Output, the Real Exchange Rate and the Crises in Turkey

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Abstract

Since the 1980s, most emerging economies have experienced economic crises associated with large, prolonged current account deficits and real exchange rate misalignment. Eventually these governments ended up devaluing national currencies. Empirical evidence from developing countries suggests that devaluation, in most cases, have been contractionary due to demand-side and supply-side effects. This paper studies the Turkish experience since the 1980s, and based on the results of a VAR analysis, finds that devauations were indeed contractionary.

Key Words: Turkey, real exchange rate, crisis, contractionary devaluations

JEL No: C32, F31, F32

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1 Introduction

Most emerging economies have experienced economic crises associated with real exchange rate misalignment (generally in the form of an overvaluation) since the 1980s. The conventional wisdom following such crises has been that a depreciation would correct the overvaluation, lead to the improvement of the trade balance by boosting exports and discouraging imports in favor of domestically produced goods, and subsequently increase output. Although this has been a widely-accepted theoretical outcome, the evidence from the Mexican crisis of 1994 suggests the opposite (see, for example, Kamin and Rogers (2000)). Indeed, Krugman and Taylor (1978) show that the outcome of a devaluation may be contractionary by focusing on the adverse income effects of the devaluation. In addition, Cooper (1971)'s account of devaluation episodes from 19 different countries provide evidence supporting the contractionary devaluation argument.

The purpose of this study is to examine the relationship between the real exchange rate and output in Turkey, and to reveal whether the evidence supports contractionary devaluations. Since 1980, the Turkish economy has undergone significant changes. The switch to export-led growth from import substitution resulted in the lifting of major restrictions on the economy placed by the government including liberalization of the current account, and abandonment of the exchange controls. The major economic problem during the period had been inflation, and many (unsuccessful) stabilization programs had been implemented. The two major crises the economy had experienced in this period were those of April 1994 and December 2000 - February 2001 and in both instances, the Turkish lira was devalued. The preliminary analysis of the data shows that in both devaluation episodes, the outcome had been a contraction in output with an improvement of the trade balance[1]. This suggests the possibility that exports and imports are not very responsive to the changes in relative prices. Rather, the improvement in the trade balance is due to the income effect, i.e. the inability to import as a result of reduced income.

The paper provides an analysis of the bivariate relationship between output and the real exchange rate in Turkey, as well as VAR modeling. The findings indicate that, for the period between 1987-2005, unanticipated movements in real output do not have much effect on the real exchange rate, however, an unexpected real depreciation reduces real GDP. This evidence supports the idea

[1]The growth rate of GDP was around -6% and -8% in 1994 and 2001 respectively. The trade deficit of 8.6% of GDP in 1993 improved to a trade surplus of 0.05% of GDP in 1994 while the trade deficit of 7% of GDP of 2000 improved to a trade surplus of 2% of GDP in 2001.

that the devaluations during the crisis episodes may be contractionary.

The rest of the paper is organized as follows. The next section introduces the related literature. Section 3 briefly reviews the Turkish economy. The data set is described and analyzed in section 4. Section 5 concludes.

2 Related Literature

Disequilibrium caused by the macroeconomic policies inconsistent with the nominal exchange rate regime had been the major underlying reason of the economic crises that are experienced by the most emerging economies in the last few decades. Such policies trigger a loss in the international reserves and a real appreciation. Responses, such as exchange controls, would prove to be ineffective unless the inconsistencies are corrected for. The erosion of reserves is eventually followed by an inevitable devaluation, and a major structural adjustment program.

The aim of the nominal devaluation implemented after the deep disequilibrium in the external sector is to achieve a real devaluation to improve the international competitiveness of the country and the current account balance. However, unless the nominal devaluation is accompanied by demand management policies, the results may not be successful. It has been pointed out that although nominal devaluation leads to price correction, this does not come without costs. Output and employment may decline as a result, i.e. devaluation may be contractionary (Edwards and Wijnbergen, 1989).

Edwards and Wijnbergen (1989) argue that such devaluations are implemented under disequilibrium conditions are not emphasized much by the traditional models of open economy. For example, the Marshall-Lerner condition states that a devaluation will improve the trade balance as long as the sum of demand elasticities of exports and imports is greater than one. However, this assumes the economy has balanced trade to begin with. As long as the Marshall-Lerner condition holds, a devaluation will be effective in a simple Keynesian model of an open economy in correcting the external balance where the current account deficit equals the excess of expenditure over income. This comes through one of the two ways: (i) by reducing expenditure relative to income, (ii) by redirecting expenditure from foreign goods to domestic goods.

On the other extreme, the monetary approach to the balance of payments (see Frenkel and

Johnson (1976), for example) states that a nominal devaluation will not translate into a real devaluation since absolute purchasing power parity (PPP) holds, and thus, the real economy will not be affected. Only prices will increase, as in classical neutrality and dichotomy.

Combining the two approaches, Edwards and Wijnbergen (1989) argue that if PPP holds in the long-run, but not in the short-run, with sticky prices and wages and domestic and foreign assets being imperfect substitutes, there is room for a nominal devaluation to improve the trade balance at least in the short-run.

Note, however, that the crucial aspect of nominal devaluations as effective policy tools is their ability to implicate real devaluations. Cooper (1971) analyzes 24 devaluation experiences in 19 different countries between 1959-1966, and finds that, in most cases, discrete nominal devaluations are coupled with trade reforms, and are associated with real devaluations. He also notes that these devaluations, in most instances, were contractionary, contrary to the common perception, due to a possible redistributionary effect of devaluation, or to imports exceeding exports with a low price elasticity of import demand. Further, prices of imports, local products that compete with imports, and exports would increase while wages would go up even more. Thus, the effects of nominal devaluation would be weakened.

Edwards (1989) analyzes more recent devaluation episodes in the developing countries for the period 1962-1982. He finds that nominal devaluations are followed by real devaluations, however, in most cases, these effects die out quickly. Further, such effects are observed in those countries that fail to correct their fiscal policies while those that implement fiscal tightening succeed.

Krugman and Taylor (1978) focus on the contractionary effects of devaluations, and conclude that, at least in the short-run, devaluations may have the unwanted result of redistribution of income which eventually causes output to decline. If the devaluing country has a trade deficit, the increase in traded goods prices will reduce domestic real income, and raise foreign real income due to the excess of foreign currency payments over receipts. On the other hand, when there is balanced trade initially, due to the increase in the relative price of tradables profits in export and import-competing industries rise. Note that, since wage increases lag price increases in most cases, this leads to a rise in national saving when marginal propensity to save out of profits is high, and eventually to a contraction. Moreover, when there are ad valorem taxes on exports and imports, a devaluation transfers income from the private sector to the government since the prices of exports

and imports increase. This transfer is saved by the government, at least in the short-run, and thus causes a contraction. These three the income effects of devaluation are usually ignored, thus leading to the widespread belief that a devaluation will improve the trade balance and increase output.

Agénor (1991) notes that in less-developed countries, most intermediate inputs are imported. Thus, a devaluation will have contractionary supply-side effects as well due to increased prices of imports since the producers may choose to reduce production rather than having to pay high interests for loans to import intermediate goods. He builds a rational expectations model of output determination with intermediate imports, and using the data for 23 developing countries for the period 1978-1987, he finds that an anticipated real depreciation has a contractionary effect while an unanticipated real depreciation has a positive impact.

3 An Overview of the Turkish Economy

The year 1980 had been the beginning of the period of liberalization and integration of the Turkish economy to the world economy. The structural change and reform plan of 1980 called for abandoning the barriers to trade, adopting export-led growth strategy, reducing the controls on foreign exchange, transition to the flexible exchange regime, lifting the controls on interest rates, easing bureaucracy, subsidizing foreign capital, and adopting price mechanism were among the main economic reforms introduced in this period. In the immediate aftermath of the implementation of this program, the economy experienced high output growth, low inflation and a healthy balance of payments situation.

The period since the late 1980s is characterized by increasing inflation and several stabilization programs. Nominal anchoring and monetary tightening were used in these programs without any serious effort to reduce the public sector borrowing requirement. Capital account liberalization came in 1989. In the aftermath high nominal interest rate and low depreciation rate were used to attract short term foreign capital to roll-over the public debt. The external and fiscal deficits were taken to be unsustainable by the end of 1993, and these, in turn, led to the crisis of April 1994. The government initiated a stabilization program in consensus with the IMF, however, it was not pursued vigorously and had to be abandoned (Ertuğrul and Selçuk, 2002).

After the Russian crisis of 1998, the general elections, and the earthquakes of 1999, the fiscal

balance deteriorated. In December of 1999, a stand-by agreement was signed with the IMF with the crawling peg regime being the major disinflation tool. Although the implementation was successful in terms of reducing the interest rates and slowing down inflation at the beginning, an overvalued exchange rate and high real interest rates were still a problem in terms of causing increased imports. Besides these, increased world oil prices and the depreciation of the euro against the US dollar contributed to the deterioration of the trade balance.

Failures on the fiscal side of the program, slow privatization and regulation attempts, and inefficiencies and increased risk in the banking sector led to the loss of confidence and high interest rates. Other factors that contributed to this were a large current account deficit, political instability, loss of credibility and worsening of the Turkey-EU relations.

The short-lived crisis of November 2000 was contained by the Central Bank at the expense of its reserves, and the temporary relief resulting from IMF's supply of extra funds. In the end, the adverse political developments of February 2001 triggered another crisis and led the Central Bank to finally abandon the parity. The magnitude of this crisis was huge, the official reserves were depleted by one-third and the stock market experienced an 18% decline in one day, Turkish lira depreciated by 40% in one week, banks were not able to meet their obligations and the overnight rates skyrocketed. As a result, a revised stand-by agreement was put in place with the IMF in May 2001 emphasizing major restructuring in the economy, especially in the banking sector, and floating exchange rate regime.[2]

4 Data and Estimation Results

The data source is the Central Bank of Turkey and the IMF's IFS. Series used include the real effective exchange rate index (REER),[3] real GDP, CPI, M2, and current account-to-GDP ratio for Turkey as well as the spread between 10-year US treasury bond rate and 3-month US treasury bill rate. The latter can be thought of as an indicator of the US term premium, which is used as a

[2]A detailed account of the 2001 crisis in Turkey is provided by, for example, Alper (2001); Alper and Öniş (2004); Gencay and Selçuk (2005) and Özatay and Sak (2002). For details on the recent developments in the Turkish economy from different perspectives, see Ertuğrul and Selçuk (2002), Metin-Özcan *et al.* (2001), Öniş and Rubin (2003) and references therein. A series of articles in Kibritçioğlu *et al.* (2002) provides a detailed analysis of inflation dynamics and disinflation efforts in Turkey. For earlier studies, see Metin (1995) and Lim and Papi (1997). More recent studies are Celasun *et al.* (2003) and Domaç and Bahmani-Oskooee (2002). Selçuk and Ardıç (2005) and Ardıç and Selçuk (2005) study the floating exchange rate period after February 2001.

[3]This index is calculated such that an increase is a real appreciation

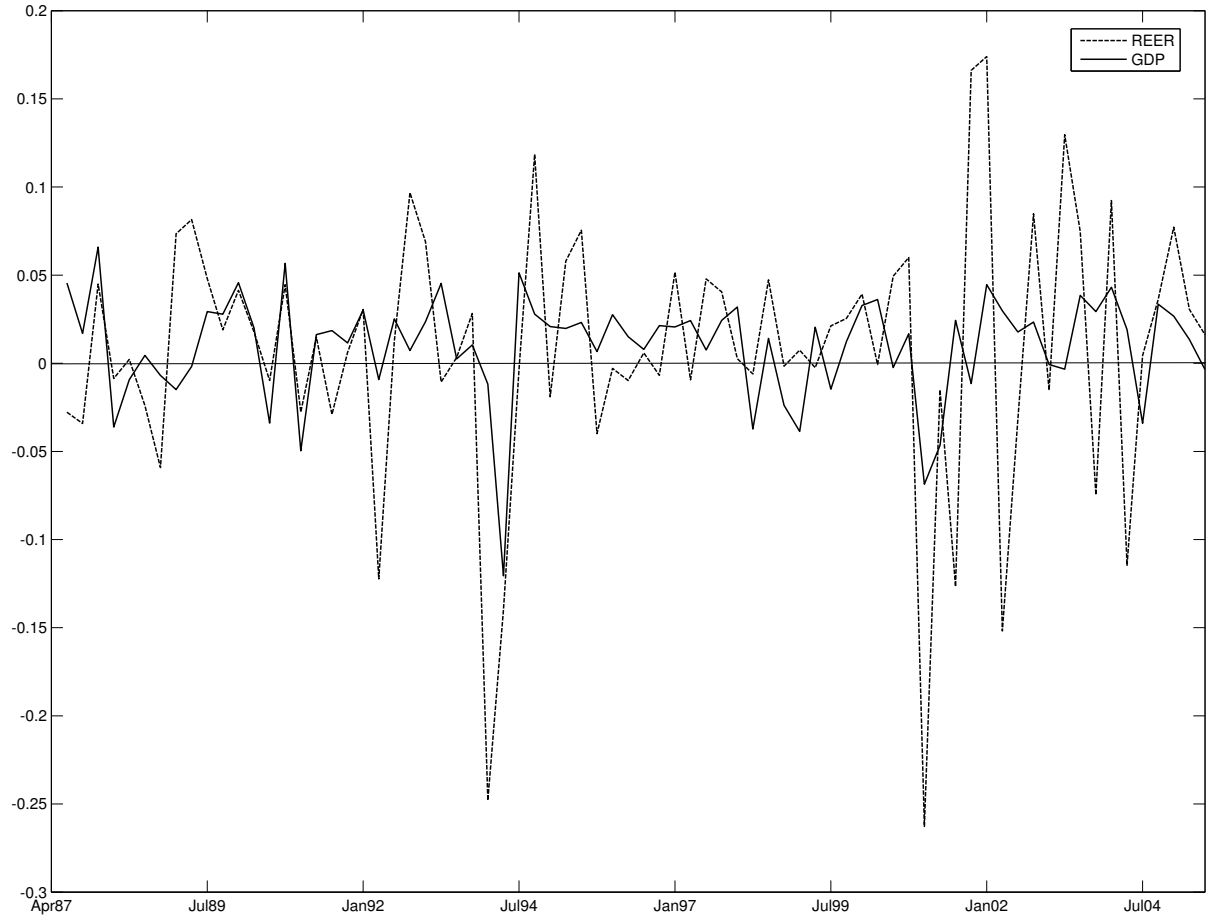

Figure 1: Natural Log of Real Effective Exchange Rate, first differences, and Natural Log of Real GDP (seasonally adjusted), first differences. Real Effective Exchange Rate index is such that an increase implies a real appreciation.

global liquidity factor in the analysis below. The sample is quarterly and covers the period 1987Q1 - 2005Q3. There had been two major crisis episodes during the sample period: April 1994 and Winter 2000-2001. The floating exchange rate regime has been in place since February 2001.

Figure 1 plots REER and real GDP during the period of analysis. Casual observations from the figure suggest that the crises are preceded by a period of real appreciation, and real depreciations follow the crises.

Table 1 tabulates the behavior of GDP components during the two crisis episodes. These suggest that during the crisis episodes, nominal devaluation of a significant magnitude is observed together with negative growth rates of output, private consumption, public consumption, public investment,

	1993	1994	1995	1999	2000	2001
Nominal Devaluation (%)[a,b]	-	40%	-	-	-	40%
Output Growth	8%	-6%	8%	-5%	7%	-8%
Growth of Private Consumption	8%	-5%	6%	-3%	6%	-9%
Growth of Government Consumption	5%	-3%	7%	6%	7%	-9%
Growth of Public Investment	3%	-35%	-12%	-9%	20%	-22%
Growth of Private Investment	35%	-9%	18%	-18%	16%	-35%
Growth of Total Investment	25%	-16%	12%	-16%	17%	-32%
Growth of Exports	8%	15%	8%	-7%	19%	7%
Growth of Imports	36%	-22%	30%	-4%	25%	-25%
Growth of National Saving	1%	18%	-6%	-21%	6%	17%

Table 1: The Behavior of GDP Components During the 1994 and Winter 2000-2001 Crises. Source: The Central Bank of Turkey.

[a] *- The percentage nominal devaluations correspond to April 5, 1994 and February 23, 2001.*

[b] *- On April 5, 1994, the government announced a 40% devaluation. On February 23, 2001, the government announced the lira was left to float. Following the announcement the lira lost 40% of its value. The next business day, the total depreciation observed was around 56%.*

private investment and imports. Meanwhile exports and national savings increase. The effect of 2000-2001 crisis on investment and consumption is much larger than the effect of 1994 crisis on these macroeconomic variables while initial nominal devaluation in both crisis episodes are the same.

Edwards (1989) suggests the use of an effectiveness index to measure the degree of impact of a nominal devaluation in causing a real devaluation, which is calculated as:

$$\zeta_k = \frac{\%\Delta\epsilon_k}{\%\Delta E_k} \tag{1}$$

where $\%\Delta\epsilon_k$ shows the percentage change in the real exchange rate between the period of devaluation and k periods after the devaluation, and $\%\Delta E_k$ is the percentage change in the nominal exchange rate in the same period. This index is one of the major indicators of the success of a devaluation, it can capture the inflationary consequences. A value of 1 for ζ implies that the adjustment in the nominal exchange rate is fully transferred into a real devaluation. If ζ is less than 1, then part of nominal devaluation has been eroded, and if ζ is less than zero, more than 100% of the devaluation has been eroded. Thus, ζ provides a measure of the effectiveness of the nominal devaluation, i.e. whether the nominal devaluation is translated into a real devaluation,

	April 1994	February 2001
1 month	0.451	0.700
2 months	0.316	0.600
3 months	0.231	0.438
4 months	0.168	0.424
5 months	0.174	0.411
6 months	0.139	0.404
7 months	0.038	0.353
8 months	-0.010	0.302
9 months	-0.018	0.218
10 months	-0.001	0.125

Table 2: Effectiveness Index for April 1994 and February 2001 Devaluations - TL/$

Lag-Lead	Level	First Difference	Linear Trend
-4	0.57	-0.16	-0.16
-3	0.61	0.12	-0.11
-2	0.68	-0.16	0.06
-1	0.73	0.34	0.20
0	0.79	0.37	0.36
$+1$	0.73	-0.04	0.33
$+2$	0.65	0.04	0.13
$+3$	0.58	-0.22	0.01
$+4$	0.52	-0.18	-0.17

Table 3: Cross-correlations of the log Real Effective Exchange Rate and log Real GDP (seasonally adjusted)

and whether this in turn may lead to an improvement of trade balance and output.

Table 2 shows the effectiveness index for the two devaluation episodes that took place during the period of analysis. The numbers suggest that the April 1994 devaluation was not very successful in translating into a real devaluation, while the effect of February 2001 devaluation on the real exchange rate was larger in the short term after the devaluation. More than 100% of April 1994 devaluation eroded by the 8^{th} succeeding month.

The cross correlations between the natural logarithm of the real exchange rate and the natural logarithm of real output are reported in Table 3. The lag number indicates the quarters by which the real exchange rate is lagged relative to real output. It is observed that the real exchange rate

	Level	First Difference	Linear Trend
Full Sample			
Real Exchange Rate	4.738 (0.002)	3.407 (0.014)	4.658 (0.002)
Real GDP	1.792 (0.142)	0.967 (0.432)	0.898 (0.471)
1987:1-1994:1			
Real Exchange Rate	1.434 (0.268)	0.789 (0.550)	1.475 (0.256)
Real GDP	1.221 (0.341)	2.054 (0.138)	2.178 (0.118)
1994:2-2000:3			
Real Exchange Rate	7.193 (0.001)	7.596 (0.001)	7.907 (0.001)
Real GDP	1.185 (0.353)	1.841 (0.167)	1.269 (0.321)
2001:2-2005:3			
Real Exchange Rate	8.379 (0.004)	7.345 (0.007)	7.270 (0.008)
Real GDP	3.983 (0.040)	0.690 (0.617)	2.757 (0.095)

Table 4: Granger Causality Tests - log Real GDP and log Real Exchange Rate[a,b]

[a] *- Four lags are used.*

[b] *- Reported are the F-statistics for the null hypothesis that the lags of the variable listed in column 1 are zero. P-values are in parentheses.*

is positively correlated with real output in most cases, implying that devaluations are associated with recessions and vice versa. In addition, the results are quite similar under different detrending methods.

Bivariate Granger causality tests are done for the REER and real GDP, both in natural logarithms. Different detrending methods are also used. These tests are done for the full sample as well as three subsamples: 1987Q1 - 1994Q1, 1994Q2 - 2000Q3, and 2001Q2 - 2005Q3 to take into account of any possible structural break due to the crises. These are summarized in Table 4. Full sample Granger causality analyses indicate that REER Granger causes real GDP at 5% significance level while there is no statistically significant effect in the other direction. Evaluating the subsample results on Granger causality, it can be observed that there is no statistically significant evidence of causality in either direction in the pre-1994 period. Between 1994 and 2001, REER Granger causes real GDP at 1% significance level, however, this is a one-way relation. In the aftermath of the 2001 crisis, there is a feedback effect between REER and real GDP, both in logs, at 1% significance, and a feedback effect between REER and real GDP, both in logarithmic deviations from a linear trend,

at 10% significance. In addition, changes in the log of REER Granger cause changes in the log of real GDP at 1%.

Next, a bivariate VAR analysis is done for the REER and real GDP. Again, this is done for the full sample as well as for the three subsamples explained above. The variance decomposition analyses indicate that most of the variation in REER is due to shocks to REER itself and this behavior is almost identical in the full sample and all the subsamples. In the full sample bivariate VAR, shocks to REER account for almost the 16% of the variation in real GDP in the first quarter following the shock, while this number increases to around 32% after the 10^{th} consecutive quarter. Similar results are obtained for the pre-1994 period, and 1994-2001 period using the bivariate VAR analysis. In the aftermath of the 2001 crisis, during the floating exchange rate regime, the shocks to REER become increasingly important in explaining the variation in real GDP, especially at the longer horizons. See Table 5 for the variance decomposition results.

The impulse responses suggest that in the full sample, REER does not respond much to shocks to real GDP, but real GDP responds positively in the short term to an unexpected real appreciation, however, this effect is offset by negative reactions in longer horizons. The pre-1994 sample bivariate VAR analysis indicates almost similar results, though the magnitude of the initial response of real GDP is smaller. Similar results are obtained for 1994-2001 subsample, and post-2001 subsample. See Figures 2-5 for plots of impulse responses.

In addition to the bivariate VAR analysis, a multivariate VAR analysis is also conducted to take into account the effects of omitted variables. The multivariate VAR analysis includes inflation, real M2, current account-to-GDP ratio (CA/GDP) and the US term premium (spread) as well as the REER and real GDP.

The multivariate VAR analysis indicates that the shocks to REER are important in the variation of real GDP, but not the other way around. In addition, a positive shock to the spread between US 10-year and 3-month treasury rates indicates a real depreciation and an improvement of the CA balance, while it does not have much effect on real GDP. As before, there is not much response by REER to a shock in real GDP but real GDP increases in response to an unexpected appreciation in the short term.

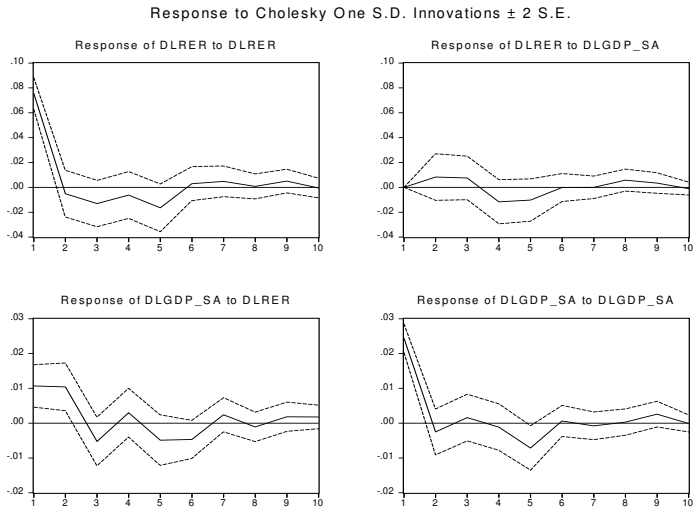

Figure 2: Impulse Responses in response to a 9.6% real appreciation, and a 2.6% real GDP growth. Model 1: Bivariate VAR in real GDP and REER using the full sample.

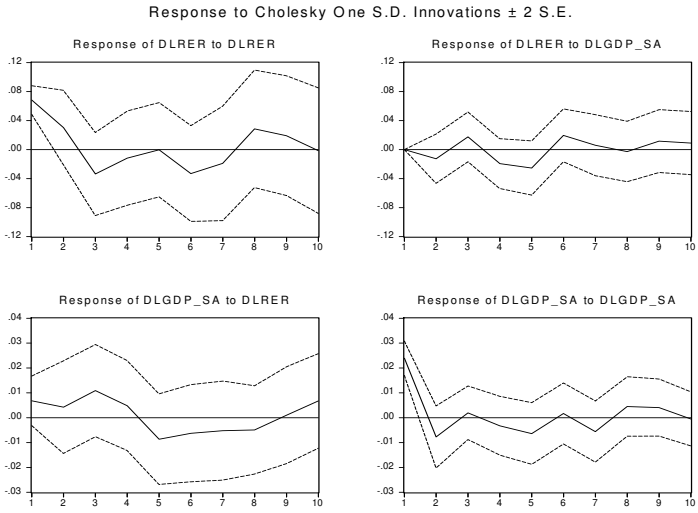

Figure 3: Impulse Responses in response to a 9.6% real appreciation, and a 2.6% real GDP growth. Model 2: Bivariate VAR in real GDP and REER using 1987Q1-1994Q1.

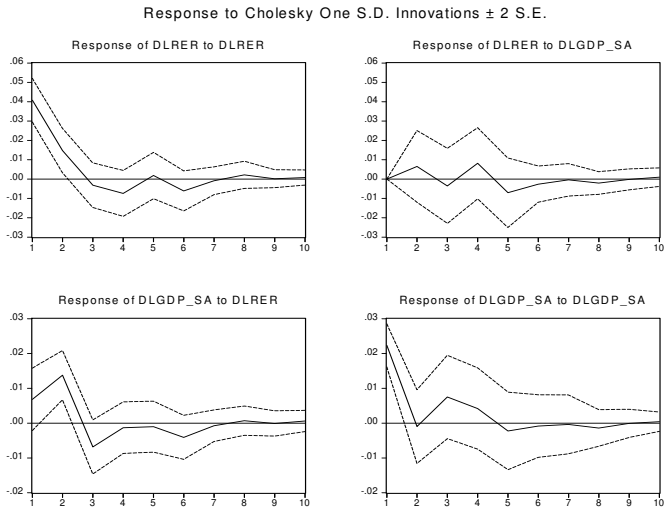

Figure 4: Impulse Responses in response to a 9.6% real appreciation, and a 2.6% real GDP growth. Model 3: Bivariate VAR in real GDP and REER using 1994Q2-2000Q3.

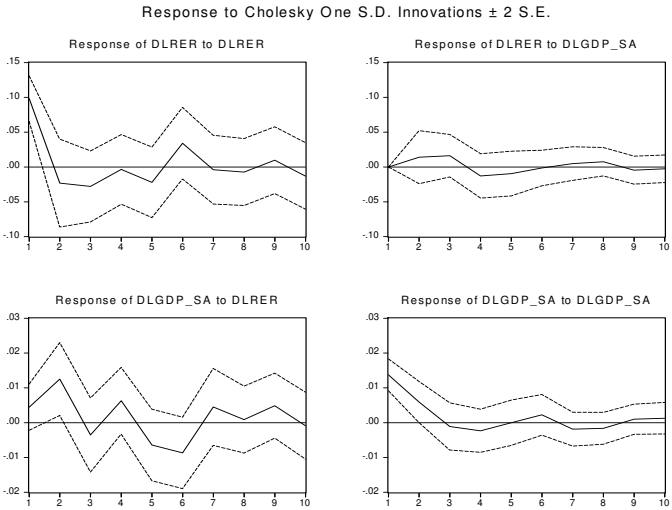

Figure 5: Impulse Responses in response to a 9.6% real appreciation, and a 2.6% real GDP growth. Model 4: Bivariate VAR in real GDP and REER using 2001Q2-2005Q3.

		Real GDP						*REER*					
	(Horizon)	Spread	CA/GDP	REER	Real M2	Inflation	Real GDP	Spread	CA/GDP	REER	Real M2	Inflation	Real GDP
Model 1	(1)	-	-	16.124	-	-	83.876	-	-	100.000	-	-	0.000
	(2)	-	-	27.048	-	-	72.952	-	-	98.813	-	-	1.186
	(5)	-	-	30.158	-	-	69.842	-	-	94.449	-	-	5.551
	(10)	-	-	32.434	-	-	67.566	-	-	93.832	-	-	6.168
Model 2	(1)	-	-	7.445	-	-	92.555	-	-	100.000	-	-	0.000
	(2)	-	-	9.217	-	-	90.783	-	-	97.273	-	-	2.727
	(5)	-	-	29.041	-	-	70.959	-	-	82.176	-	-	17.824
	(10)	-	-	35.550	-	-	64.450	-	-	81.650	-	-	18.35
Model 3	(1)	-	-	8.616	-	-	91.384	-	-	100.000	-	-	0.000
	(2)	-	-	32.185	-	-	67.815	-	-	97.781	-	-	2.219
	(5)	-	-	33.102	-	-	66.898	-	-	91.873	-	-	8.128
	(10)	-	-	34.362	-	-	65.638	-	-	91.520	-	-	8.48
Model 4	(1)	-	-	9.576	-	-	90.424	-	-	100.000	-	-	0.000
	(2)	-	-	44.175	-	-	55.825	-	-	98.095	-	-	1.905
	(5)	-	-	53.995	-	-	46.005	-	-	94.124	-	-	5.876
	(10)	-	-	61.588	-	-	38.412	-	-	94.003	-	-	5.997
Model 5	(1)	5.687	24.196	5.909	0.970	1.124	62.114	0.832	0.739	98.430	0.000	00.000	0.000
	(2)	4.239	19.515	19.727	4.313	3.143	49.063	15.808	0.550	77.185	4.818	1.59	0.049
	(5)	8.606	17.430	19.249	5.170	11.443	38.102	21.020	3.590	60.275	6.666	2.606	5.844
	(10)	8.123	17.683	17.545	9.162	13.954	33.533	20.111	4.166	56.419	9.991	3.903	5.41

Table 5: Variance Decompositions of Real GDP and Real Effective Exchange Rate (REER)in response to an 81 basis points increase in the spread, a 5.6% increase in inflation, a 3.4% improvement in CA/GDP, a 5.4% increase in real M2, a 9.6% real appreciation, and a 2.6% real GDP growth. Model 1 is a bivariate VAR in real GDP and REER using the full sample. Model 2 is a bivariate VAR in real GDP and REER using 1987Q1-1994Q1. Model 3 is a bivariate VAR in real GDP and REER using 1994Q2-2000Q3. Model 4 is a bivariate VAR in real GDP and REER using 2001Q2-2005Q3. Model 5 is a multivariate VAR in spread (the spread between the rate on 10-year US treasury bonds and that on 3-month US treasury bills), current account-to-GDP ratio, REER, real M2, inflation (CPI-based), and real GDP using the full sample.

5 Conclusion

This paper is an attempt to analyze the link between the real exchange rate, output and crises in Turkey. Specifically, the question of whether the devaluations observed during the crisis episodes have been contractionary is considered. The analysis, which includes bivariate models of the REER and real GDP as well as multivariate models that take into account other macroeconomic indicators, provides evidence supporting the idea of contractionary devaluations.

The next question, therefore, is to investigate the mechanism through which these devaluations are transformed into contractions in output. One potential explanation is the extensive use of imported intermediate goods in production. As a result of a devaluation, these imported intermediate goods become so expensive that production declines. This is a future research question to investigate.

In addition, some factors that contributed to the crises are left out in this analysis, such as the banking sector. It might be useful to include these factors in the analysis to see if they provide additional insight to the relation between the real exchange rate and output as well as to the workings of the mechanism which transforms devaluations into contractions.

Lastly, this paper does not take into account the potential existence of Balassa-Samuelson effect. This is beyond the scope of this paper, and can be pursued as a future research question as well.

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