April the deviation was –11.98 owing to the devaluation of the currency. A similar process has been witnessed before the 2001 crisis, too. Starting from October 2000, the deviations in October, November, December 2004 and January 2005 were +1.3, +3.2, +4.7 and +5, respectively indicating that Turkish Lira appreciated substantially in cumulative terms. An important point that needs to be mentioned right here is that the monthly figures of overvaluation are not that much extreme numbers. That is to say, there exist many other months in our observations that the deviations were even bigger. But it is seen that the mutual

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feature of the periods before the crises were that the overvaluation went on for a continuum of months leading to severe overvaluation in cumulative terms. Thus it can be said that not every overvaluation in the currency produces crises in Turkey but the crises already seen in past came with highly overvalued currencies. The misalignment in the currency does not only mean upward deviation from the equilibrium, that is overvaluation of the currency, but it also can be a downward deviation, that is undervaluation. The more severe misalignment in Turkish Lira with respect to magnitude is seen as undervaluation of the currency following the crises. In February 2001, with the effect of the crisis, the deviation was –5.8. In March and April the deviations were –9.3 and –2.2. The severe undervaluation was already said to reach –11.98 in April 1994. In conclusion, before the two crises Turkish Lira was overvalued to a considerable extent in cumulative terms and Turkey is experiencing a similar overvaluation according to our findings at the end of 2004. Another interesting finding is that the summer months always have negative deviations. In summer the foreign exchange inflow accelerates thanks to the increasing revenues of the tourism sector. One would then expect Turkish Lira to gain value against foreign currencies, which would require positive deviations. Plus, it must be remembered that in summer inflation also slows down to a great degree even leading to negative monthly inflation rates seasonally. It can safely be argued that the summer months are the least risky months in Turkey for a balance of payments crisis to break through thanks to the inflow of foreign currencies owing to tourism which has positive effects on the chronic current account deficit, and the shrinking gap between the equilibrium and actual levels of the real exchanges.

On the other hand, the 2001 crisis in Turkey, marks the beginning of a new period as aforesaid since the overvaluation in Turkish lira in this period has been more in comparison to the level of overvaluations in the preceeding periods. However, Turkish economy did not collapse due to exchange rate misalignment in the aftermath of 2001. This resilience in the Turkish economy can be attributed to many factors such as free exchange rate regime, structural reforms, fiscal discipline and political stability.

Conclusions

This paper documented that Turkish Lira is a highly overvalued currency as of the end of 2012. This finding has significant importance for a country like Turkey given the fact that in dollar terms Turkey runs the fifth largest foreign trade imbalance in the world as of the end of 2012 according to the World Trade Organization trade balance data. Moreover, Turkey has one of the largest current account deficit to GDP ratios in the world. Plus, the analysis in this study also indicated visually that the Turkish Lira was highly overvalued right before the 1994 and 2001, two crisis years in the recent past of Turkey. That is why, highly overvalued exchange rate should be seen as a risk factor in Turkey for it has the potential to create a financial collapse as it did in 1994 and 2001 after sharp corrections in the exchange rate and also for it might be the reason for the external imbalances of Turkey.

Nevertheless, this study also noted another interesting finding. The cumulative overvaluation of the Turkish Lira in the aftermath of 2001 has been much more in magnitude than the

overvaluations recorded right before the 1994 and 2001 crises. Therefore, one might argue that the Turkish economy probably gained some resilience to excessive exchange rate misalignments after 2001. An increase in resilience could be attributable to many factors adopted in Turkey after 2001 such as the free exchange rate regime, regulations and supervisions for the banking sector, central bank independence, political stability under the single party rule and fiscal discipline.

Nevertheless, the persistent overvaluation in a currency should always be considered as a potential risk factor in any country without regard to such persistent overvaluation causes financial collapses or not. After all, persistent overvaluation causes external imbalances through artificial increases in imports and decreases in exports through the nominal price effects. Persistent overvaluations could also destabilize the financial system in a country since a highly misaligned currency against the foreign currencies might trigger a sharp correction at some point in time. Furthermore, persistently misaligned currencies would cause a deterioration in the resource allocation because misalignments would create wrong price signals in the market.

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