E C O N O M I C S B U L L E T I N

Fiscal Theory of Exchange Rate Determination: Empirical Evidence from Turkey

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Abstract

In this paper we empirically test the effects of fiscal and monetary policies on real exchange rates for Turkey for the period 1990-2003. The analyzed period is characterized by large budget deficits, high and variable inflation rates. To assess the effects of fiscal and monetary polices on exchange rate we estimate a 5-variable VAR model for budget deficits, money supply, exchange rates, output, and interest rate differentials. The results suggest that expansionary fiscal policy appreciates real exchange rate whereas the effect of monetary shock is statistically insignificant. Innovations in interest rate differentials and output also cause to appreciation of Turkish Lira. The results of variance decomposition suggest that the effects of fiscal policy on real exchange rates are more pronounced than the effects of monetary policy. Our results are consistent with fiscal theory of exchange rates.

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I. INTRODUCTION

Fiscal theory of price level links price determination to the government present value budget constraint. According to this constraint, the present value of future primary government surpluses must equal the value of current public debt. There are two different mechanism which enable satisfaction of the present value budget constraint. In the first mechanism, the fiscal authority adjusts primary surplus so that budget constraints holds for any sequence of price levels. In the case of such a regime (the so-called Ricardian regime), fiscal policy plays no role at all in price level determination. In the second mechanism, fiscal authorities set primary surpluses independent of the debt level and budget deficits play a dominant role in determination of general price levels. In this case (i.e., in the so-called non-Ricardian regime), the general price level is determined by the government's debt repayment requirement and adjusts so as to satisfy present value of budget constraint (see, for example, Woodford, 1994, 1995, 1996; Sims, 1994, 1998; and Canzoneri et al., 1998). Recently some researchers (e.g., Kawai and Maccini, 1995; Loyo, 1998; Dupor, 2000; Canzoneri et al. 2001; Daniel, 2001) have extended the fiscal theory of price level to open economy set-up, and showed that in non-Ricardian regimes fiscal policy is the major determinant of both price levels and exchange rates. In addition, some researchers (e.g., Hakkio; 1996; Chinn, 1997; Daly and Kearney, 1998; Balvers and Bergstrand, 2002) have provided empirical evidence supporting the view that fiscal policy has more power on both real and nominal exchange rates than monetary policy. Therefore, examination of relative power of fiscal and monetary policies on exchange rate dynamics is of greatest interest, for both academicians and policy-makers.

In this paper we empirically assess the fiscal theory of exchange rate determination for a high inflation country, namely for Turkey, for the period 1990-2003. The analyzed period is characterized by large budget deficits, high and variable inflation rates, and substantial fluctuations in exchange rates. Although the effects of fiscal policy on real exchange rates in the case of Turkey have been analysed before (e.g., Agenor et al., 1997), to the best of our knowledge, no study has examined relative importance of fiscal and monetary policies on real exchange rate dynamics. The results suggest that the effects of fiscal policy are greater than the effects of monetary policy. In addition, it has been found that interest rate differentials, which are a fiscal policy-driven variable, explain overwhelming part of fluctuations in the exchange rates.

The rest of the paper is organized as follows. In part 2 we briefly discuss developments in the Turkish economy during the analyzed period. In part 3 we present empirical results and part 4 concludes.

II. AN OVERVIEW OF THE TURKISH ECONOMY

In this section we provide a brief overview of the Turkish economy during the period 1990-2003. Major macroeconomic indicators of the Turkish economy are presented in Table 2.1. The Turkish economy has experienced a high and volatile inflation during the period 1990-2003. The average inflation rate (as measured percentage change in GDP deflator) was 64.69%, reaching its highest level 107.3% in 1994 and its lowest level 22.3% in 2003. Turkey has undergone two economic crises during this period, in 1994 and in 2001. The Turkish economy declined by 6.1% in 1994 and by 9.5% in 2001,

experiencing its severest recession since 1950's. In addition, the 1999 earthquake that hit the most industrialised region of the country, caused to economic decline by 6.1%. The average real growth rate was around 3.38% during this period.

(Table 2.1)

As argued by Telatar et al. (2003), the main factor behind inflationary process was the need to finance high budget deficits. During the first half of the 1980's Turkey has implemented tight fiscal policies to keep inflation under control. However, after end of stand-by agreement with IMF in 1986, inflation has gained acceleration and jumped to 69.7% in 1988 from its level of 33.5% in the previous year and remained at high levels during 1990's. The budget deficits were initially financed from central bank resources. After introducing domestic borrowing instruments in 1984, domestic borrowing has gained importance in financing budget deficits.

The expansionary fiscal policy increased not only budget deficits, but borrowing requirement and interest rates as well. The public sector borrowing requirement (PSBR) increased rapidly after abandonment of tight fiscal policy and reached to 10.2% in pre-crisis year 1993 from 3.6% in 1985. Short term borrowing at high interest rates caused a need for re-borrowing for debt repayments, and thus created a vicious cycle of high budget deficits and high interest rates. High domestic interest rates have attracted huge capital inflows commencing from 1989 when capital account were liberalised, what in term caused appreciation of the Turkish Lira. Appreciation of the Turkish Lira has been seen by the governments as a mean of fighting high inflation rates (Aşıkoğlu and Uçtum, 1992).

Commencing from 1993, in order to cover budget deficits, central bank resources have been used intensively along with foreign borrowing. In the same time interest rates on domestic borrowing instruments have been suppressed by administrative decisions. For this purpose, six out of nine domestic borrowing tenders were cancelled in November-December 1993 period. However, such interventions were not successful and interest rates continued to rise and maturity of domestic borrowing has shortened further. On the other hand, two leading credit rating agencies have downgraded credit note of Turkey in January 1994, which has been perceived as downturn in economic condition. Under these conditions economic units have lost credence to government and demand for foreign currency has increased dramatically. The Central Bank of Republic of Turkey has used most of its reserves to stabilise exchange rates. These interventions were not successful and worsened economic conditions necessitated extensive reforms.

Stabilisation program launched on April 5, 1994 aimed at stabilisation of value of the Turkish Lira and ensuring financial and economic stability. Turkish Lira was devaluated, prices of state economic enterprises and tax rates were increased, and new taxes were introduced. The stabilisation program has been successful in stabilising financial markets and reducing PSBR. In the pre-crisis year 1993 the ratio of PSBR to GDP was 10.2%. This ratio has been reduced to 6.16% in 1994 and further to 4.97% in 1995. After the crisis was defeated successfully, however, the government once more switched to expansionary fiscal policies, mainly due to political considerations. Tight fiscal policies were in force until second half of the year 1995, when general elections were hold.

Since comprehensive reforms were not undertaken to reduce public sector deficits, the April 1994 stabilisation program had only a limited effect. The public sector

borrowing requirement and domestic debt stock relative to GDP began to rise again commencing from 1996, reaching their peak values in 1999. The sharp increase in PSBR relative to GDP was mainly a result of economic recession due to the earthquake that hit the most industrialised region of the country and increased government expenditures to remove consequences of the natural disaster. In order to cover increased government expenditures due to earthquake, new taxes were introduced and existing tax rates were increased.

Turkey has adopted an exchange rate based stabilisation programme in December, 1999 under support of IMF. In addition to using a basket of 1 USD and 0.77 DEM as the nominal anchor, the programme envisaged implementing structural reforms, tight fiscal policies and large-scale privatisation. While budget deficits and PSBR relative to GDP were reduced by 1% and 3.8%, respectively, the ratio of domestic debt stock to GDP was reduced by only 0.3% in 2000. Although there was a slight improvement in public finance conditions, the failure of the government to implement massive structural reforms and privatisation has reduced the credibility of the stabilisation program and inflation rate remained high at 51% per year. Fixed devaluation rates coupled with initial high interest rates had increased short term capital inflows and caused to appreciation of the Turkish Lira and decrease in interest rates. The banking crisis in November, 2000 reduced credibility of the programme. The financial support provided by IMF under extra reserve facility in November/December 2000 just postponed a new crisis and failed to prevent it. The exchange rate stabilisation programme was abandoned in February 2001 in face of speculative attacks. The Turkish economy has experienced its severest economic crisis in 2001: overnight interbank rates rose to above 4,000%, Turkish Lira depreciated by 40% in a day against USD, and the economy declined by 9.5% in that year. Although exchange rate anchoring was abandoned, the stabilisation programme was in force thereafter with major changes. One of the major amendments introduced in the programme was tightening fiscal policy further, increasing the ratio of primary surplus to GDP to 6.5% over its level of 3.7% envisaged for the year 2000. Furthermore, the law on the Turkish Central Bank has been amended in April 2001, and the central bank was granted independence in conduct of monetary policy. The principal task of the bank was stipulated as ensuring price stability.

As briefly outlined above, fiscal imbalances played a great role in dynamics of the Turkish economy, consistent with findings of Celasun et al. (1999) and Telatar et al. (2003). Therefore, it is worth to assess the role of fiscal policies on exchange rates, which are of one of the important variables for open economies like Turkey. Examination of the relative effects of major determinants of exchange rates has important implications for both policy-makers and academicians. In this paper we confine ourselves to assessing relative importance of fiscal and monetary policies on real exchange rates, which, according to general belief, are primary determinants of exchange rates. Now we turn to estimate the effects of fiscal and monetary policies on real exchange rates. Our empirical model and results are presented in the following section.

III. EMPIRICAL MODEL AND ESTIMATION RESULTS

The effects of fiscal and monetary policies on exchange rates were estimated under framework of the following unrestricted vector autoregressive (VAR) model using monthly data spanning the period 1990:01-2003:12[1]:

$$A(L)X_t = u_t$$
$$A(L) = I - A_1L - A_2L^2 - \cdots - A_PL^p$$
$$\mathrm{E}(u_t) = 0, \quad \mathrm{E}(u_t, u_t) = \sigma^2, \quad \mathrm{E}(u_t, u_s) = 0 \text{ for } t \neq s, \text{and } \mathrm{E}(X_t, u_s) = 0$$
$$X_t = (B_t, M_t, R_t, Y_t, FX_t)$$

Here X_t is (1xn) vector of time series, A is (nxn) matrix of coefficients, u is (nx1) vector of error terms, and L is lag operator (i.e., $L^jX_t = X_{t-j}$). The variables included in the vector X_t are consolidated budget deficits B_t, narrow money supply measured as M1, M_t, trade weighted real exchange rate FX_t, industrial production index Y_t, and interest rate differential R_t. Interest rate differential was calculated as $R_t = (1+i_t)^{1/12} - (1+i_t^*)^{1/12}(s_{t+1}/s_t)$, where i_t is domestic interest rate (of treasury bills), i_t^* is foreign interest rate (LIBOR on 3 month USD deposits), and s_t is the spot rate of USD at date t. Domestic interest rates were taken from SPO, LIBOR rates from IFS, and all other variables were sourced from CBRT.

Since budget deficits at monthly frequency include both positive and negative values, in order to deal with stationarity and seasonality problem, we take annual rates of change ($\Delta Z_t = (Z_t - Z_{t-12})/Z_{t-12}$) of all variables except for interest rate differential. The VAR model assumes that all variables included in the model are stationary. The results of unit root tests of the variables in the model are given below in Table 3.1. We also included dummy variables for 1994 and 2001 crises. The lag length in the model was chosen by using Akaike Information Criterion.

(Table 3.1)

The effects of variables in the model on exchange rate were assessed by impulse response functions and variance decomposition using Cholesky decomposition. It is well known that the Cholesky method of decomposing is sensitive to ordering of variables. Therefore, our particular ordering in computing impulse responses and variance decomposition was budget deficits, money supply, interest rate differential, industrial production and exchange rates, assuming that the budget deficit is the most exogenous variable in the model. However, different ordering of variables did not affect the results provided here.

[1] The time span of the data was restricted by data availability. The interest rates were not available before January 1989 and the definitions of the consolidated budget items were changed commencing from January 2004. Since we compute annual rates of change, the beginning of the sample is January 1990.

3.1. Dynamic response of exchange rates to policy variable shocks

The impulse response functions of the real exchange rates to one standard deviation innovations in budget deficit growth rate, money supply growth rate, interest rate differentials and industrial production growth rate are provided in Figure 1 below. The dotted lines are two standard error bands, which are used as a measure of statistical significance.

As the figure evidences, an unexpected increase in budget deficits cause to temporary appreciation of the real exchange rate. This finding is consistent with findings of Agenor et al. (1997), who also reports that an increase in government expenditures lead to appreciation of real exchange rates. This result agrees with theoretical predictions, as well. As pointed out by Telatar (2002), the Turkish economy has operated in a non-Ricardian regime, in which an increase in budget deficits is not accompanied by corresponding increase in private savings. Therefore, an increase in government spending – mainly on home goods, which are the main component of public outlays in the case of Turkey – requires an increase price of non-traded goods in order to bring the market into equilibrium. Thus, increases in budget deficits lead to increases in relative price of non-traded goods, i.e., appreciation of real exchange rate.

Innovations in the money supply cause depreciation of the real rates as expected. However, the effects of money supply shocks on real exchange rates are not statistically significant. An increase in the money supply is expected to increase nominal exchange rates as well as general price levels. The effects of monetary shocks on real exchange rates thus shall depend on relative effects of money on nominal exchange rates relative to price levels. As the figure evidences, the monetary shock affects both nominal exchange rates and price level almost proportionally, though the effect of money innovations on real exchange rates are only marginally insignificant in the first month after the shock hits the economy, implying that nominal exchange rates adjusts faster to money innovations than price level.

(Figure 3.1)

An increase in interest rate differential causes real exchange rate to appreciate. This is an expected result, since as domestic interest rates rises, capital inflows intensifies, what in turn suppresses nominal exchange rates, and thus leads to appreciation of the real exchange rate. Finally, output growth also causes real exchange rates to appreciate, consistent with the well-known Balassa-Samuelson effect, assuring that economic growth leads to real exchange rate appreciation.

3.2. Variance Decomposition Analysis

The relative contribution of each variable to real exchange rate fluctuations is assessed by variance decomposition using Cholesky method of decomposing, provided in Table 3.2 below. The contribution of the variance of the budget deficits to the variance of the real exchange rate is about 5% after one month, and reaches 12.6% after 3 months and 19.3% after two years. On the other hand, the contribution of the variance of money supply to the variance of the exchange rates is only 2.5% after one month and increases to about 3.4% after two years. As the table reveals, the most important variable in explaining variance of the exchange rates is interest rate differential. The contribution of

the variance of the interest rate differential to that of the real exchange rate is about 23.7% after one month, and reaches 41.4% after one year, exceeding the percentage contribution of the real exchange rate variance to itself. The contribution of the variance of output to the variance of exchange rate is also relatively high, around 15% after one year.

(Table 3.2)

As can be seen, the contribution of the variance of money to that of the real exchange rate is the smallest, whereas the contribution of the fiscal policy and interest rate differential (which is a fiscal policy-driven variable) to the variance of exchange rates is fairly high, rising above 50% after one year. This finding implies that fiscal policy is the most important factor affecting real exchange rates in Turkey. The fiscal policy affects exchange rates through two channels: (i) by increasing price of non-traded goods, and (ii) by increasing capital inflows through rising domestic interest rates.

IV. Conclusion

In this paper we have examined the importance of fiscal and monetary policies on real exchange rates in Turkey in the period from 1990 to 2003. The analyzed period is characterized by large budget deficits, high and variable inflation rates, and substantial fluctuations in exchange rates. By estimating a 5-variable VAR model for budget deficits, money supply, exchange rates, output, and interest rate differentials we showed that innovations in budget deficits, interest rate differentials and output growth rate cause to appreciation of real exchange rates, consistent with theoretical expectations. Although it has been found that an increase in money supply initially leads to depreciation of real exchange rates, the effects of money on real exchange rates were found to be marginally insignificant. It is found that interest rate differentials and budget deficits explain a major part of variations in exchange rates. All in all, our results suggest that fiscal policy has more power than monetary policy on exchange rates, consistent with fiscal theory of exchange rates.

Table 2.1 Selected Macroeconomic Variables

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Real GDP Growth Rate	9.4	0.3	6.4	8.1	-6.1	8.0	7.1	8.3	3.9	-6.1	6.3	-9.5	7.9	5.9
Percentage change in GDP Deflator	57.6	59.2	63.5	67.4	107.3	87.2	78.0	81.2	75.3	55.8	50.9	55.3	44.4	22.5
Consolidated Budget Deficit/GDP	3.0	5.3	4.3	6.7	3.9	4.0	8.3	7.6	7.3	11.9	10.9	16.9	15.2	11.3
PSBR/GDP	7.3	10.1	10.5	10.2	6.2	5.0	8.6	7.7	9.4	15.6	11.8	16.5	12.7	9.4
Domestic Interest Rates	54.0	80.5	87.7	87.6	164.4	121.9	135.2	127.2	122.5	109.5	38.0	96.2	63.8	45.0
Real Exchange Rate	117	112.9	114.9	125.7	95.7	103.1	101.7	115.9	120.9	127.3	147.6	116.3	125.4	140.6
M2 Growth Rate	65.1	53.6	64.8	54	95.4	112.7	97.7	107.2	100.6	101.8	57.1	57.9	35.1	31.1
Portfolio Investments (million $)	547	623	2411	3917	1158	237	570	1634	-6711	3429	1022	-4515	-593	2465
Domestic Debt Stock/GDP	14.4	15.4	17.6	17.9	20.6	17.3	21.0	21.4	21.7	29.3	29.0	69.2	54.5	54.5

GDP: Gross Domestic Product, PSBR: Public Sector Borrowing Requirement
Source: State Planning Organisation, Undersecretariat for Treasury, and Central Bank of Republic of Turkey

Table 3.1 Unit Root Test Results

	Number of Lags	ADF	PP
	k	**Test statistic**	
ΔB	5	-4.554**	-5.789**
R	0	-9.741**	-9.571**
ΔFX	4	-4.212**	-3.684**
ΔM	3	-3.209*	-2.930*
ΔY	4	-3.347*	-6.627**

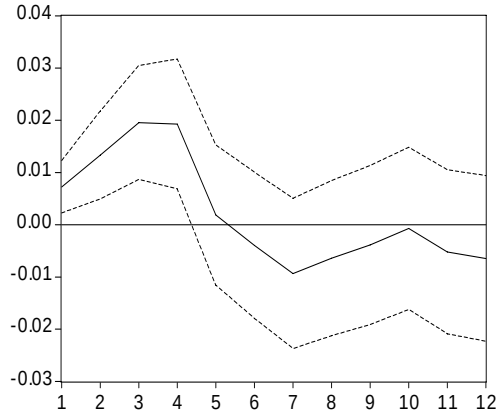
Note: All regressions include an intercept. ** and * denote significance at %1 and 5% levels. The value k is the lag order selected by AIC.

Table 3.2 Variance Decomposition

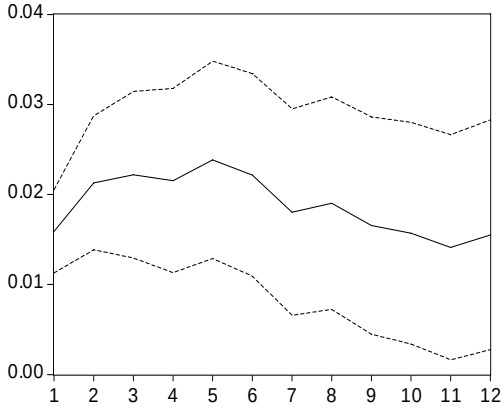
Period	Budget Deficits	Money Supply	Interest Rate Differential	Output	Real Exchange Rate
1	5.219591	2.490260	23.71142	4.198798	64.37993
3	12.55163	1.642340	23.58046	11.93560	50.28997
6	12.49896	2.007545	32.66653	14.76052	38.06645
12	11.51871	2.664366	41.35493	15.02143	29.44057
18	16.88159	2.554653	38.39067	13.45430	28.71879
24	19.34940	3.389204	36.76277	13.11811	27.38052

Ordering: Budget deficits, money supply, interest rate differentials, output, real exchange rate

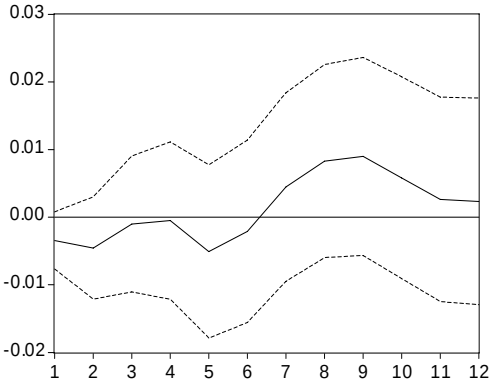
Figure 3.1 Response of Real Exchange Rate to One Standard Innovations



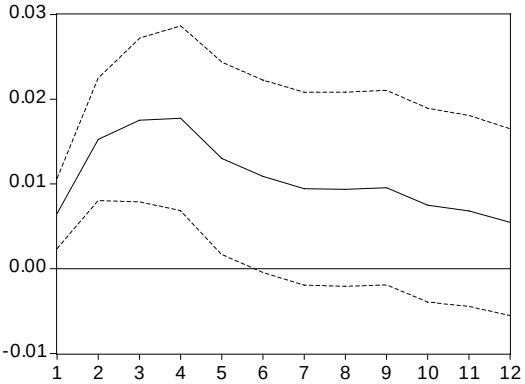
a) Response to budget deficit innovations



b) Response to interest rate differential innovations



c) Response to money supply innovations



d) Response to output growth innovations

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