EXCHANGE RATE DEPRECIATION IN TURKEY IN THE SPOTLIGHT OF CRISIS

by

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Abstract

Contractionary depreciation hypothesis has been frequently investigated for Latin American countries after 1970s due to liability dollarization problems. Unlike the traditional view this hypothesis claims net effect of real depreciations is contractionary in economy. After studied for Latin American countries, contractionary depreciation hypothesis has been studied especially for other developing economies. This thesis investigates the contractionary depreciation for Turkey. In Turkey's economic history various exchange rate regimes were conducted. Also, Turkey experienced massive economic crisis, thereby convenient country for contractionary depreciation investigations.

In this thesis, we employ vector auto regression (VAR) model by constructing our main variables as real effective exchange rate, inflation and real GDP. Besides main variables we add various alternative variables to enhance the investigation. Although we construct our model inspired by Kamin and Rogers (2000), this thesis makes three contributions: 1998 Q1-2016Q1 period covers two exchange rate regimes; fixed and floating exchange rate which give chance to evaluate effects of regimes on the hypothesis. Second, we examine three different identification assumptions about the relationship and order of endogenous variables. Therefore, we compare the empirical suggestions with theory. Third, unlike previous studies focus only on real GDP we analyze impacts of real effective exchange rate on GDP components: consumption, investment, export, import. We find depreciations are contractionary in the short term but for the long term positive trade competitiveness dominates the negative balance sheet effect and depreciations are expansionary and permanent. Moreover, we find real depreciations are inflationary.

Keywords: Contractionary depreciation, real effective exchange rate, real GDP

Özet

Daraltıcı devalüasyon hipotezi dolarizasyon problemi yüzünden 1970'lerden sonra Latin Amerika ülkeleri için sıklıkla incelenmiştir. Geleneksel görüşün aksine bu hipotez reel devalüasyonun net etkisinin daraltıcı olacağını iddia ediyor. Daraltıcı devalüasyon hipotezi Latin Amerika ülkeleri için çalışıldıktan sonra diğer gelişmekte olan ekonomiler için de çalışılmaya başlanmıştır. Bu tez daraltıcı devalüasyon hipotezini Türkiye için araştırmaktadır. Türkiye'nin ekonomi tarihinde çeşitli döviz kuru rejimlerinin uygulanması ve büyük çapta ekonomik krizler deneyimlemiş olması daraltıcı devalüasyon alanında araştırma yapmak için elverişli bir zemin oluşturuyor.

Bu tezde, ana değişkenlerimizi reel efektif döviz kuru, enflasyon ve reel GSYİH şeklinde belirleyerek VAR modeli uyguluyoruz. Ana değişkenlerin yanında alternatif değişkenler ekleyerek araştırmamızı genişletiyoruz. Modelimizi Kamin Rogers (2000) çalışmasından esinlenerek inşa etmiş olmamıza karşın bu tez 3 katkı yapıyor. 1998 ve 2016 yılları birinci çeyreklerini kapsayan dönem içerisinde Türkiye'de dalgalı ve sabit döviz kuru rejimleri uygulanmış ve bu sayede döviz kuru rejimlerinin hipotez üzerinde etkisi değerlendirilmiştir. İkinci olarak endojen değişkenler arasındaki ilişki ve sıralama için üç farklı varsayım kullanarak ampirik öneriler ile teoriyi karşılaştırdık. Üçüncü olarak, sadece reel GSYİH üzerine etkiyi inceleyen önceki çalışmaların aksine reel GSYH'yi oluşturan tüketim, yatırım, ihracat ve ithalat ile reel efektif döviz kuru arasındaki ilişkiyi inceliyoruz. Kısa dönemde devalüasyonun daraltıcı etkisi görülürken uzun vadede pozitif ticari rekabetin negatif bütçe dengesini domine etmesi sayesinde genişleyici etki görüyoruz. Bununla birlikte yapılan tüm çalışmalarda reel devalüasyonların tamamı enflasyonist etki gösteriyor.

Anahtar Kelimeler: Daraltıcı devalüasyon, reel efektif döviz kuru, reel GSYİH

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Abbreviations:

REER……. Real effective exchange rate

IRF……..Impulse Response Function

FEVD……..Forecast Error Variance Decomposition

GDP……Gross Domestic Product

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1. INTRODUCTION

In economics, the traditional view suggests currency depreciation should improve the current account balance through changes in the exchange rate, shifting demand from imported to domestically produced goods and increasing output afterwards (Dornbusch & Werner, 1994; Gylfason & Schmid, 1983). This view would imply that depreciations are expansionary. However, there are also theoretical and empirical studies that show depreciations are contractionary.

Contractionary depreciation can be analyzed through both the supply and demand sides. On the demand side, three channels exist to investigate contractionary depreciation. First, the negative effect of reduced real wages due to increased price levels can cause income to be redistributed in favor of capitalists whose Marginal Propensity to Consume is low rather than wage earners whose Marginal Propensity to Consume is high. Thus, the net effect of this redistribution is contraction of output and aggregate demand. Second, considering price rigidity, prices of non-tradable adjust slowly. When absolute value of the decrease for demand of non-tradable is more than the absolute value of the increase in foreign demand for tradable, then real GDP decrease. Further, if a country imports fundamental goods for consumption, intermediate goods for production or capital goods and if these imported goods are inelastic, then the current account deficit and decline in output will result in an import-export imbalance (Edwards, 1986; Krugman & Taylor, 1978; Lizondo & Montiel, 1989).

Contractionary depreciation may also be investigated through supply side channels. First, especially in emerging economies depreciation diminishes the volume of credit (Van Wijnbergen, 1986). Since, these economies are not adequate for qualified financial market transactions. Second, when local currency depreciates, rise in relative price for imported goods leads to higher costs, which means reduced aggregate supply. Third, because of collective bargaining agreements and wage indexation, nominal wage increases in high-inflation economies can actually outstrip inflation causing a reduced supply of output (Sencicek & Upadhyaya, 2010).

Empirical findings concerning the effects of exchange rate movements on real GDP vary. We mainly adopted a model similar to that of Kamin and Rogers (2000), who analyze the Mexican

peso crisis by investigating real GDP and inflation response to exchange rate depreciations and found contractionary devaluation.

Berument and Pasaogulları (2003) and Ardıc (2006) implement vector auto regression (VAR) for the investigation of contractionary depreciation in Turkey. Also, Domaç (1997), as well as Sencicek and Upadhyaya (2010) study the contractionary depreciation hypothesis utilizing other techniques. On the one hand Berument and Pasaogulları (2003) and Ardıc (2006) found contractionary devaluation for Turkey. Besides, Domac (1997) found last impact of unanticipated devaluations on output was moderate; the impact of anticipated devaluations was contractionary at the beginning but expansionary for the second year. However, results were statistically inconsequential in terms of dynamics for real economy in Turkey. Finally, Sencicek and Upadhyaya (2010) found real devaluations are contractionary in the short-run, expansionary in the medium-run, and neutral in the long-run.

Thesis contributes three objects to contractionary depreciation subject in Turkey. We examine three different identification assumptions about the relationship and order of endogenous variables. While the main ordering is REER-inflation-real GDP, inflation-REER-real GDP and real GDP-inflation-REER orderings are taken into consideration. Second, the data period covers different exchange rate regimes and two economic crisis. After the 2001 crisis, Turkey put forth a good economic performance. As this study covers a longer period, unlike other studies we can investigate effects of new exchange rate regime about contractionary depreciation subject. Third, most papers about contractionary depreciation analysis the impact of real exchange rate on real GDP. Also response of four sub-components of real GDP so as to evaluate the balance sheet channel is examined in this thesis (see Mojon and Peersman 2003). According to Bernanke, Gertler and Gilchrist (1999), a dynamic general equilibrium model that clarifies financial friction, which is an imbalance between assets and liabilities, shows a rise in stock prices and induce either spending and output through balance sheet effects and wealth effects on consumption. When stock prices fall, deterioration in the balance sheet can cause the external finance premium to increase and, eventually, investment to decrease (Bernanke et al., 1999). Thus, when considering assets-liabilities imbalance in foreign currency for emerging economies, a balance sheet channel investigation is crucial. In sum, the purpose of this thesis is analyzing real GDP and the real effective exchange rate linkage in Turkey. Also we investigate whether the empirical evidence

reinforces the contractionary depreciation hypothesis in various exchange rate regimes and economic crisis.

Section 2 focuses on empirical and theoretical studies about contractionary depreciation. Section 3 provides the theoretical background for contractionary depreciation and real exchange rate output linkages. Section 4 briefly scrutinizes the Turkish economy and real GDP-real effective exchange rate linkage. Section 5 provides a bivariate data analysis for REER and real GDP. Granger causality test and statistical features for data that embody Johansen co-integration and unit root. Section 6 provides bivariate and multivariate VAR analysis, forecast error variance decompositions of the VARs and impulse response functions of these analyses. Section 6 is conclusion.

2. LITERATURE REVIEW

Wide range of empirical and theoretical studies for contractionary devaluation-depreciation hypothesis exist. Various approaches were implemented to investigate impact of real exchange rate on real GDP. As Agenor (1991) mentioned, there are four approaches to study contractionary depreciation cases: before-after approach, control group approach, econometric approach and macro simulation approach. In the econometric approach, VAR models, panel data and least squares analysis are common; for the macro simulation approach, macro model simulations have been used for empirical studies.

Edwards (1986) conducted a study utilizing a reduced form equation and annual data for 1965-1980 for twelve developing countries. In the equation, the terms of trade, ratio of nominal government spending to nominal income, monetary surprise variable and a country dummy variable are added. The conclusion of this paper was contractionary effects of devaluation last for the first year, then for longer period devaluation was neutral.

Using VAR, Kamin and Rogers (2000) investigate contractionary devaluation in Mexico in 1981-1995 period. They used four endogenous variables: the real exchange rate, inflation, the U.S. interest rate, and output; they found that although the principal explanatory factor for the output is

mostly its own innovations, depreciation effects on output are permanent and negative which means contractionary devaluation exists. In a similar study Rogers and Wang (1995) examined Mexico and chose the endogenous variables of output, government spending, consumer price index, money growth. They reached the same results as Kamin and Rogers (2000).

Contrary to contractionary depreciation thought, Chang and Velasco (2001) reached the conclusion that the contractionary balance sheet effect cannot undermine standard expansionary depreciation. Also Connolly and Schröder (1983), as well as Gylfason and Schmid (1983) found depreciation expansionary.

Some recent papers about contractionary depreciation in developing countries follow the Kamin and Rogers (2000) methodology, and the results are ambiguous. For instance, Shi (2006) used four endogenous variables for China: real GDP, REER, inflation, foreign GDP. The study covered from 1991 to 2005 and quarterly data is used. After one standard deviation to REER, real GDP experiences an obvious decline. But from the 8^{th} quarter, the contractionary effect is weakened slightly, and after the 18^{th} quarter the result is reversed and the effect of REER on output becomes positive (Shi, 2006). Melander (2009) discusses the contractionary depreciation case of Bolivia due to extreme liability dollarization. Three endogenous variables are used: output, inflation, and REER in a VAR for 1990-2006 period. Even though negative balance sheet effect occurs positive effect of trade balance overcomes. Therefore even though Bolivian economy is in extreme liability dollarization, depreciations are not contractionary.

Currency mismatches on domestic balance sheets, high volatility of international capital flows and lack of credibility of macroeconomic policies are common problems of developing countries, resulting in a fall in domestic demand. Ahmed, Ara and Hyder (2006) come to terms with these problems and find depreciations are contractionary for Pakistan. However, Vinh and Fujita (2007) use a VAR model and find depreciations expansionary for Vietnam.

Besides empirical analyses, theoretical arguments are built on demand and supply side perspectives. The first study was conducted by Alejandro (1963) regarding the demand side. He used a hypothetical economy consisting of three goods: export, import and home goods. He specified export and import goods as relatively price-inelastic and non-wage earners as having a higher propensity to save than workers for the consumption function. He concluded that devaluations may cause decrease in income through procedure by which real income is transferred

from the workers, who receive the fixed nominal wage, to capitalists with a higher propensity to save (Alejandro, 1963). In a more formalized and extended version of the demand side view, Krugman and Taylor (1978) point out three issues. First, when devaluations occur in a period of trade deficit for a country, since the economy suffers from the gap between foreign currency payments and foreign currency receipts, the price increase of traded goods reduces real income in the home country and increases it abroad. As a consequence, aggregate demand falls and the magnitude of the contractionary outcome is determined by the initial trade deficit. Second, the distributional effect explains the decrease in aggregate demand. With the assumption that nominal wages are rigid in the short run, devaluation reduces the real wage by means of increasing the price of goods in response to intermediate increased import costs, which ends with reduction in the aggregate demand. Finally, ad valorem taxes applied on exports and imports may allow the devaluation to redistribute income from the private sector to the government, which has greater tendency to save in short run. So, aggregate demand falls (Krugman & Taylor, 1978).

On the supply side, Van Wijnbergen (1986) demonstrates contractionary devaluation, building a model with intermediate goods and deterred financial markets. According to this study, there are three major factors for contractionary effects of devaluation on the supply side: an increase in the cost of inputs denominated with domestic currency; credit problems for domestic firms that need to finance working capital with these credit funds; and wage indexation when food imports are considerable (Van Wijnbergen, 1986).

In contrast to evaluating the supply and demand sides separately, Agénor (1991) finds the effect of devaluation ambiguous as devaluation generates expansionary effect through aggregate demand but also generates a contractionary effect through aggregate supply. Therefore, devaluation can be contractionary even aggregate demand is expansionary.

There are some studies regarding contractionary depreciation in Turkey. For instance, Sencicek and Upadhyaya (2010) find devaluations are contractionary in the short run, expansionary in the medium run and neutral in the long run. Their other finding is that the fall in output stems from nominal devaluation. Ardıc (2006) evaluates the Turkish economy for the period of 1987-2005 for contractionary depreciation. For this investigation, the VAR model is utilized and the result is that contractionary depreciation exists for Turkey, which is parallel with the facts of developing countries in general.

3. THEORETICAL BACKGROUND

Contractionary depreciation analysis mainly focuses on output-real exchange rate linkages and how they affect each other. We can categorize this linkage into three headings. First, output and real exchange rate may react to external shocks, giving the impression of a genuine linkage, regardless of whether or not one exists. Second, output can explain the movements of the real exchange rate. Finally, the direction of causality may run from the real exchange rate to the output. Brief presentations of these theoretical explanations follow.

A. Spurious Correlation

In light of vast empirical studies about the real GDP and the real exchange rate, in contrast to the classical view that there is positive relationship between these two variables, the opposite is alleged for developing countries in particular(Agénor, 1991; S. B. Kamin & Rogers, 2000; Lizondo & Montiel, 1989). When examined, depreciations have been designated in response to either external or internal adverse shocks. Increases in international interest rates, imbalances in terms of trade and capital outflows are counted as external adverse shocks. On the other hand, domestic imbalances – overvalued exchange rates or excessive current account deficits – are generally responded to by depreciations. Kamin (1988) and Edwards (1989) found that before devaluations occur, the above-mentioned adverse effects on economy can be observed. The spurious correlation approach between real GDP and the real exchange rate emerges from these empirical studies.

B. Causality From Real GDP to Real Effective Exchange Rate

Some studies are undertaken to support exchange rate-based stabilization programs due to strong output growth (Calvo & Végh, 1993; Kiguel & Liviatan, 1992; Mendoza & Uribe, 1997; Uribe, 1997). Although there are different opinions about demand increases after exchange rate is stabilized, a common point of these studies is that causality runs from output to the real exchange rate. The reason for observing this situation in this stabilization programs is implementation of pegged exchange rate regimes. In this regime, an increase in domestic demand also increases the price of non-tradable goods more than tradable goods, so the real exchange rate appreciates.

The Disinflation Program was conducted in 2000 in Turkey; GDP enlarged by 4.39 and the real exchange rate appreciated by 8.36 per cent in 2000. Nevertheless, whether major price decrease in non-tradable goods inducing great deal of real exchange rate depreciation is ambiguous (Berument & Pasaogullari, 2003).

C. Causality From Real Effective Exchange Rate to Real GDP

Kamin (1988) calculated response of trade balance to a devaluation will depend on how the balance is measured. If the flows are measured in domestic currency, the trade balance may follow a J-curve path. In other words, a pre-existing deficit with domestic currency value will increase by means of devaluation as the deficit falls due to the increase in export volume and decrease in import volume as a response to relative price changes. Moreover, a foreign currency denominated trade balance response to a devaluation depends upon, as the Marshall-Lerner condition suggests, demand elasticity of export and import. According to these measurements, contractionary depreciation does occur; there are a few explanatory (causal) pathways which may account for it.

a. Price rigidities

Krugman and Taylor (1978) mention that if price rigidity is a fact in an economy, in conjunction with price increases, when sticky wages adjust to these increases in prices slowly real wages will decrease after a depreciation. Then, a fall in domestic demand may weaken the level of output.

b. Eroding confidence

In conjunction with the depreciation, a slow adjustment of prices in the economy may increase the expected inflation in the long run and deepen the expected level of depreciation. This economic environment might weaken agents' confidence and bring on diminish in GDP.

c. Liability Dollarization Problem

Krugman and Taylor (1978) point out that when devaluations occur in during a trade deficit for a country with a liability dollarization problem, because the economy suffers from a gap between foreign currency payments and foreign currency receipts, the price increase of traded goods reduces

real income in the home country. From the banks' point of view, banks with balance sheet problems will be significantly affected by the depreciation, hence credits may be called back before the maturity date and the real sector will suffer from a lack of credit funds. Therefore, output may decrease significantly.

d. Capital Outflow Problem

The economies of developing countries like Turkey are highly dependent on foreign financial and real sector investments. With the help of foreign investment, employment can be created. Before or during a period of depreciation, high capital outflows can be observed due to the insecure economic environment. This might have short run and long run effects on the economy. Eventually, output declines.

e. Income Distribution

Alejandro (1963), and Krugman and Taylor (1978) point out that after a devaluation, if income is transferred from the workers with a low propensity to save to capitalists with high propensity to save, output declines.

f. Increase in Cost of Intermediate Goods

Relatively low-tech countries, including Turkey, use a high amount of imported intermediate goods. After the depreciation, the cost of these intermediate goods will increase; this could lead to a fall in aggregate supply. Thus, output decreases.

4. HISTORICAL REVIEW OF THE TURKISH ECONOMY

Turkey has experienced three financial crisis in the last three decades. To liberalize the economy, and to overcome the hazardous effects of economic crises, various exchange rate regimes were implemented parallel with state monetary policy. In 1980, the government decided to liberalize and

integrate the Turkish economy with the global economy. To this end, certain economic reforms were introduced: trade openness, domestic and global financial liberalization, streamlining the bureaucracy, and diminishing government control over interest rates. After liberalizing the foreign exchange rate in 1984, citizens were allowed to deposit investments in foreign currency. In the following year, open market operations were initiated by the Central Bank. In the aftermath of reforms, the balance of payments was recovered with an increase in export revenue at an annual rate of 10.8 per cent during the 1983-87 period. Additionally, approximately 6.5 per cent growth in the Gross Domestic Product at an annual rate was achieved during the 1980s. Following this, full liberalization of capital accounts was conducted in 1989. The immediate effect of this liberalization was capital inflows into Turkey. In the aftermath, appreciation of REER was 9.8 percent in 1990. The monetary policy of this period was high nominal interest rates and a low depreciation rate; the main goal of this approach was to capture foreign capital to decrease public debt. No matter how the Central Bank tried to eliminate exchange rate uncertainties during the Persian Gulf Crisis, depreciation was 8.4 percent in 1991. Unlike period of 1989-90, the flexibility of the exchange rate regime was diminished, and in 1992 the Central Bank did not allow real exchange rate appreciations. Even though the Turkish lira was kept depreciated for a few years, at the end of 1993, it appreciated 19 per cent due to the policy in place during 1989-90 (Berument and Pasaogullari, 2003) (Cömert and Çolak, 2014).

The fiscal and external instabilities stemming from arbitrage-seeking inflows and outflows of capital at the end of 1993 and the ongoing current account deficit, public sector borrowing and wrong policies for financing paved the way for the April 1994 crisis. The Turkish lira was devalued by 20 per cent on April 5, 1994. Drastic devaluation and financial crisis were experienced in this year. Afterwards, GDP decreased by 6.3 percent. The government started a stabilization program with the IMF, but could not sustain it and had to abandon the program (Ertuğrul & Selçuk, 2001)). Even if inflation was quite high and decreasing it was the goal of the Central Bank, after the crisis the Central Bank determined its primary goal to be financial stability. The Central Bank pursued a competitive real exchange rate policy to diminish deviation of the nominal exchange rate from the expected inflation rate to gain stability for the real exchange rate.

Crawling peg regime was implemented with the Year 2000 Disinflation Program. While primary purpose of program was eliminating imported inflation and inflationary expectations, crawling peg was the main tool for this program. For a year and a half, the domestic currency value of a foreign

exchange basket was fixed. Even though real interest rates decreased and the real GDP growth rate increased during the first half of 2000, the government's attitude towards the disinflationary program increased concerns about the government's willingness to sustain this program. The government procrastinated on financial sector reforms and privatization attempts; moreover, the program to realize long term foreign direct investment to finance the current account deficit failed. Finally, with a serious attack on the Central Bank's reserves on February 22, 2001, a floating exchange rate regime was put into place. By implementing the floating exchange rate regime, an immediate 40 percent US dollar appreciation relative to lira was seen on that day and depreciation was 11.8 percent in 2001. One of milestones of the Turkish economy is the 2001 economic crisis and the subsequent change in exchange rate regime. When comparing the pre-float and floating exchange rate regimes, in the latter regime, exchange rate depreciations were followed by appreciation in the exchange rate, in contrast with the ongoing depreciations of the Turkish lira in 1990s. As Alper and Alper (2003) mentioned, the main reason for that is because during the 1990s, supporting the price competitiveness of Turkish exports with stabilizing the real exchange rate was a major concern of monetary policy. It can be inferred that the actual reason for this change to the Turkish lira stemmed from price stability becoming the major concern for the Central Bank and the value of the real exchange rate was determined by market forces in the floating exchange rate regime (Kara et al., 2005).

After the 2001 crisis, various economic reforms were conducted under the patronage of the IMF. In this regard, privatization attempts were supported, and banking sector regulations were tightened. After 2002, an implicit inflation targeting regime was implemented, and in 2006 it became the formal policy of the Central Bank. As Benlialper and Cömert (2015) argue, in the 2002-2008 period, Turkey did not experience any large financial shocks and financial inflows caused an appreciation in the Turkish lira, which worked as an implicit exchange rate peg. However, with the 2008 global financial crisis, the Turkish economy deteriorated. GDP growth declined from the third quarter of 2008 until the third quarter of 2009. While the Turkish economy made 0.7 per cent annual real GDP growth rate in 2008, it declined by 4.8 per cent in 2009.

As compared to other crises Turkey has experienced, in the most recent crisis the resilience of the Turkish financial system depended on the good shape of the banking and financial sectors, flexible exchange rate regime and continuation of financial inflows during the 2008 crisis. Moreover,

depreciation pressure was much weaker for the 2008 crisis than during the other two crises and resumption of the lira was much more rapid after the 2008 crisis than after other crises in Turkey.

5. DATA AND ESTIMATION RESULTS

Contractionary depreciation focuses on impacts of real exchange rate on real GDP. Whether there is a significant effect on inflation depending on depreciation in the real exchange rate is another question for this study. When these relations are analyzed, various exogenous variables related to the real exchange rate are taken into account. This helps to increase the accuracy of results regarding the impacts of real exchange rate on real GDP or inflation and account for potentially confounding factors.

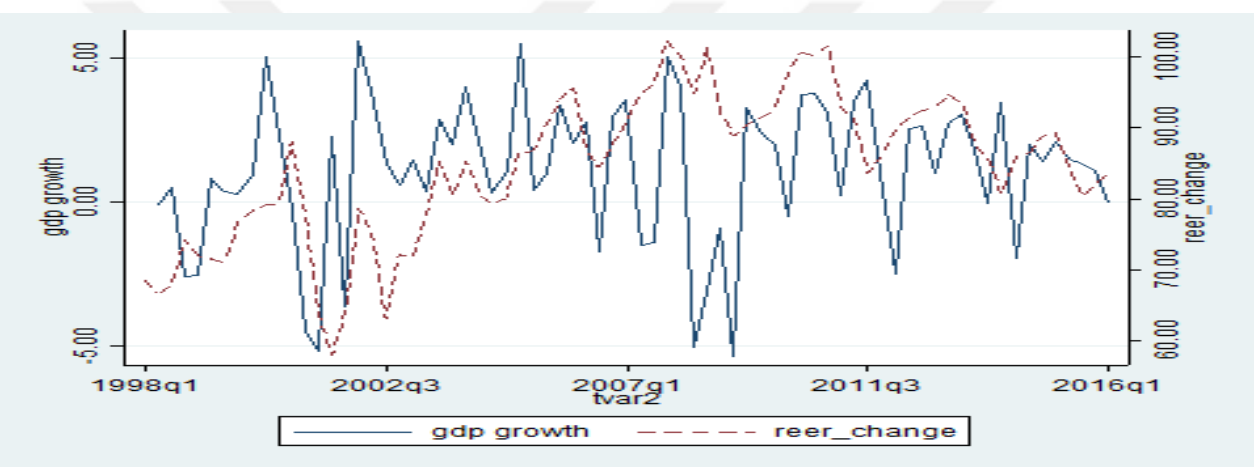
To analyze the real exchange rate and real GDP linkage, at beginning various mechanisms were used in cross correlation. Then, Granger causality test will be conducted. Spurious correlation is one of the main problems when investigating the relationship between two variables. Thus, a unit root test will be performed whether variables follow a stationary process or not. Then, a cointegration test will be conducted to look for any long run relationship between variables. Finally, in the case of a long run relationship between variables, we can perform a VAR to precisely study if exchange rate negatively correlates to real GDP and check whether fundamentals of this correlation emerge from spurious correlation or a genuine connection.

Models are divided into two types: core and alternative models. Core model consists of the real effective exchange rate (REER), inflation and real GDP are used. The alternative model series includes M1 money supply, current account, capital plus financial account, 3-month U.S. Treasury bill rate and government expenditure. Moreover, as contractionary depreciation literature generally focuses on the impacts of real exchange rate on real GDP, we investigate impacts on components of real GDP: export, import, investment, and consumption. Data is taken from the Central Bank of Turkey and the International Financial Statistics (IFS) of the IMF. The data covers the period from 1998Q1 to 2016Q1 by quarter. This period contains two major crises: the 2001 local crisis and the

2008 global crisis. Due to volatility problems real GDP is seasonally-adjusted. Real GDP, REER, government expenditure, M1 money supply and real GDP components are used at logarithmic levels. For the balance of payment items we take nominal GDP ratio of these variables. Consumer Price Index is calculated according to per cent change.

Figure 1 shows that large depreciations are tracked by large reduces in real GDP, also in the same manner appreciations are correlated with real GDP growth. It is also inferred from Figure 1 that there is negative relationship between REER and real GDP.

Figure 1: Real GDP growth rate and REER change. An increase in REER implies real appreciation.



5.1 Cross-Correlation

To scrutinize the relationship between REER rate and real GDP, a cross-correlation test is conducted with different transformations; lag numbers state the number of quarters REER is lagged relative to real GDP. The data covers 1998Q1-2016Q1. In the lag periods column negative values point out REER is lagged relative to real GDP, while positive values point out real GDP is lagged relative to REER. We use the variables in logarithmic form. To analyze the cross-correlation, different transformations are used: logarithm level, first difference of logarithm, and deviation from linear trend. All these transformations are made for both the real effective exchange rate and real GDP.

Table 1: Cross-correlations of the log REER and the log real GDP

		I	II	III
	Lag	Level	First Difference	Linear Trend
1	-4	-0.41**	0.22*	0.21*
2	-3	-0.45**	0.16	0.18
3	-2	-0.50**	0.07	0.12
4	-1	-0.56**	-0.13	0.04
5	0	-0.61**	-0.11	-0.01
6	1	-0.62**	-0.30**	-0.05
7	2	-0.62**	-0.006	-0.006
8	3	-0.63**	-0.09	0.05
9	4	-0.62**	0.02	0.14

In Table 1, correlation values are reported under different transformations. In the level column, all values are significant at the 5 per cent level (Row 1, 2, ...9 - Column I). Additionally, REER and real GDP negatively correlates with each other for all lags. Due to the greater magnitudes of the cross-correlations in the lead periods rather than lag periods, it seems changes in seasonally-adjusted real GDP lead to changes in REER.

In the first difference portion for cross-correlation analysis, only the fourth lag period and the first lead period are statistically significant (at 10 per cent and 5 per cent respectively). Between first lag period and third lead period, the relationship between REER and real GDP is negative. There is no obvious inference for the direction of causality for the first difference transformation. Finally, the linear trend transformation shows the only statistically significant period is the fourth lag period with a 10 per cent significance level. The relationship in this transformation is generally positive and causality goes from REER to real GDP.

Table 1 demonstrates logarithmic level filter has the greatest magnitude of the correlations between REER and real GDP. All periods are statistically significant in this period. According to the level

filter, we can say that in general changes in the real GDP lead to changes in real effective exchange rates due to higher correlation magnitudes of lead periods compared to lag periods.

For a more precise evaluation, VAR is conducted for REER and real GDP. With the help of the Granger causality test, we can observe whether lagged variables are able to explain other variables.

5.2 Granger causality test

The Granger causality test will provide an opportunity to determine whether one variable is able to explain other variables; then we can say more precisely whether one variable Granger-causes the other variable. For this test, different detrending methods are used and tests are done for the full sample in addition to the subsamples: 1998Q1 - 2002Q3, 2002Q4 -2008Q3, 2008Q3-2016Q1, 2009Q2 – 2016Q1.

As seen in Table 2, we first computed Granger causality for the whole sample with three different detrending methods. Variables written in the row Granger cause the other variable (i.e. for the first row and the first column REER Granger-causes the Real GDP with 1.77 F-statistics and 0.14 standard errors). Each column shows the results of Granger causality statistics with different detrending methods. The results are ambiguous. The hypothesis that REER do not Granger-cause the real GDP is rejected for logarithmic first difference transformation at a 1 per cent significance level (Row 1-Column II). On the other hand, for the logarithmic level and linear trend forms, we don't reject the hypothesis that REER does not Granger-cause the real GDP (Row 1–Column I, Row 1–Column III). The other way around for the hypothesis real GDP does not Granger-cause REER is rejected for all detrending methods (Row 2–Column I, Row 2-Column II, Row 2–Column III).

We expected REER to Granger-cause real GDP consistent with contractionary depreciation view, but the results of the full sample did not conform to our expectations. One possible explanation for the unexpected result of the full period is the long period of investigated data. Considering the longitude of the data, Turkey experienced multiple economic crises and different exchange rate regimes, which may affect the results. Moreover, we cannot remove the possible effects of inflation, interest rate or balance of payment items from the endogenous variables. This limit credibility of Granger causality test.

Table 2: Granger Causality Tests- log Real GDP and log REER, (F-statistics and standard errors)

		I	II	III
	Full Sample	Level	First Difference	Linear Trend
1	REER	1.77 (0.14)	3.19 (0.01)***	1.61 (0.18)
2	Real GDP	2.52 (0.05)**	2.58 (0.04)***	2.91 (0.02)***
	1998Q1-2002Q3			
3	REER	17.79 (0.0005)***	6.74 (0.01)***	7.09 (0.007)***
4	Real GDP	0.35 (0.83)	0.12 (0.97)	1.62 (0.25)
	2002Q4-2008Q3			
5	REER	10.27 (0.0004)***	2.00 (0.14)	4.01 (0.02)***
6	Real GDP	8.97 (0.0008)***	7.27 (0.001)***	6.43 (0.003)***
	2008Q3-2016Q1			
7	REER	13.72 (0.001)***	4.29 (0.01)***	5.54 (0.003)***
8	Real GDP	5.42 (0.003)***	4.18 (0.01)***	4.52 (0.008)***
	2009Q2-2016Q1			
9	REER	9.46 (0.0003)***	5.09 (0.005)***	5.62 (0.003)***
10	Real GDP	4.86 (0.007)***	3.94 (0.01)***	3.64 (0.02)**

** and *** denote the rejection of the hypothesis that the first variable does not Granger-cause the second variable at the 5 % significance level and 1 % significance level respectively.

For first subperiod, 1998Q1-2002Q3, Turkey experienced the 2001 economic crisis with serious currency problems. As a result, Table 2 shows that the hypothesis is rejected at the 1 percent significance level (Row 3-Column I, Row 3-Column II, Row 3-Column III). In contrast, we can easily say the real GDP does not Granger-cause REER for this subsample explicitly (Row 4-Column I, Row 4-Column II, Row 4-Column III).

In the 2002Q4-2008Q3 subperiod, explanatory power for the variables are bilateral. Both the hypothesis for REER and real GDP Granger-causality relations are not rejected, except for the logarithmic first difference method for the REER to Real GDP direction (Row 5-Column I, Row 5-Column III, Row 6-Column I, Row 6-Column II, Row 6-Column III). In the third subperiod, 2008Q3-2016Q1, causality is bilateral for REER and real GDP. At one per cent significance level, both the hypothesis that REER does not have Granger causality the real GDP and that the real GDP does not have Granger causality REER are rejected (Row 7-Column I, Row 7-Column II, Row 7-Column III, Row 8-Column I, Row 8-Column II, Row 8-Column III). For the 2009Q2-2016Q1 subperiod, results are similar to the previous period, and at the 1 per cent significance level, both endogenous variables explain each other (Row 9-Column I, Row 9-Column II, Row 9-Column III, Row 10-Column I, Row 10-Column II).

5.3 Unit Root Test

In this subsection, both endogenous and exogenous variables are analyzed by the unit root test below. The main goal of this test is to determine whether variables are stationary processes or not. By determining the type of process existence, a spurious correlation can be inferred. All of the variables, except for rates, are used in logarithmic form. In Table 3, both the Augmented Dickey Fuller (ADF) Test and the Phillips-Perron Test are used for Level and First Difference. In the Level portion, we cannot reject the presence of a unit root for the real effective exchange rate, real GDP, U.S. 3-month nominal interest rate, capital plus financial account and inflation rate using the ADF Test (Row 1, 2, 3, 5, 7-Column I). In contrast, we can reject the presence of the unit root at a 1 per cent significance level for import (Row 12-Column I), at a 5 per cent significance level for current account, M1 money supply and government expenditure and export (Row 4, 6, 8, 11-Column I), and at a 10 per cent significance level for consumption and investment (Row 9-Column I, Row 10-Column I).

For the Phillips-Perron Test, we can reject existence of a unit root for capital plus financial account, M1 money supply, inflation rate, government expenditure, consumption, export and import at the 1 per cent significance level (Row 5, 6, 7, 8, 9, 11, 12-Column II) and at the 10 per cent significance level for investment (Row 10-Column II) but for all other variables a unit root cannot be rejected. However, for the First Difference section, we reject existence for unit root for all variables for both

tests with different magnitudes of significance except for the ADF Test First Difference for consumption (Row 9-Column III).

Table 3: Unit Root Test

		I	II	III	IV
		Level	Level	First Difference	First Difference
		ADF Test	Phillips-Perron	ADF Test	Phillips-Perron
1	Reer	-1.895 (0.3343)	-2.394 (0.1434)	-4.628 (0.0001)***	-8.129 (0.0000)***
2	Real gdp	-0.140 (0.9453)	0.218 (0.9732)	-4.903 (0.0010)***	-7.895 (0.00)***
3	Tbill	-2.055 (0.2632)	-1.674 (0.4446)	-3.621 (0.0054)***	-4.139 (0.0008)***
4	Ca	-2.883 (0.0474)**	-2.381 (0.1472)	-4.399 (0.0003)***	-7.622 (0.00)***
5	Capfin	-2.064 (0.2591)	-4.291 (0.0005)***	-4.780 (0.0001)***	-15.938 (0.00)***
6	M1	-2.993 (0.0355)**	-4.793 (0.0001)***	-2.905 (0.0448)**	-4.997 (0.00)***
7	Cpi	-2.122 (0.2359)	-3.448 (0.0094)***	-5.812 (0.00)***	-16.579 (0.00)***
8	Gov	-2.800 (0.0583)**	-4.738 (0.0001)***	-2.558 (0.1020)*	-14.227 (0.00)***
9	Cons.	-2.798 (0.0586)*	-6.443 (0.00)***	-1.849 (0.3563)	-7.492 (0.00)***
10	İnvestment	-2.629 (0.0871)*	-2.560 (0.1016)*	-3.123 (0.0249)**	-15.048 (0.00)***
11	Export	-3.164 (0.0222)**	-3.805 (0.0029)***	-2.632 (0.0866)*	-7.647 (0.00)***
12	İmport	-4.455 (0.0002)***	-3.810 (0.0028)***	-3.127 (0.0246)**	-8.739 (0.00)***

Note: Four-lag orders are used

* and ** and *** denote the rejection of the hypothesis that the variable does not contain a unit root at the 10 % significance level, the 5 % significance level, and the 1 % significance level respectively.

5.4 Cointegration Test

In this part, the Johansen cointegration test is conducted and λ-max eigenvalue and λ-trace test statistics are computed. The aim of this test is to observe any long run relationship between the variables. The first setting provides an analysis for the core model and the variables are REER, inflation and real GDP. We also conduct Johansen cointegration test for the alternative settings. As Table 4 suggests, there is a long run relationship between these endogenous variables and λ-max eigenvalue and λ-trace test also show that we reject the hypothesis for zero cointegration vector both at 5 and 1 percent significance level (Row 1-Column IV, Row 2-Column IV). Thus, there are two cointegrating vectors for the core model analysis. The existence of at least one cointegrating vector means there is long run relationship among the variables.

Alternative models include government expenditure, M1 money supply, capital plus financial account and current account, consumption, investment, export and import with various settings. The results of the Johansen cointegration test for the alternative settings (Tables 5 to 12) show at least one long run relation in each setting present.

As mentioned in Sims, Stock and Watson (1990), we can implement VAR if variables are cointegrated. Hence, for next section VAR is analyzed for the core and alternative models.

Table 4: Cointegration Test for Real Effective Exchange Rate, Inflation and Real GDP

Real Effective Exchange Rate, Inflation, Real GDP

	I	II	III	IV
	Maximum rank	Eigenvalues	λ-max	λ-trace
1	0	.	18.5546	32.6809**
2	1	0.22998	14.0838	14.1263*
3	2	0.17993	0.0425	0.0425
4	3	0.00060		

* reject zero cointegration vector at the 5 percent significance level

**reject zero cointegration vector at the 1 percent significance level

Table 5: Cointegration Test for Real Effective Exchange Rate, M1, Inflation, Real GDP Real Effective Exchange Rate, M1, Inflation, Real GDP

	I	II	III	IV
	Maximum rank	Eigenvalues	λ-max	λ-trace
1	0		25.0903	65.2324
2	1	0.29769	21.2963	40.1422
3	2	0.25914	17.9512	18.8459**
4	3	0.22340	0.8947	0.8947*
5	4	0.01252		

Table 6: Cointegration Test for Current Account, REER, Inflation, Real GDP, Current Account, Real Effective Exchange Rate, Inflation, Real GDP

	I	II	III	IV
1	Maximum rank	Eigenvalues	λ-max	λ-trace
2	0		25.5381	52.6108**
3	1	0.30.211	15.1880	27.0727*
4	2	0.19258	11.6000	11.8848
5	3	0.15073	0.2848	0.2848
6	4	0.00400		

Table 7: Cointegration Test for Capital-Financial Account, REER, Inflation, Real GDP

Capital and Financial Account, Real Effective Exchange Rate, Inflation, Real GDP

	I	II	III	IV
	Maximum rank	Eigenvalues	λ-max	λ-trace
1	0		26.5718	55.3897
2	1	0.31220	15.8454	28.8179**
3	2	0.20002	12.9720	12.9725
4	3	0.16699	0.0005	0.0005
5	4	0.00001		

Table 8: Cointegration Test for Government expenditure, REER, Inflation, Real GDP

Government Expenditure, Real Effective Exchange Rate, Inflation, Real GDP

	I	II	III	IV
	Maximum rank	Eigenvalues	λ-max	λ-trace
1	0		30.2492	70.4881
2	1	0.34691	25.1775	40.2388
3	2	0.29856	14.3215	15.0613**
4	3	0.18267	0.7399	0.7399
5	4	0.01037		

Table 9: Cointegration Test for REER, Consumption, Inflation, Real GDP

Real Effective Exchange Rate, Consumption, Inflation, Real GDP

	I	II	III	IV
	Maximum rank	Eigenvalues	λ-max	λ-trace
1	0		32.2610	69.6952
2	1	0.36516	21.7602	37.4342
3	2	0.26397	14.7459	15.6740**
4	3	0.18754	0.9281	0.9281*
5	4	0.01299		

Table 10: Cointegration Test for REER, Innvestment, Inflation, Real GDP

Real Effective Exchange Rate, Investment, Inflation, Real GDP

	I	II	III	IV
	Maximum rank	Eigenvalues	λ-max	λ-trace
1	0		31.9395	65.6958
2	1	0.36228	19.5546	33.7563**
3	2	0.24074	13.5643	14.2018*
4	3	0.17391	0.6374	0.6374
5	4	0.00894		

Table 11: Cointegration Test for REER, Export, Inflation, Real GDP

Real Effective Exchange Rate, Export, Inflation, Real GDP

	I	II	III	IV
	Maximum rank	Eigenvalues	λ-max	λ-trace
1	0		25.8062	60.4785
2	1	0.30474	18.1543	34.6723**
3	2	0.22562	15.6767	16.5179
4	3	0.19812	0.8412	0.8412*
5	4	0.01178		

Table 12: Cointegration Test for REER, Import, Inflation, Real GDP

Real Effective Exchange Rate, Import, Inflation, Real GDP

	I	II	III	IV
	Maximum rank	Eigenvalues	λ-max	λ-trace
1	0		41.3288	80.3980
2	1	0.44127	22.0950	39.0692
3	2	0.26743	15.8339	16.9742**
4	3	0.19990	1.1403	1.1403*
5	4	0.01593		

6 VAR MODEL AND EMPIRICAL INVESTIGATIONS

VAR models for the core and alternative models are conducted. Then, parallel to the VAR results, impulse response functions are analyzed. For the last subsection, the forecast error variance decomposition analysis are evaluated.

6.1 Model

Up to this point, the Granger causality test has been conducted to investigate any relationship between REER and real GDP. Period for which that test is conducted is divided into sub-periods. This is because over a long period of time, economic indicators show high volatility due to crises, which may cause incorrect inferences about the direction of causality between variables. On the other hand, to use the Granger causality test, VAR is performed. As a virtue of VAR, impulse response function and forecast error variance decomposition analysis can also be conducted as we gather results about the variables. To apply the VAR for variables at the beginning, stationarity is checked with the unit root test to determine whether spurious regression exists. Then, when current account, capital plus financial account, M1 money supply and government expenditure variables are added into the core model (REER, inflation and real GDP) we observe there is cointegration relationship between variables. Thus, possibility of spurious correlation is eliminated. Subsequent to the result of cointegration tests, we can safely apply VAR to our models. With the help of a practical feature of VAR models, variables can be predicted with significant levels.

The first model that we analyze is the core model, which consists of three endogenous variables; REER, inflation and real GDP. The U.S. 3-month Treasury bill is considered exogenous, as the U.S. interest rate has serious effect on Turkish economy. Model consists of the variables in a particular order. Variables occurring earlier in the ordering have a contemporaneous effect on variables which occur lower in the ordering, but lower-ordered variables can affect higher-ordered variables only with a lag. Thus, we conduct three different orderings for the core model to observe whether there is a remarkable change in the direction of causality and magnitude. The order of the variables of the second core model are formed as inflation, REER and real GDP. Order of variables of third core model are formed as real GDP, inflation, REER.

REER-Inflation-Real GDP ordering for core model is based on Kamin and Rogers (2000). The rationale behind this ordering is because REER shifts nominal price level, which eventually causes a change in the real GDP. We also analyze the ordering of Inflation-REER-Real GDP. The rationale for the orderings are as follows. We assume that inflation has a contemporaneous effect on both the real effective exchange rate and real GDP. On the other hand, responses of inflation to the real effective exchange rate and real GDP shocks occur only with a lag. Additionally, we assume price is sticky in the short run. As contractionary depreciation-devaluation literature suggests, the real exchange rate explains the real GDP but not vice versa. Thus, we order the real effective exchange rate prior to the real GDP. For the third ordering of the core model, studies by Eichenbaum and Evans (1995) for the U.S. and Peersman and Smets (2001) for the E.U. suggest monetary policy shocks have a significant impact on the exchange rate. Thus, the third ordering is implemented as real GDP-inflation-real effective exchange rate. In addition to the core models, there are four alternative models. M1 money supply changes can cause inflation, which may, in turn, increase the price of domestic goods. As prices increase, domestic goods will be less competitive, which then affects volume of exports. So, demand for domestic currency decreases, which affects the real exchange rate and real GDP. Therefore, in the first alternative model we add money supply.

Current account balance is added into core model. Current account is the balance of trade between a country and its trading partners. When the current account has a deficit, it means that the country buys more than it sells of its goods and services. As a consequence, demand for foreign currency increases to a level which results in a lower exchange rate for the country and foreigners find the purchase of goods and services cheap. Thus, the current account has an explanatory effect on the real exchange rate. From the point of inflation-current account relation, there are indirect channels. In addition, the current account affects the real GDP directly by means of trade channels.

For the third alternative model, we add the sum of capital and financial accounts. Whenever the foreign or domestic goods and services are traded, there is also trade for currencies. Thus, supply and demand for foreign currencies are affected by the capital and financial account transactions, which means there is a relationship between the real exchange rate and capital and financial accounts. Capital and financial accounts also have an indirect effect on inflation and real GDP.

For the fourth model investigation, Balvers and Bergstrand (2002) suggest that an increase in government expenditure may cause a real appreciation of the country's currency and

simultaneously, due to government expenditure complementing the utility from private consumption, the same government spending may cause the currency to appreciate in real terms. Moreover, according to a study from Çebi and Çulha (2014)), implementing the structural VAR for Turkey shows that a positive shock to government spending tends to induce real exchange rate appreciation and deterioration in the trade balance. Therefore, an explicit relationship between government expenditure and the endogenous variables makes adding government expenditure into the VAR model essential. We use quarterly data for core and alternative VAR models that have four lags with constant terms and the U.S. Treasury bill is taken as exogenous for all models. For the interpretation of the results of the models, we use the forecast error variance decomposition (FEVD) and impulse-response function analysis techniques below.

6.2 Forecast Error Variance Decomposition

In this subsection, we indicate FEVD of both core and alternative models. We analyze the forecast error variance decompositions at 2, 10, 20, 30 periods. In the tables, columns represent shocks and variables in the rows represent forecast error variance decompositions as a response to innovations in the column variables. The parenthesis inform us about the standard errors for these fractions. For instance, 17 per cent represents fraction of forecast variance in real GDP as response to REER at period 2 and 0.09 is attributed to standard error for the fraction (Row 3-Column I).

Table 13 shows that for each endogenous variable, their own innovations are the most powerful to explain the change in their forecast error variances. For the real effective exchange rate, this rate is between 0.94 and 0.72 (Row 1-Column I, II, III, IV), for the real GDP between 0.79 and 0.77 (Row 3-Column I, II, III, IV), and for inflation between 0.78 and 0.77 (Row 2-Column V, VI, VII, VIII). When further checking is done, real effective exchange rate changes are significant for the forecast error variances of inflation by explaining 19 to 22 per cent of innovations in the inflation (Row 2-Column I, II, III, IV).

In this regard, consistent with the result above, Arslaner, Karaman, Arslaner, and Kal (2014) examine the exchange rate pass-through and inflation targeting relationship for Turkey and find that a weak Turkish lira increases the rate of inflation; the appreciated Turkish lira has contributed significantly during times of single-digit inflation rates over the last decade. However, the real

effective exchange rate's explanatory power on real GDP is relatively small, at 6 to 17 per cent (Row 3- Column I, II, III, IV).

Table 13: Forecast Error Variance Decomposition of Model 1: REER-Inflation-Real GDP

		REER				CPI				Real GDP			
		I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
		2	10	20	30	2	10	20	30	2	10	20	30
1	REER	0.94 (0.03)	0.77 (0.12)	0.72 (0.14)	0.72 (0.14)	0.02 (0.02)	0.19 (0.02)	0.24 (0.15)	0.24 (0.15)	0.02 (0.02)	0.02 (0.04)	0.02 (0.04)	0.02 (0.04)
2	CPI	0.22 (0.09)	0.19 (0.08)	0.20 (0.08)	0.21 (0.08)	0.77 (0.09)	0.78 (0.09)	0.77 (0.09)	0.77 (0.09)	0.004 (0.01)	0.01 (0.03)	0.01 (0.03)	0.01 (0.03)
3	Real GDP	0.17 (0.09)	0.09 (0.09)	0.06 (0.04)	0.06 (0.06)	0.04 (0.05)	0.12 (0.13)	0.14 (0.18)	0.13 (0.19)	0.77 (0.09)	0.78 (0.15)	0.78 (0.19)	0.79 (0.20)

For the full sample in Table 13, innovations of inflation explain the fractions of REER with leading periods as 2 to 24 per cent, which is a meaningful value (Row 1-Column V, VI, VII, VIII). However, the explanatory power of inflation on real GDP is relatively small at 4 to 14 per cent (Row 3-Column V, VI, VII, VIII). On the other hand, real GDP doesn't explain the other two variables, but its own innovation ideally explains itself. It accounts for 77-79 percent of FEVD (Row 3-Column IX, X, XI, XII). Real GDP innovations explain the fractions of forecast error variances for inflation at most 1 per cent levels and for real effective exchange rate at most 2 per cent levels (Row 1, 2-Column IX, X, XI, XII).

The theoretical approach claims REER explains fractions of real GDP. For core model, even though the significance level of the magnitude is not large for the explanatory power of REER on real GDP, the reverse causality direction is not statistically significant. Thus, complying with the theoretical approach for the contractionary depreciation, causality goes from REER to real GDP. Also fractions of REER explain the innovations of the inflation permanently. On the other hand, even the explanatory power of inflation on REER and real GDP is not sufficient for the short term, but in the longer term inflation explains both REER and real GDP. When we compare the core

model with the second ordering core model, there is no difference in the direction of causality but the magnitude differs.

When the sequence of the core model is formed as real GDP-inflation-REER (Table 15), extremely different results can be observed. Rather than REER having explanatory power on real GDP, real GDP explains the fractions of REER with 13-16 per cent levels (Row 3-Column I, II, III, IV). The relationship between inflation and REER does not change remarkably. Both variables can explain the fractions of each other.

However, we claim that the first ordering (real effective exchange rate-inflation-real GDP) is more appropriate for Turkey and other developing countries. From a study on the relationship between capital inflows and output performance especially focusing on crisis periods for Turkey, Rodrik (2012) suggests that Turkey and other developing countries are mostly dependent on capital inflows to show good economic performance. Moreover, as Combes, Kinda and Plane (2012) and Agénor (1998) claim, capital inflows are associated with REER appreciations. Thus, when considering these studies, causality goes from REER to real GDP for Turkey due to capital inflow dependency.

Table 14: FEVD Second Ordering: Inflation-REER-Real GDP

		CPI				REER				Real GDP			
		I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
		2	10	20	30	2	10	20	30	2	10	20	30
1	CPI	0.81 (0.07)	0.81 (0.08)	0.80 (0.08)	0.79 (0.09)	0.18 (0.07)	0.16 (0.07)	0.18 (0.08)	0.18 (0.08)	0.004 (0.01)	0.01 (0.03)	0.01 (0.03)	0.01 (0.03)
2	REER	0.06 (0.06)	0.25 (0.14)	0.30 (0.16)	0.30 (0.15)	0.90 (0.06)	0.72 (0.13)	0.66 (0.15)	0.66 (0.15)	0.02 (0.02)	0.02 (0.04)	0.02 (0.04)	0.02 (0.04)
3	Real GDP	0.06 (0.06)	0.13 (0.14)	0.14 (0.18)	0.13 (0.19)	0.15 (0.08)	0.07 (0.07)	0.06 (0.04)	0.06 (0.08)	0.77 (0.09)	0.78 (0.15)	0.78 (0.19)	0.79 (0.20)

Until now, we have discussed forecast error variances of variables in core model; henceforth, analyze alternative models to compare with findings of core model. We built four other VAR models with four lags; by keeping the core model the same, we add a variable to each alternative model. To limit the foreign effect, the U.S. 3 month t-bill is used as exogenous for all alternative models. First alternative model is designed as current account, REER, inflation, real GDP respectively. In the second model, we augment with capital plus financial account; model is composed of capital plus financial account, REER, inflation and real GDP respectively. For the third alternative model, M1 money supply is included with REER, M1 money supply, inflation, real GDP respectively. For the fourth alternative model, government expenditure, REER, inflation and real GDP are included respectively. All of these models are constructed with four lags and the U.S.t-bill is accepted as exogenous. As with the core model, column variables are the innovations for the fractions of the FEVD of the row variables.

Table 15: FEVD Third Ordering: Real GDP- Inflation-REER

		Real GDP				CPI				REER			
		I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
		2	10	20	30	2	10	20	30	2	10	20	30
1	Real GDP	0.93 (0.03)	0.94 (0.06)	0.90 (0.14)	0.87 (0.19)	0.001 (0.006)	0.02 (0.04)	0.02 (0.08)	0.02 (0.07)	0.06 (0.03)	0.02 (0.02)	0.06 (0.12)	0.10 (0.18)
2	CPI	0.08 (0.06)	0.10 (0.09)	0.10 (0.09)	0.10 (0.09)	0.74 (0.09)	0.73 (0.10)	0.72 (0.11)	0.72 (0.11)	0.16 (0.07)	0.15 (0.06)	0.16 (0.07)	0.17 (0.18)
3	REER	0.13 (0.08)	0.16 (0.12)	0.16 (0.12)	0.16 (0.12)	0.02 (0.04)	0.18 (0.13)	0.23 (0.16)	0.23 (0.15)	0.83 (0.08)	0.64 (0.13)	0.60 (0.14)	0.60 (0.14)

One of the conspicuous results of the FEVD analysis is that the contractionary depreciation hypothesis is valid for the subperiods which do not include crisis periods. During periods which include economic crisis, the direction of causality changes. For the first alternative model, in Table 16 we add the M1 money supply into the core model containing REER, inflation, and real GDP

respectively. Consistent with core model, REER is successful at explaining inflation and real GDP, but these two variables and money supply have no effect on REER. For each variable, their own innovations are the most powerful explanatory factor for the fractions. As seen from the Table 16, M1 money supply does not explain any of the variables with strong values; only for inflation does M1 money supply have slight explanatory power, at most at the 9 per cent level (Row 2-Column V, VI, VII, VIII).

In economics, balance of payment items are considered directly related to output and indirectly related to the exchange rate. When looking at the second alternative model FEVD analysis in Table 17, we can say the current account explains REER at 22 per cent level (Row 1-Column I, II, III, IV), which is a reasonable significance level and also explains inflation at approximately the 15 per cent level (Row 2-Column I, II, III, IV). As might be expected due to economic theory, the current account strongly explains the fractions in the real GDP at most at the 52 per cent level (Row 3-Column I). Even though innovations of REER for explaining the fractions of the real GDP are not as strong compared to previous results, nevertheless it is stronger than the results of the real GDP in explaining REER. Thus, causality goes from REER to real GDP once again. Inflation is important for fractions of REER especially for further periods.

Other balance of payment items are the capital account and financial account. These two items can be evaluated in conjunction with each other. In this alternative VAR model, capital plus financial account, REER, inflation and real GDP are aligned respectively in Table 18. Innovations in the capital plus financial account can explain REER's fractions for forecast error variances at the 25 per cent level (Row 1-Column I). But similar to former results, the real GDP has no impact on REER and innovations in inflation explain the fractions of REER especially in further periods with a 20 per cent level (Row 1-Column XI, XII,). On the contrary, REER explains both the fractions of the real GDP and inflation at 2-11 per cent (Row 3-Column V, VI, VII, VIII) and 16-18 per cent levels (Row 2-Column V, VI, VII, VIII) respectively. Parallel with the previous results, variables' own innovations are the main explanatories for their fractions.

For the last alternative model in Table 19, as expected government expenditure is highly effective in explaining the real GDP, reaching the 55 per cent level in the longer period (Row 3-Column IV). However, government expenditure does not explain REER and inflation. REER innovations explain both inflation and real GDP at the 20-22 and 16-25 per cent levels respectively. Inflation

explains REER at approximately the 20 per cent level (Row 1-Column X, XI, XII) in the longer period. However, the real GDP does not explain the other two variables. The main determinants for the fractions of the variables are their own innovations.

To sum up, the results of the alternative models show parallels with the main model in the study. REER is not affected by real GDP but inflation generally explains the fractions of REER. Additionally, from the alternative models, government expenditure and M1 money supply do not explain the fractions of REER, but balance of payment items can cause REER fractions. On the other hand, innovations of REER are influential in explaining FEVD of the real GDP and inflation. The balance of payment items and government expenditure explain the real GDP fractions, which is consistent with the economic theory.

Table 16: FEVD for 1st Alternative Model: REER-M1-Inflation-Real GDP

		REER				M1				CPI				Real GDP			
		I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI
		2	10	20	30	2	10	20	30	2	10	20	30	2	10	20	30
1	REER	0.94 (0.03)	0.83 (0.08)	0.80 (0.09)	0.78 (0.10)	0.004 (0.01)	0.04 (0.05)	0.05 (0.05)	0.05 (0.05)	0.009 (0.01)	0.03 (0.03)	0.03 (0.03)	0.03 (0.03)	0.03 (0.03)	0.08 (0.05)	0.10 (0.07)	0.11 (0.08)
2	CPI	0.22 (0.08)	0.26 (0.08)	0.26 (0.08)	0.26 (0.08)	0.01 (0.02)	0.07 (0.04)	0.09 (0.04)	0.09 (0.04)	0.75 (0.09)	0.58 (0.09)	0.56 (0.09)	0.56 (0.09)	0.003 (0.01)	0.06 (0.04)	0.07 (0.05)	0.07 (0.06)
3	Real GDP	0.15 (0.08)	0.10 (0.06)	0.12 (0.12)	0.13 (0.15)	0.02 (0.01)	0.02 (0.03)	0.05 (0.07)	0.06 (0.09)	0.01 (0.02)	0.006 (0.09)	0.004 (0.01)	0.003 (0.01)	0.81 (0.09)	0.86 (0.09)	0.81 (0.16)	0.79 (0.19)

Table 17: FEVD for 2nd Alternative Model: Current Account- REER-Inflation-Real GDP

		Current Account				REER				CPI				Real GDP			
		I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI
		2	10	20	30	2	10	20	30	2	10	20	30	2	10	20	30
1	REER	0.22 (0.09)	0.22 (0.12)	0.22 (0.12)	0.22 (0.12)	0.75 (0.09)	0.59 (0.13)	0.56 (0.13)	0.56 (0.13)	0.01 (0.01)	0.17 (0.11)	0.20 (0.13)	0.20 (0.13)	0.007 (0.01)	0.007 (0.01)	0.007 (0.01)	0.007 (0.01)
2	CPI	0.14 (0.08)	0.16 (0.10)	0.15 (0.10)	0.15 (0.10)	0.15 (0.07)	0.13 (0.06)	0.15 (0.06)	0.15 (0.07)	0.70 (0.09)	0.68 (0.11)	0.67 (0.11)	0.67 (0.11)	0.002 (0.01)	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)
3	Real GDP	0.52 (0.09)	0.43 (0.14)	0.35 (0.17)	0.31 (0.19)	0.04 (0.03)	0.02 (0.02)	0.08 (0.13)	0.13 (0.19)	0.02 (0.03)	0.13 (0.13)	0.15 (0.17)	0.13 (0.17)	0.41 (0.09)	0.40 (0.13)	0.40 (0.15)	0.41 (0.16)

Table 18: FEVD for 3rd Alternative Model: Capital + Financial Account-REER-Inflation-Real GDP

		Capital + Financial Account				REER				CPI				Real GDP			
		I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI
		2	10	20	30	2	10	20	30	2	10	20	30	2	10	20	30
1	REER	0.25 (0.10)	0.24 (0.14)	0.23 (0.14)	0.23 (0.14)	0.69 (0.10)	0.55 (0.13)	0.51 (0.14)	0.51 (0.14)	0.02 (0.02)	0.18 (0.12)	0.23 (0.14)	0.23 (0.14)	0.01 (0.02)	0.01 (0.03)	0.01 (0.03)	0.01 (0.03)
2	CPI	0.04 (0.04)	0.06 (0.08)	0.06 (0.08)	0.06 (0.08)	0.18 (0.08)	0.16 (0.07)	0.17 (0.07)	0.17 (0.07)	0.75 (0.09)	0.76 (0.10)	0.75 (0.10)	0.74 (0.11)	0.01 (0.02)	0.01 (0.02)	0.01 (0.02)	0.01 (0.02)
3	Real GDP	0.30 (0.10)	0.31 (0.19)	0.26 (0.22)	0.23 (0.23)	0.03 (0.04)	0.02 (0.02)	0.07 (0.13)	0.11 (0.20)	0.06 (0.05)	0.12 (0.12)	0.14 (0.17)	0.12 (0.17)	0.59 (0.10)	0.53 (0.17)	0.52 (0.22)	0.51 (0.24)

Table 19: FEVD for 4th Alternative Model: Government expenditure-REER-Inflation-Real GDP

		Gov. expenditure				REER				CPI				Real GDP			
		I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI
		2	10	20	30	2	10	20	30	2	10	20	30	2	10	20	30
1	REER	0.01 (0.02)	0.02 (0.04)	0.03 (0.08)	0.03 (0.09)	0.93 (0.04)	0.78 (0.11)	0.72 (0.14)	0.72 (0.14)	0.02 (0.02)	0.18 (0.12)	0.21 (0.15)	0.21 (0.15)	0.02 (0.02)	0.02 (0.03)	0.02 (0.04)	0.02 (0.04)
2	CPI	0.0001 (0.01)	0.01 (0.05)	0.02 (0.07)	0.02 (0.08)	0.22 (0.09)	0.20 (0.08)	0.21 (0.08)	0.22 (0.09)	0.77 (0.09)	0.76 (0.11)	0.74 (0.14)	0.74 (0.15)	0.003 (0.01)	0.01 (0.02)	0.01 (0.03)	0.01 (0.03)
3	Real GDP	0.04 (0.05)	0.21 (0.17)	0.45 (0.19)	0.55 (0.21)	0.18 (0.09)	0.16 (0.09)	0.23 (0.14)	0.25 (0.18)	0.05 (0.05)	0.15 (0.12)	0.08 (0.07)	0.05 (0.05)	0.71 (0.10)	0.46 (0.17)	0.22 (0.11)	0.13 (0.11)

6.3 Impulse Response of the Core and the Alternative Models

In this subsection we analyze the impulse response functions (IRF) of the core and alternative VAR models. In the core model, variables consist of REER, inflation and real GDP, which are endogenous, and we use these variables with four lags for thirty periods. For all the impulse response functions, confidence intervals are 10-90 per cent. Both the impulse and the response are normalized with one standard deviation. Since there are three variables, we have nine different IRF for each model. In figure 2, we show three variables' shocks and responses toward each other.

A positive shock to a REER decreases the real GDP up to the tenth period, then the real GDP starts to increase, but only the first five periods are statistically significant (Figure 2.1). Though the magnitude of expansion in the real GDP is small and statistically insignificant, the positive response of the real GDP is permanent. In the alternative models we will see that a positive response of the real GDP to a positive REER shock is statistically significant. Unlike Kamin and Rogers (2000), we cannot say there is a permanent contractionary depreciation for Turkey. A positive REER shock cause inflation for short term; after the fifth period deflation occurs, but only the first four periods are statistically significant (Figure 2.2). As known from FEVD analysis, a positive REER shock is responded to by a REER with appreciation up to the tenth period but then loses the effect.

Parallel to the results of the previous analysis regarding the effects of the real GDP on REER, the response of REER is negative and permanent but statistically insignificant (Fig 2.3). A positive real GDP shock does not have a statistically significant effect on inflation (Fig 2.4). However, a real GDP impulse causes a permanent increase in real GDP. One standard deviation shock to inflation causes currency to depreciate and it is statistically significant (Fig 2.5). Real GDP responds negatively to inflation shock and it is permanent (Fig 2.6). Three possible explanations for the decrease in real GDP to inflation shock are: (1) a decrease in consumer and business confidence; (2) an increase in the nominal interest rate and hence domestic debt burdens; and (3) a decline in demand for money, resulting in a decreased supply of loanable funds.

Figure 2: Impulse Responses of the Core Model : REER-Inflation-Real GDP

Figure 2.1: Response of Real GDP to REER shock

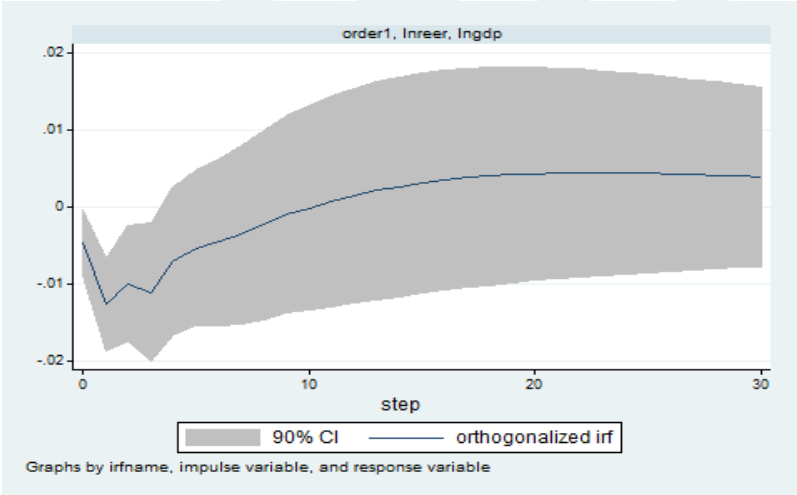


Figure 2.2: Response of Inflation to REER shock

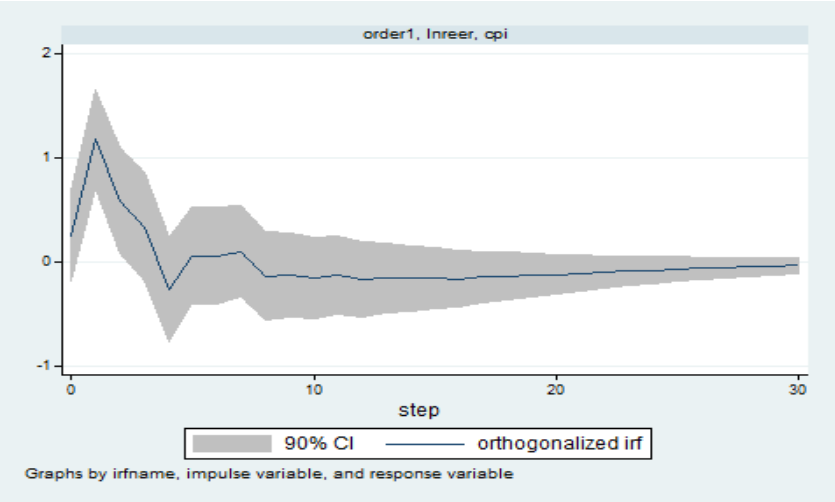


Figure 2.3: Response of REER to Real GDP shock

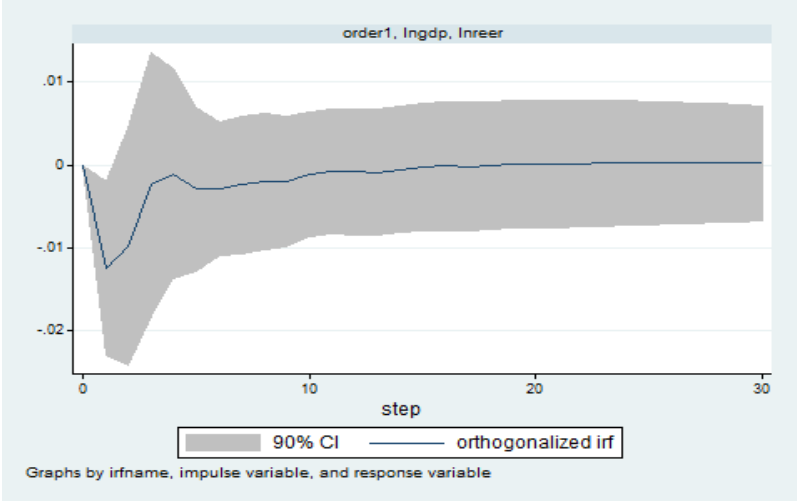


Figure 2.4: Response of Inflation to Real GDP Shock

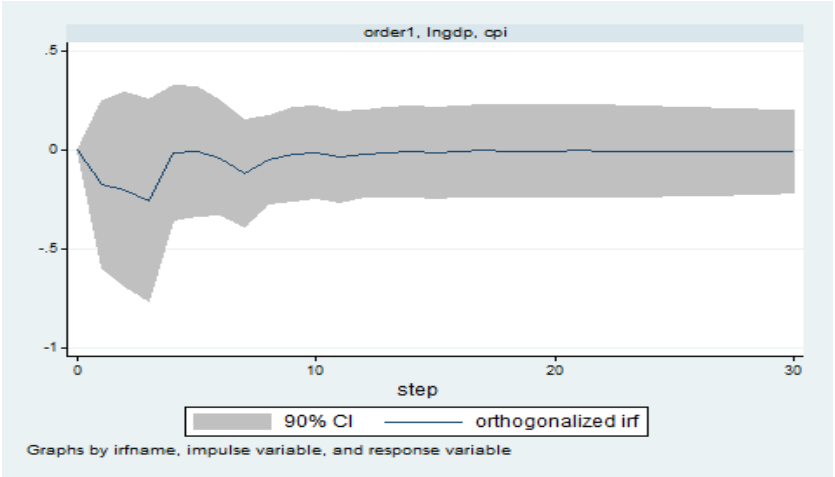


Figure 2.5: Response of Inflation to Real GDP shock

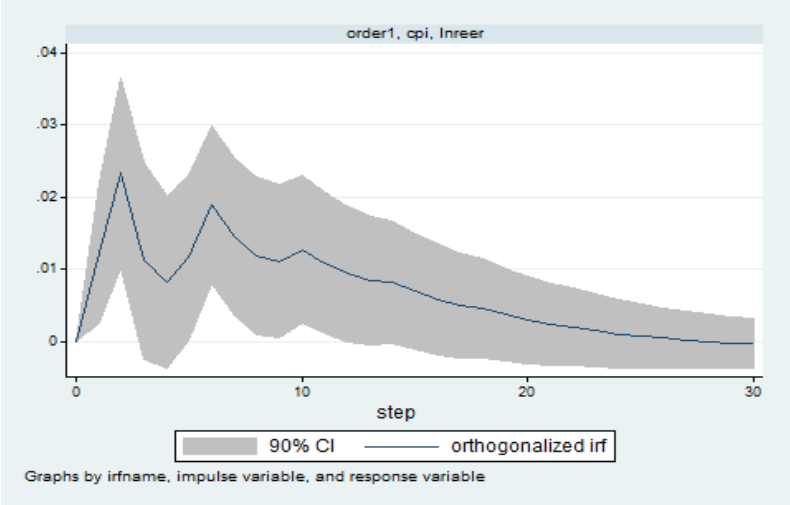


Figure 2.6: Response of Real GDP to Inflation shock

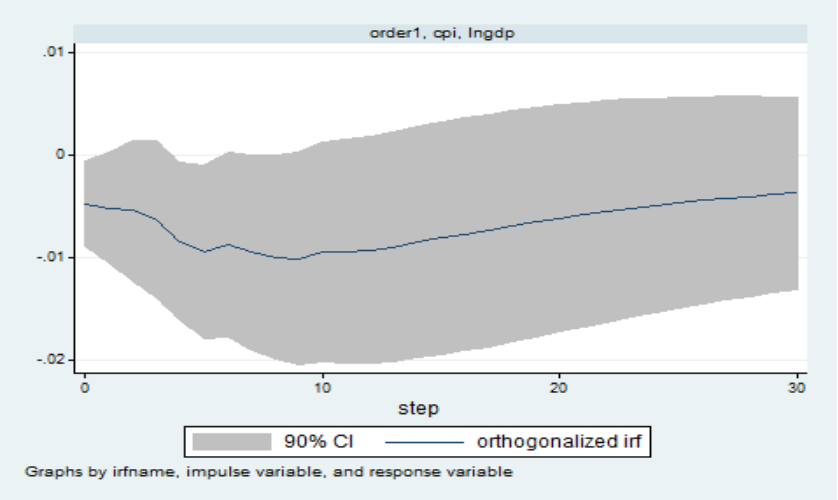


Figure 3: Impulse Responses of 1st Alternative Model: REER, M1, Inflation, Real GDP

Figure 3.1: Response of Real GDP to REER shock

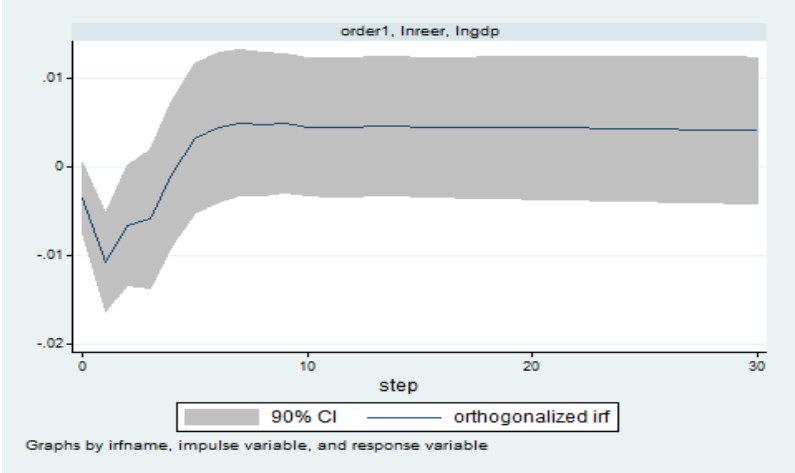


Figure 3.2: Response of Inflation to REER shock

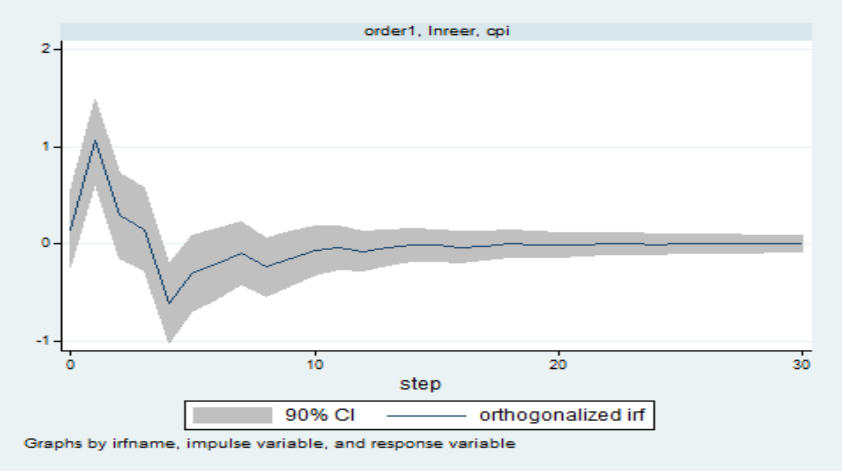


Figure 3.3: Response of REER to Real GDP shock

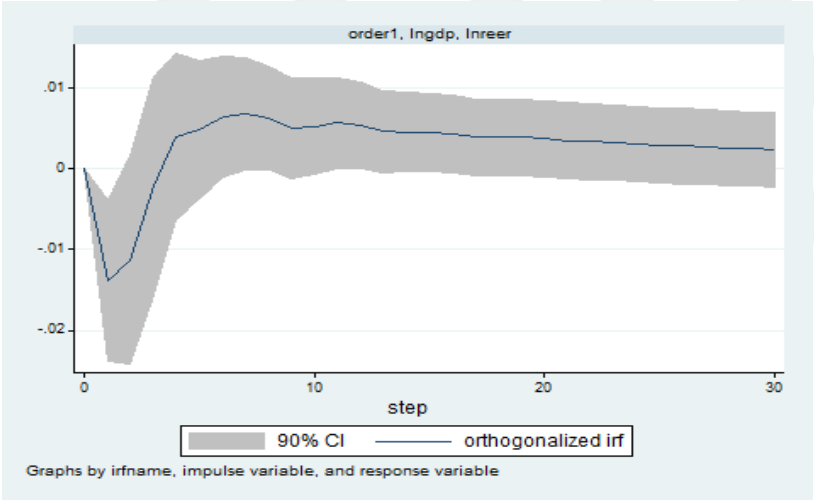


Figure 3.4: Response of Inflation to Real GDP shock

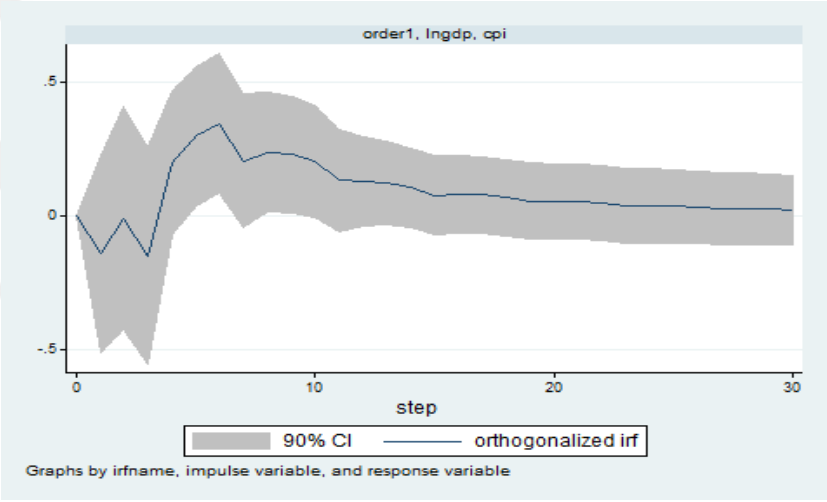


Figure 3.5: Response of REER to Inflation shock

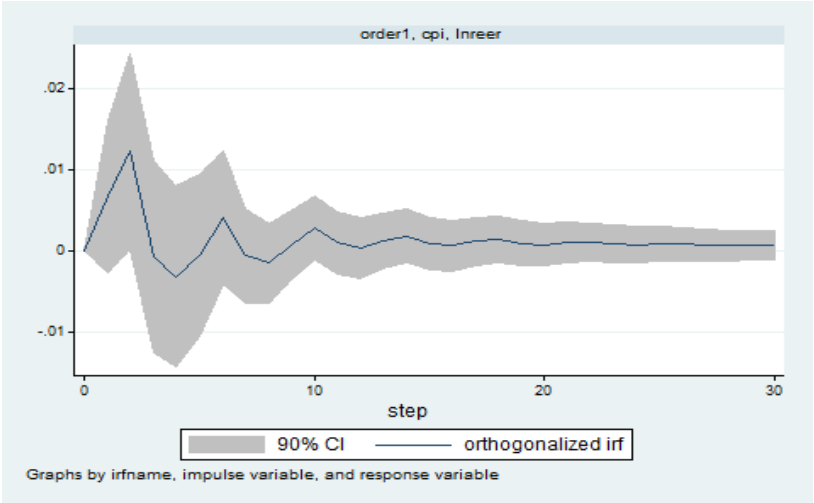


Figure 3.6: Response of Real GDP to Inflation shock

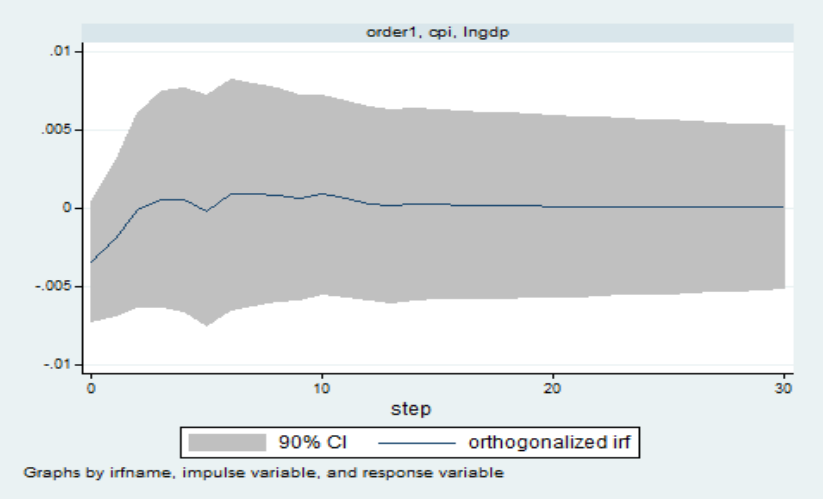


Figure 4: Impulse Responses of 2nd Alternative Model: Current Account, REER, Inflation, Real GDP

Figure 4.1: Response of Real GDP to REER shock

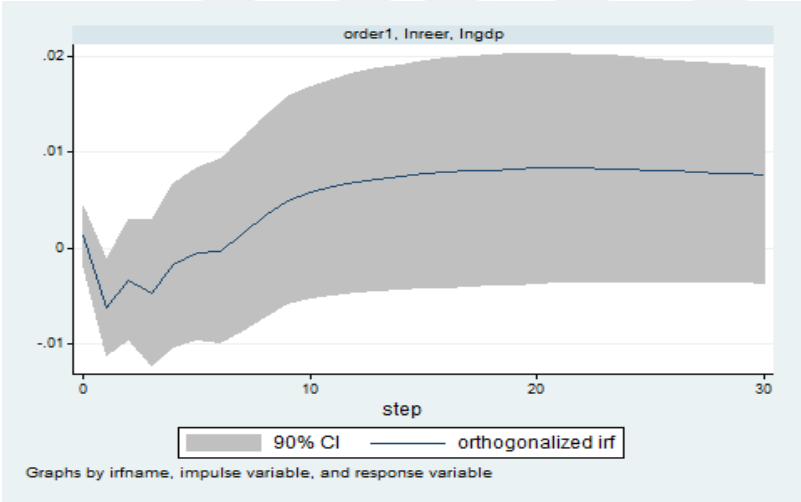


Figure 4.2: Response of Inflation to REER shock

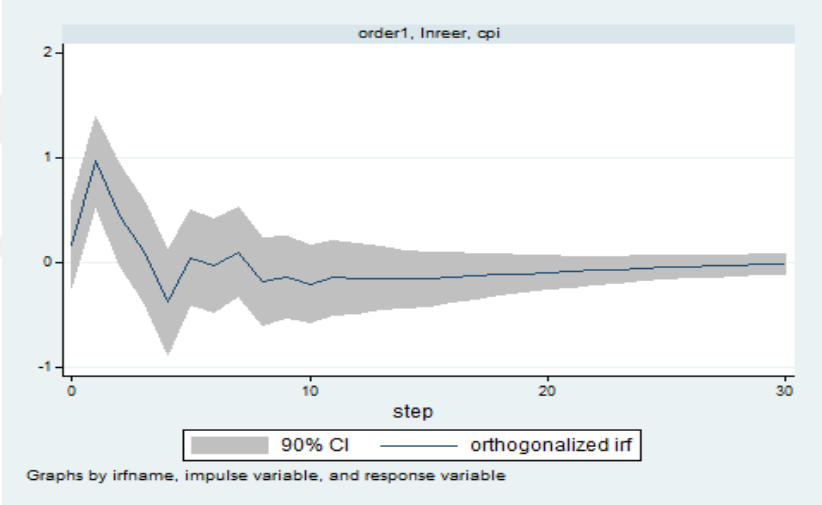


Figure 4.3: Response of REER to Real GDP shock

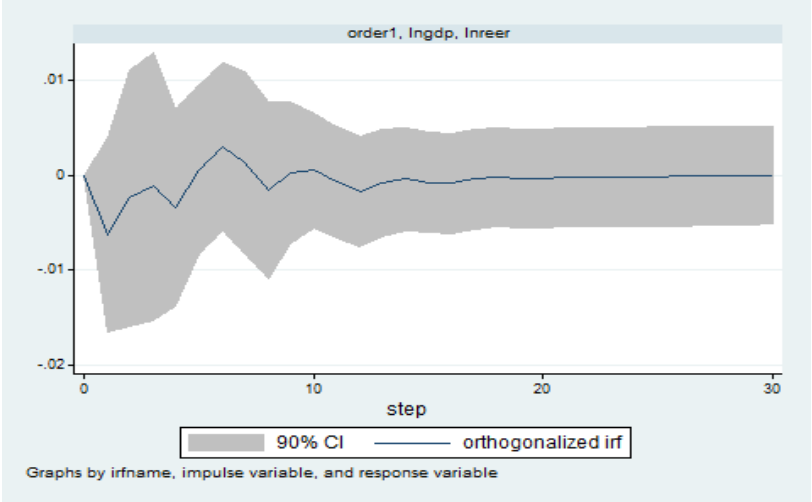


Figure 4.4: Response of Inflation to Real GDP shock

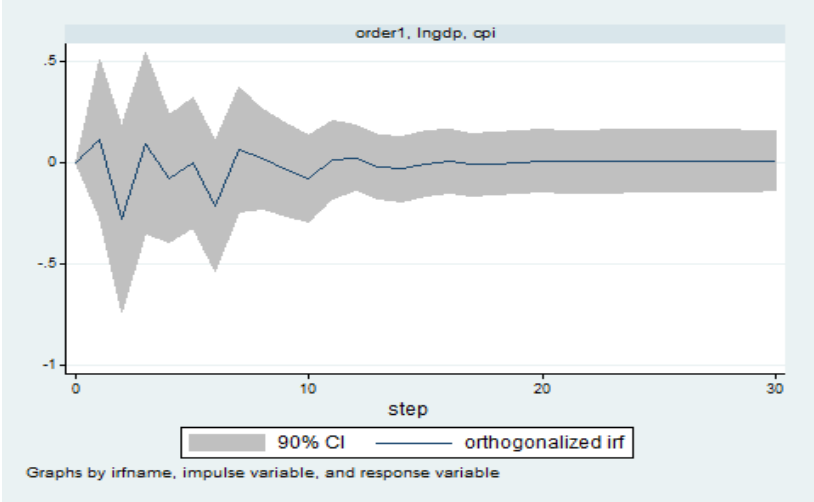


Figure 4.5: Response of REER to Inflation shock

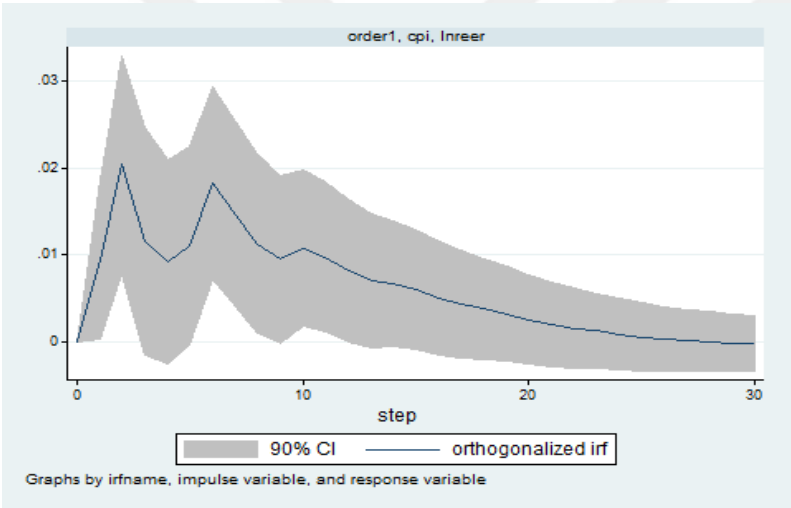
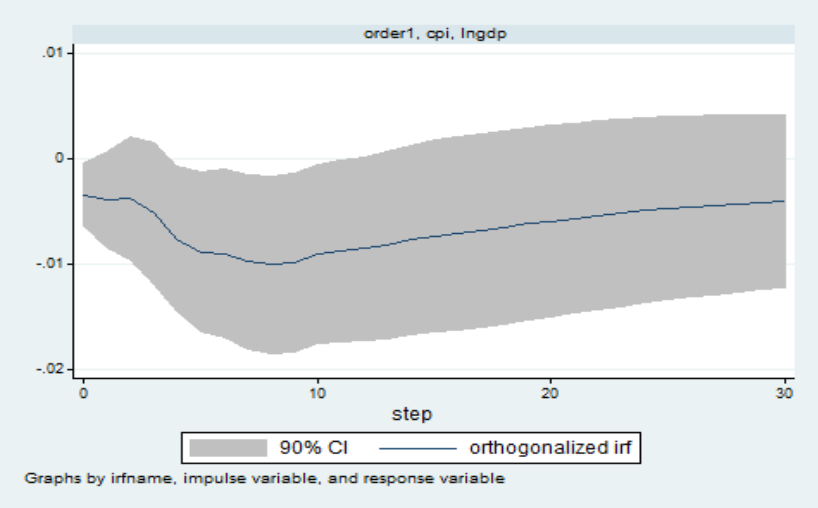


Figure 4.6: Response of Real GDP to Inflation shock



A. Impulse Response of the First Alternative Model
(Real effective exchange rate, M1, Inflation, Real GDP)

After examining the impulse responses of the core model variables, we investigate the alternative VAR model specifications with the same endogenous variables and compare them with the core model results in order to check robustness of results.

For the first alternative model we add M1 money supply. A positive shock to REER decreases the real GDP for the first five periods, then the response of the real GDP is permanently positive (Fig 3.1). However, only the decrease in real GDP is statistically significant. The other difference between the core model and the first alternative model is that a negative shock to the real GDP decreases REER more than in the core model for the beginning periods, but after the fourth period, the response of REER to a positive real GDP shock is positive and permanent (Fig 3.3). Again, however, only the beginning periods are statistically significant. A positive shock to the real GDP is responded to with deflation for the beginning, as in the core model, but unlike the core model the rest of the periods show there is permanent inflation (Fig 3.4). Adding M1 into the model makes a difference in that the magnitude of the increase in REER as a response to inflation shock is smaller than in the core model.

B. Impulse Response of the Second Alternative Model
(Current Account, Real effective exchange rate, Inflation, Real GDP)

A positive shock to REER decreases the real GDP for the short term, but in the medium and longer period real GDP increases (Fig 4.1). The negative response of the real GDP is meaningful in terms of statistics, as is the positive response periods of the real GDP, unlike the core model. Positive impulse to real GDP causes REER volatility in the first ten periods (Fig 4.3). The other impulse response functions follow the same path as the core model.

Figure 5: Impulse Responses of 3rd Alternative Model: Capital + Financial Account, REER, Inflation, Real GDP

Figure 5.1: Response of Real GDP to REER shock

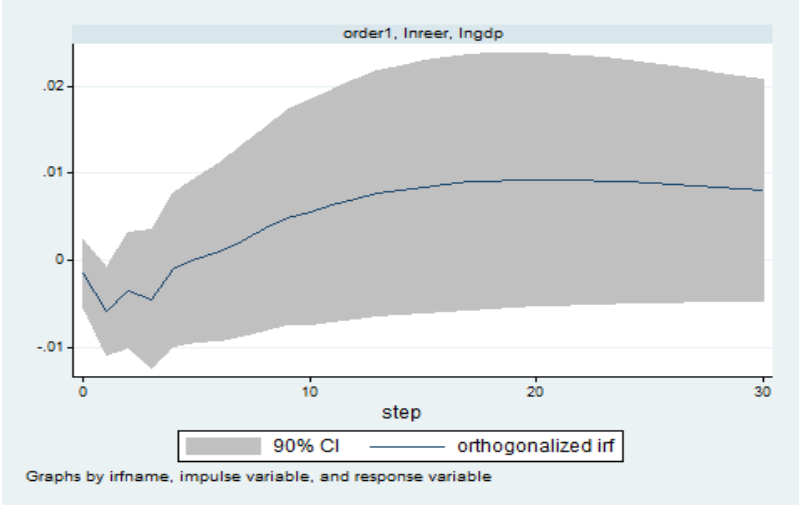


Figure 5.2: Response of Inflation to REER shock

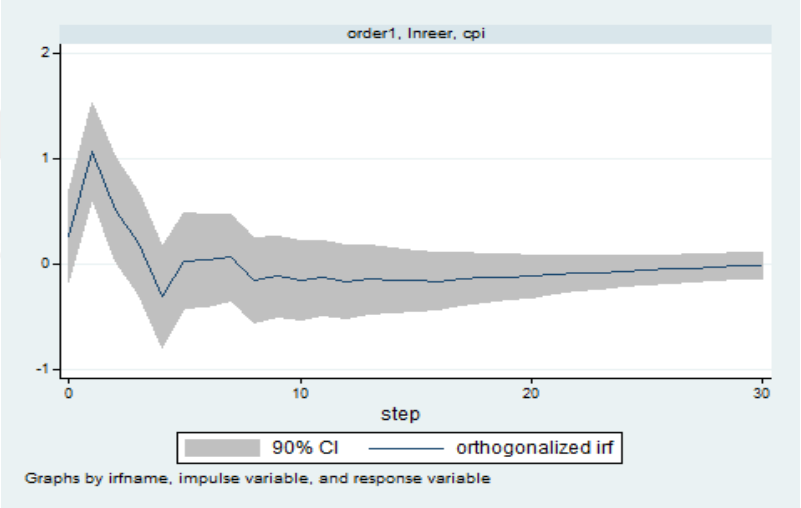


Figure 5.3: Response of REER to Real GDP shock

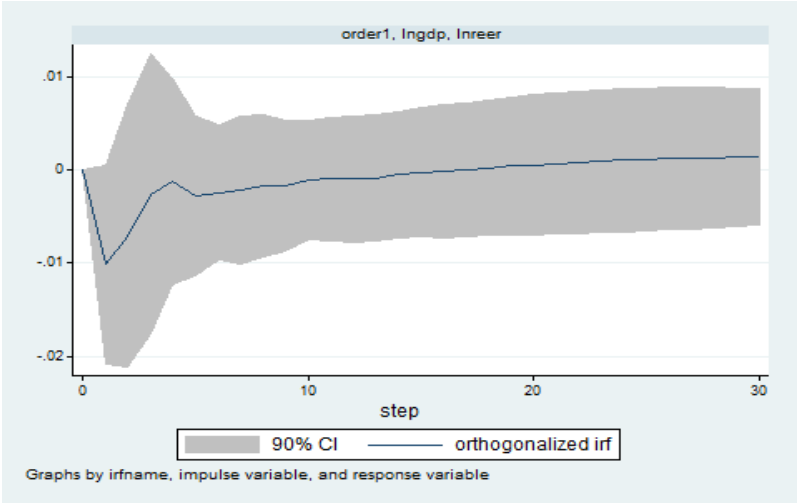


Figure 5.4: Response of Inflation to Real GDP shock

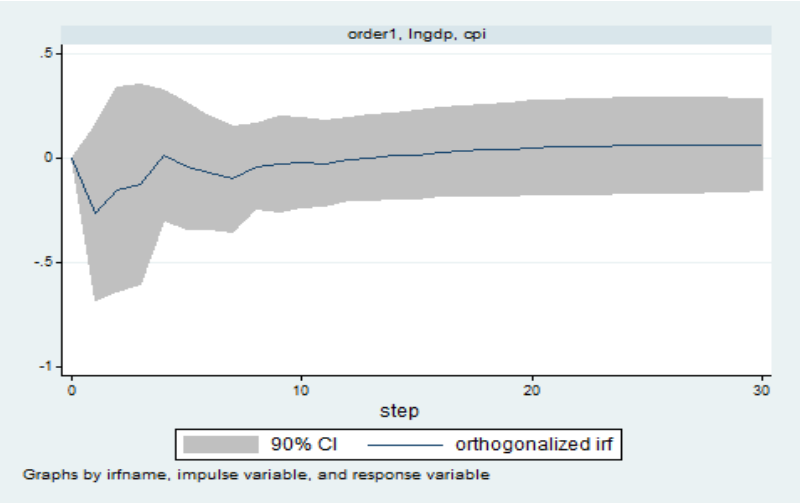


Figure 5.5: Response of REER to Inflation shock

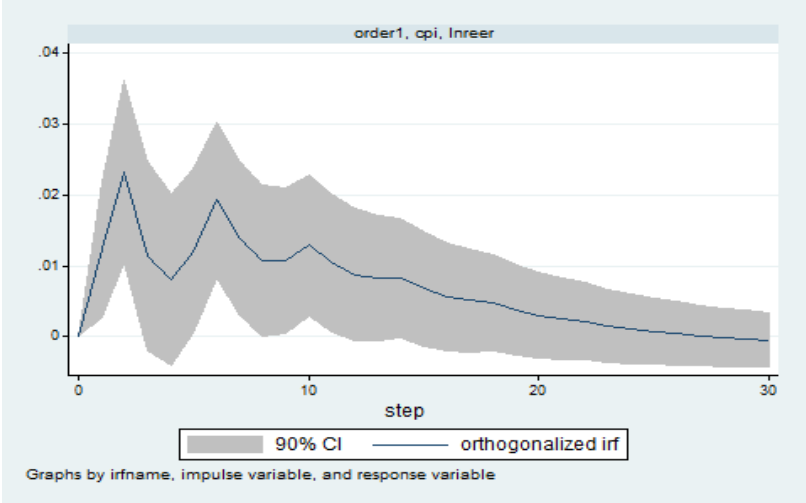


Figure 5.6: Response of Real GDP to Inflation shock

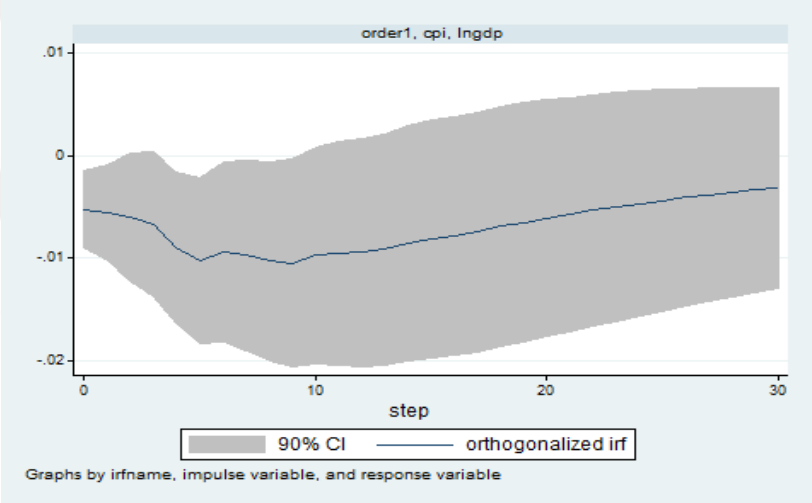


Figure 6: Impulse Responses of 4th Alternative Model: Government Expenditure, REER, Inflation, Real GDP

Figure 6.1: Response of Real GDP to REER shock

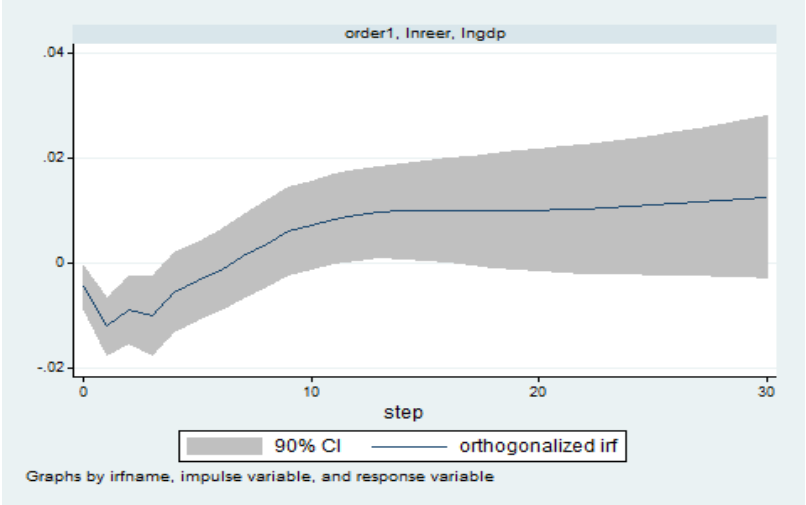


Figure 6.2: Response of Inflation to REER shock

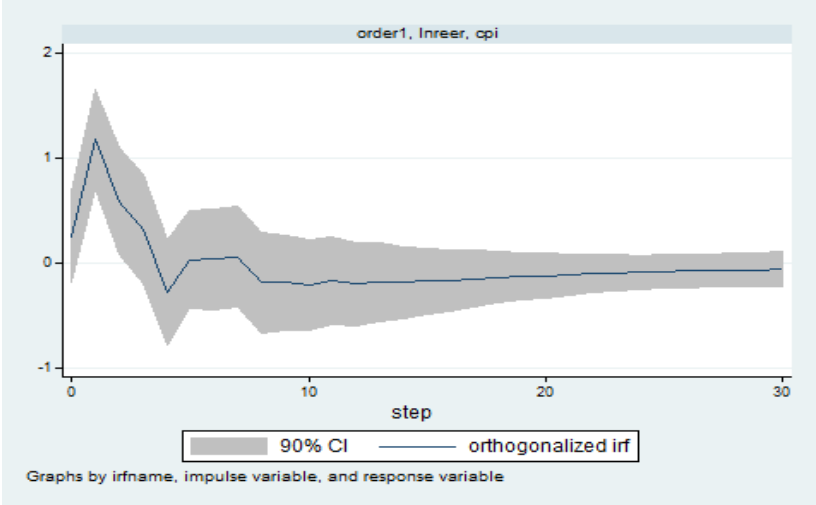


Figure 6.3: Response of REER to Real GDP shock

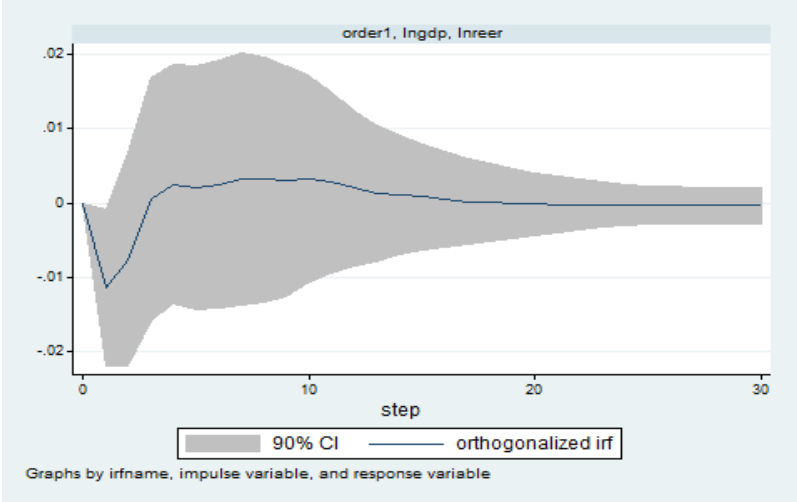


Figure 6.4: Response of Inflation to Real GDP shock

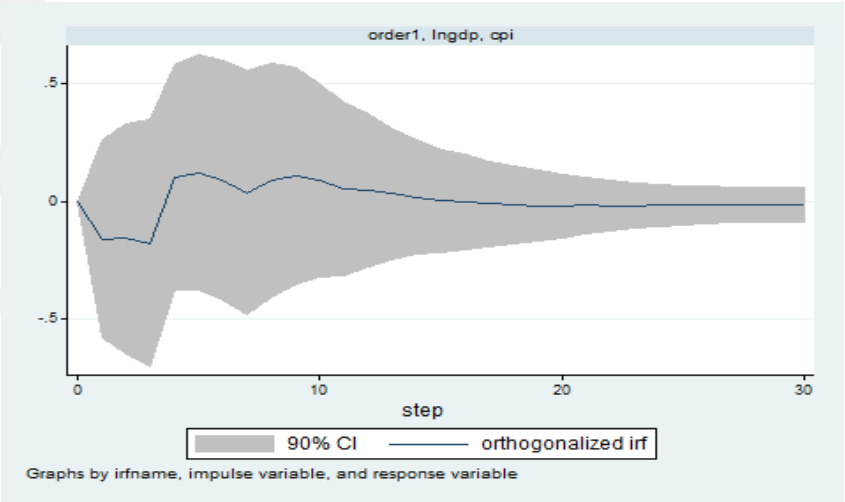


Figure 6.5: Response of REER to Inflation shock

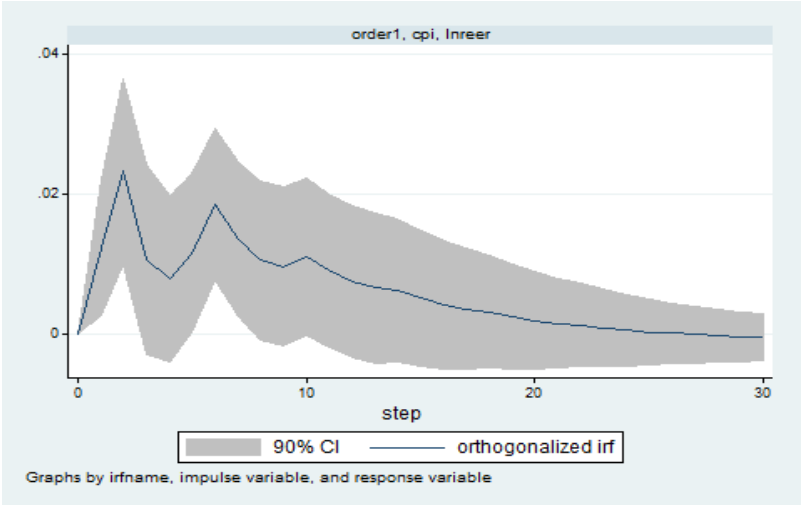
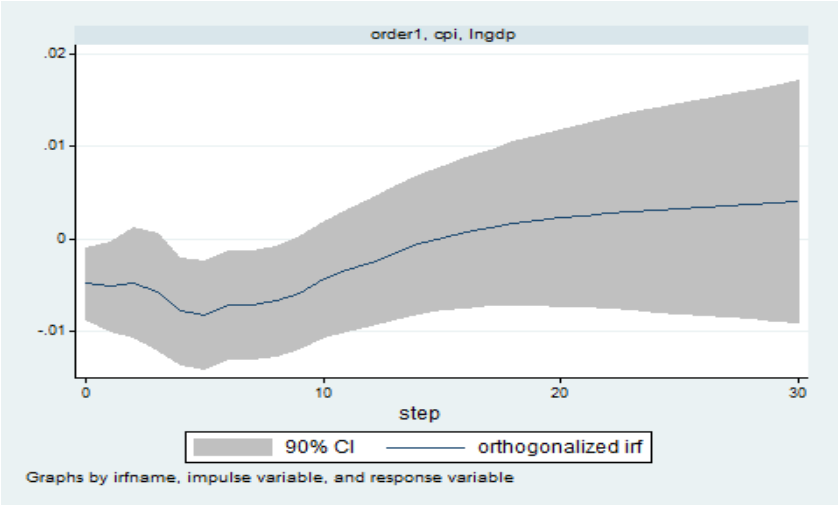


Figure 6.6: Response of Real GDP to Inflation shock



C. Impulse Response of the Third Alternative Model

(Capital Account + Financial Account, Real effective exchange rate, Inflation, Real GDP)

Wıth the addition of the capital account plus financial account, the third alternative model is conducted. A positive REER shock is responded to with a real GDP negative for the first four periods. Then the response of the real GDP becomes positive permanently. Between the first and the third periods, the magnitude is statistically significant. Unlike the core model, the positive real GDP response is meaningful. This result shows that in the short term contractionary depreciation is observed, but for the medium and long terms expansionary depreciation occurs. The other results of the IRFs are parallel with the core model.

D. Impulse Response of the Fourth Alternative Model

(Government expenditure, Real effective exchange rate, Inflation, Real GDP)

For the fourth alternative model, we add government expenditure especially to observe the effect on REER and real GDP. A positive shock to REER causes a decline for the real GDP in the short term. In the medium and long terms, the real GDP responds with a permanent increase. Both periods of negative responses and positive responses are statistically significant. A positive shock to the real GDP causes a decline in REER in both the fourth alternative model and the core model over a short time. However, different than the core model due to the inclusion of government expenditure, REER starts to increase, but this result is statistically insignificant. Unlike any of the other models, the response of real GDP to real GDP shock follows a different path. The real GDP drastically decreases; for a short period of time the response of the real GDP to a positive real GDP shock is negative, but it is statistically insignificant. Adding government expenditure also makes a difference regarding inflation shock on the real GDP. In the fourth model, inflationary shock is responded to by a decrease in the real GDP in the short and medium terms, but in the long term real GDP increases. Also these results are statistically insignificant.

In a nut shell, the results of the alternative models are generally similar to the core model. In the core model, we have found that the effects of REER on real GDP are negative for the short term, but then become positive permanently. However, periods of increase in the real GDP are statistically insignificant for the core and first alternative models; for the second, third and fourth alternative models, an increase in real GDP periods as a response to real depreciation is statistically significant. It can be interpreted to mean that in the short run, depreciation in the currency causes

deterioration in the balance sheet and decreases investment. Over a longer period, however, this effect vanishes and depreciation in the currency causes an increase in the output level, which contradicts the contractionary depreciation hypothesis.

It seems that one standard deviation shock to REER causes deflation to occur permanently and the magnitude is highly statistically significant. REER response to positive real GDP impulse is highly volatile for both the core and alternative models. The starting periods show a negative response to output shock, then both positive and negative responses are observed. However, the results are statistically insignificant.

E. Impulse Responses of GDP components: Investment-Consumption-Export-Import

(5^{th} Alternative Model: REER-Consumption-Inflation-Real GDP)
(6^{th} Alternative Model: REER-Investment-Inflation-Real GDP)
(7^{th} Alternative Model: REER-Export-Inflation-Real GDP)
(8^{th} Alternative Model: REER-Import-Inflation-Real GDP)

As positive shock to REER is given, consumption starts to increase for a few periods then the response is permanently positive and stable. On the other hand, the response of investment to REER impulse is negative in the short term, but becomes positive. For the balance sheet channel, depreciation of the Turkish lira causes a negative balance sheet effect for the short term, but with the increase in investment, the balance sheet effect becomes positive. On the other hand, a positive shock to REER increases export permanently. The response of import to REER shock is positive and permanent, except between the third and fifth periods. For the first three periods, an increase in import is higher compared to other periods, but in the longer periods the responses of import are statistically insignificant. In comparison with the magnitudes of responses of export and import, the magnitude of export is higher than import. Thus, export-import balance constitutes a standard expansionary effect. Due to the negative balance sheet effect, contractionary depreciation is observed for the short term. But in the longer term, with the help of net export and increase in investment, real GDP responds with expansion to the real depreciation

Figure 7: Impulse Responses of REER-Consumption, Investment, Export, Import

Figure 7.1: Response of Consumption to REER shock

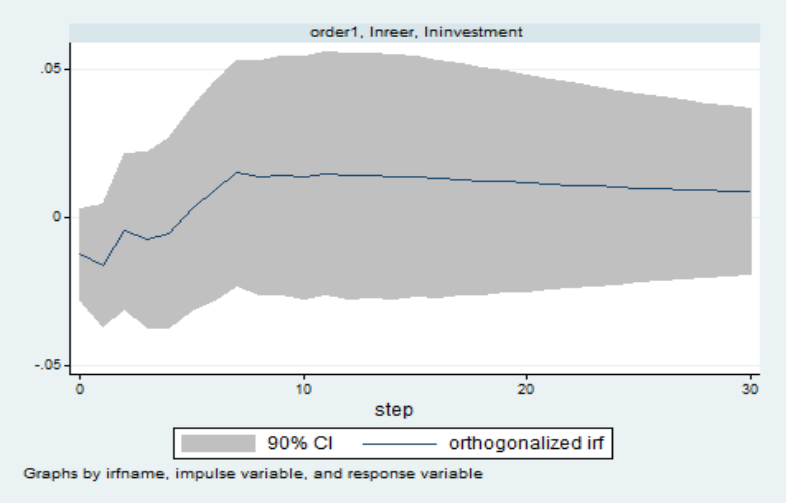


Figure 7.2: Response of Investment to REER shock

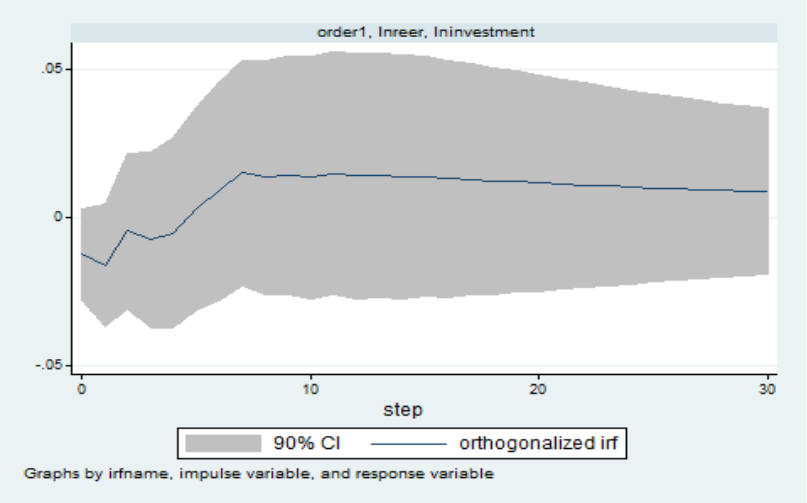


Figure 7.3: Response of Export to REER shock

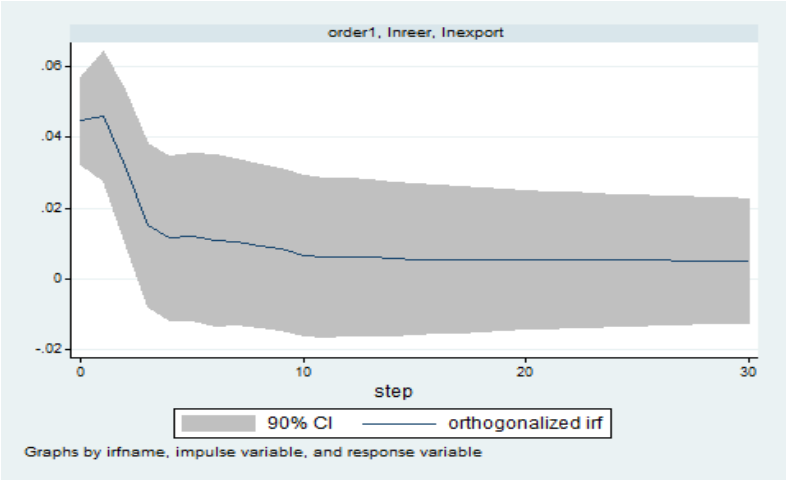
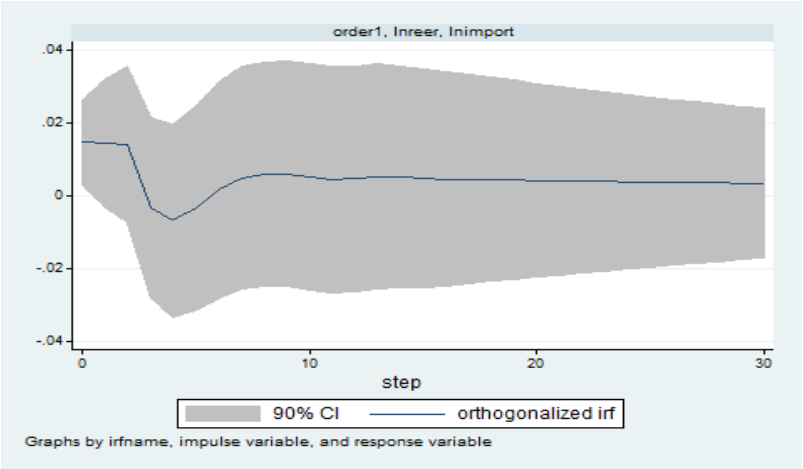


Figure 7.4: Response of Import to REER shock



7 CONCLUSION

The aim of this paper is to investigate the relationship between REER and real GDP in Turkey. In this regard, we first conducted an analysis of the bivariate data and found at a reasonable level REER and real GDP are negatively correlated with each other in general. On the other hand, due to inability to eliminate the effects of other exogenous variables, the Granger causality test was inconclusive. Following this, a cointegration test is conducted to observe any long run relationship between variables. We found there exist long-run relationships between variables which led us to implement VAR models for the core and alternative models.

First, unlike previous studies, we analyzed three different orderings for the core VAR model and decided that the REER-Inflation-Real GDP ordering is suitable for Turkey. The first ordering and Inflation-REER-Real GDP ordering do not show large differences, but for the third ordering, Real GDP-Inflation-REER, the direction of causality shows significant differences. However, even though studies investigating developed economies (e.g., Eichenbaum & Evans, 1995; Peersman & Smets, 2001) claim monetary policy shocks have a significant impact on the exchange rate, for developing economies like Turkey, due to capital flows and a high rate of exchange rate pass-through, REER explains both inflation and real GDP. In addition to the core model, we add other variables – M1 money supply, current account, capital and financial account, and government expenditure – creating alternative models to observe the external effects of REER movements on real GDP.

In the core and alternative settings for the first periods contractionary, and for further periods expansionary, depreciations are observed. In alternative settings, expansion in the real GDP as a response to a real depreciation shock can be observed clearly relative to the core model which shows the necessity to take other variables into consideration. Although previous studies show permanent contractionary devaluation exists for Turkey, nevertheless with a good economic performance in the recent past, real depreciations started to gradually increase the real GDP. In reference to our study, though Kamin and Rogers (2000) found contractionary devaluation for Mexico, they claim with structural reforms the Mexican GDP may start to increase as a response to real devaluations. Moreover, we found real depreciations are inflationary for all settings.

For further investigation between REER and real GDP, we analyzed the effects of real depreciation on GDP components: import-export and consumption-investment. Contrary to positive trade

competitiveness, due to negative investment rates for the first periods the adverse balance sheet effect dominates the trade balance and contractionary depreciation occurs. Following recovery in the balance sheet, the real GDP has a permanent positive response to real depreciation. For a more concrete analysis, a micro-level data investigation would be beneficial.

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