

145735

FIVE ESSAYS ON MONETARY POLICY APPLICATIONS
IN AN OPEN ECONOMY
UNDER ECONOMIC UNCERTAINTY AND SHOCKS

A Ph.D. Dissertation

by
NAZİRE NERGİZ DİNÇER

145735

Department of
Economics
Bilkent University
Ankara
November 2004

To My Parents



FIVE ESSAYS ON MONETARY POLICY APPLICATIONS
IN AN OPEN ECONOMY
UNDER ECONOMIC UNCERTAINTY AND SHOCKS

The Institute of Economics and Social Sciences
of
Bilkent University

by

NAZİRE NERGİZ DİNÇER

In Partial Fulfilment of the Requirements for the Degree of
DOCTOR OF PHILOSOPHY

in

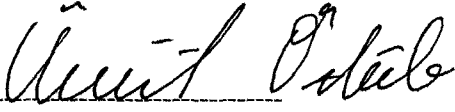
THE DEPARTMENT OF ECONOMICS
BİLKENT UNIVERSITY
ANKARA

November 2004

I certify that I have read this thesis and have found that it is fully adequate, in scope and in quality, as a thesis for the degree of Doctor of Philosophy in Economics


(Assoc. Prof. Hakan Berument)
Supervisor

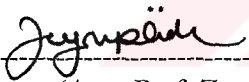
I certify that I have read this thesis and have found that it is fully adequate, in scope and in quality, as a thesis for the degree of Doctor of Philosophy in Economics.


(Asst. Prof. Ümit Özlale)
Examining Committee Member

I certify that I have read this thesis and have found that it is fully adequate, in scope and in quality, as a thesis for the degree of Doctor of Philosophy in Economics.


(Asst. Prof. Özge Şenay)
Examining Committee Member

I certify that I have read this thesis and have found that it is fully adequate, in scope and in quality, as a thesis for the degree of Doctor of Philosophy in Economics.


(Asst. Prof. Zeynep Önder)
Examining Committee Member

I certify that I have read this thesis and have found that it is fully adequate, in scope and in quality, as a thesis for the degree of Doctor of Philosophy in Economics.


(Dr. Neil Arnwine)
Examining Committee Member

Approval of the Institute of Economics and Social Sciences


(Prof. Erdal Erel)
Director

ABSTRACT

FIVE ESSAYS ON MONETARY POLICY APPLICATIONS IN AN OPEN ECONOMY UNDER ECONOMIC UNCERTAINTY AND SHOCKS

Dinçer, Nazire Nergiz

P.D., Department of Economics

Supervisor: Assoc. Prof. Dr. Hakan Berument

November 2004

In this dissertation, we analyzed the monetary policy applications under uncertainty and shocks and their effects on the economy. The uncertainties we concern are inflation uncertainty and exchange rate risk, whereas the shocks are the unexpected exchange rate shocks, change in parity and capital flights. The case study is Turkey, except the analysis on inflation uncertainty, which is on G-7 countries.

The analyses on inflation uncertainty suggest that inflation increases inflation uncertainty for G-7 countries, whereas inflation uncertainty decreases inflation for four countries. Therefore, when uncertainty is high, the central bank reduces those real costs at the margin by reducing inflation. On the other hand, the effects of exchange rate risk are an increase in prices, a depreciation of the real exchange rate, and a decrease in the output.

In the face of unexpected currency depreciation or appreciation, the economic activity decreases. The effects of an improvement in the USD-Euro parity on an open economy, where the denomination composition of trade is asymmetric is an appreciation of the real exchange rate, an increase in the relative income and an improvement in the trade balance. The empirical analyses on capital outflows suggest that growth decreases, inflation increases and exchange rate depreciates, which are critical negative signals for an economy.

Overall this dissertation suggests that when designing a policy program, it is important to consider the possible deviations from the policies. Otherwise, it would not be possible to achieve the targets, moreover the costs would be too high for the economy.

Keywords: Monetary policy, Uncertainty, Shocks

ÖZET

DIŞA AÇIK BİR EKONOMİDE BELİRSİZLİKLER VE ŞOKLAR ALTINDA PARA POLİTİKASI UYGULAMALARI ÜZERİNE BEŞ MAKALE

Dinçer, Nazire Nergiz

Doktora, Ekonomi Bölümü

Tez Yöneticisi: Doç. Dr. Hakan Berument

Kasım 2004

Bu tezde, belirsizlikler ve şoklar altında para politikası uygulamaları ve bunların ekonomiye etkileri incelenmiştir. Göz önüne alınan belirsizlikler, enflasyon belirsizliği ve kur riski iken şoklar beklenmedik kur şoku, paritedeki değişme ve sermaye hareketleridir. G-7 ülkeleri üzerine olan enflasyon belirsizliği analizleri haricinde vaka çalışması Türkiye'dir.

Enflasyon belirsizliği konusundaki analizler G-7 ülkeleri için enflasyonun enflasyon belirsizliğini arttırdığını, dört ülke için ise enflasyon belirsizliğinin enflasyonu düşürdüğünü önermektedir. Dolayısıyla, enflasyon belirsizliği yüksek olduğunda, merkez bankası enflasyonu düşürerek, reel maliyetleri düşürmektedir. Diğer taraftan, kur riskinin etkileri; fiyatların artışı, reel kurun değer kaybetmesi ve ekonominin daralmasıdır.

Beklenmedik kur değeri lenmesi ve değeri kaybı durumunda ekonomik aktivite düşmektedir. Ticaretin döviz kompozisyonu asimetrik olan dışa açık bir ekonomide USD-Euro pritesindeki olumlu gelişmenin etkileri, reel kurda değeri lenme, göreli gelirde artış ve ticaret dengesinde düzelmedir. Sermaye çıkışları konusundaki ampirik analizler, ekonomi için kritik negatif sinyaller olan büyümede düşüş, enflasyonda artış, ve kurda değeri kaybı önermektedir.

Bütününde bu doktora tezi, bir politika programı düzenlendiğinde politikalardan olası sapmaların gözönüne alınmasının önemli olduğunu önermektedir. Aksi takdirde, hedeflere ulaşmak mümkün olmayabilir, dahası maliyetler ekonomi için fazlasıyla yüksek olabilir.

Anahtar Kelimeler: Para politikası, Belirsizlik, Şoklar

ACKNOWLEDGMENTS

I would like to express my gratitude to my supervisor, Assoc. Prof. Hakan Berument, for his kind support, encouragement and guidance during this study. I have been fortunate to have the opportunity of being under his supervision. Without him life would be too difficult.

I would like to thank Asst. Prof. Özge Şenay and Asst. Prof. Ümit Özlale for reading my thesis and for their valuable comments.

I also should emphasize my family's understanding and support in every stage of my thesis. Without them, I would not have overcome the difficulties during my thesis.

Last, but not least, my thanks go to my colleagues in Economic Modeling Department of State Planning Organization, especially Mine, Eser, Özgür and Sedef for their encouragement, understanding and for being near me.

TABLE OF CONTENTS

ABSTRACT.....	iii
ÖZET.....	v
ACKNOWLEDGMENTS.....	vii
TABLE OF CONTENTS.....	viii
CHAPTER 1: INTRODUCTION.....	1
CHAPTER 2: INFLATION AND INFLATION UNCERTAINTY IN THE G-7 COUNTRIES	10
2.1. Introduction.....	10
2.2. The General Method.....	13
2.3. The Full Information Maximum Likelihood Specification with Extended Lags	14
2.4. Estimates	15
2.5. Conclusion	21

CHAPTER 3: THE EFFECTS OF EXCHANGE RATE RISK ON ECONOMIC PERFORMANCE: THE TURKISH EXPERIENCE.....	22
3.1. Introduction.....	22
3.2. The Theoretical Model	27
3.3. Measuring the Exchange Rate Risk.....	35
3.4. Data.....	39
3.5. Estimates.....	40
3.5.1. Impulse Response Functions.....	41
3.5.2. Forecast Error Variance Decompositions.....	45
3.6. Conclusion.....	49
CHAPTER 4: ASYMMETRIC EFFECTS OF EXCHANGE RATE FLUCTUATIONS ON ECONOMIC PERFORMANCE: TURKISH EXPERIENCE.....	51
4.1. Introduction.....	51
4.2. Developments in the Turkish Exchange Rate.....	61
4.3. Model	65
4.4. Estimates.....	67
4.5. Conclusion	74
CHAPTER 5: DENOMINATION COMPOSITION OF TRADE AND TRADE BALANCE: THE EMPIRICAL EVIDENCE.....	76
5.1. Introduction.....	76

5.2. Turkish Trade Balance and its Relation with the USD-Euro Parity.....	88
5.3. Developments in USD-Euro Parity.....	90
5.4. Data and Descriptive Statistics.....	91
5.5. Model Specification (VAR).....	96
5.6. Impulse Response Functions.....	98
5.7. Conclusion.....	104
 CHAPTER 6: DO CAPITAL FLOWS IMPROVE MACROECONOMIC PERFORMANCE IN EMERGING MARKETS? : THE TURKISH EXPERIENCE..	 105
6.1. Introduction.....	105
6.2. An Overview of Capital Flows in Turkey.....	108
6.3. Macroeconomic Effects of Capital Flows.....	111
6.4. Methodological Issues.....	113
6.5. The VAR Specification.....	114
6.6. Impulse Response Functions.....	116
6.7. Variance Decompositions.....	118
6.8. Sensitivity Analysis.....	119
6.9. Policy Implications and Conclusions.....	123
 CHAPTER 7: CONCLUSION.....	 124
SELECT BIBLIOGRAPHY.....	127
APPENDICES.....	139

LIST OF TABLES

1. Granger Causality Tests between Inflation and Inflation Uncertainty after the Specification Issue are Addressed.....	17
2. Granger Causality Tests between Inflation and Inflation Uncertainty as Grier and Perry (1998) used.....	19
3. Granger Causality Tests between Inflation and Inflation Uncertainty after the Specification Issues are Addressed with 1 lag.....	20
4. Cross correlations between real exchange rate volatility (as measured with moving standard deviation) and lags of exchange rate risk proxies.....	38
5. Cross correlations between real exchange rate volatility (as measured with moving standard deviation) and leads of exchange rate risk proxies.....	39
6. Forecast Error Variance Decompositions: Contribution of FXL_t/RES_{t-1} to Changes in Key Macroeconomic Variables.....	46
7. Forecast Error Variance Decompositions: Contribution of $FXL_t/TRES_{t-1}$ to Changes in Key Macroeconomic Variables.....	46
8. Forecast Error Variance Decompositions: Contribution of FXL_t/TLL_{t-1} to Changes in Key Macroeconomic Variables.....	47
9. Forecast Error Variance Decompositions: Contribution of Volatility	

to Changes in Key Macroeconomic Variables.....	49
10. The Asymmetric Effects of the Exchange Rate:	
Marginal Significance Levels.....	70
11. Signs of the Unanticipated Real Exchange Rate Shocks.....	71
12. The Asymmetric Effects of the Real Exchange Rate–3SLS:	
Marginal Significance Levels.....	73
13. Signs of the unanticipated real exchange rate shocks – 3SLS.....	73
14. Unit Root Tests.....	93
15. Correlation Matrix.....	93
16. Cross Correlations of Parity with Other Variables.....	95
17. Co-integration Test.....	95
18. Forecast Error Variance Decompositions: Contribution of Capital Inflow Shocks to Changes in Key Macroeconomic Variables.....	119

LIST OF FIGURES

1. Impulse Response Functions with FXL_t/RES_{t-1}	42
2. Impulse Response Functions with $FXL_t/TRES_{t-1}$	43
3. Impulse Response Functions FXL_t/TLL_{t-1}	44
4. Impulse Response Functions with $Volatility_t$	48
5. Change in the Real Exchange Rate (% TL/\$).....	62
6. Change in the Nominal Exchange Rate (% TL/\$).....	63
7. Growth of GNP (%).....	63
8. The Ratio of Trade Balance to GNP.....	89
9. USD-Euro Parity.....	91
10. Impulse Response Functions with Commonly Used Definition.....	100
11. Impulse Response Functions (SPO definition is used as real exchange rate)...	102
12. Development of Capital Flows.....	111
13. Responses to one Standard Deviation Innovation in Capital Inflows.....	117

CHAPTER 1

INTRODUCTION

Policymakers set monetary policy for attaining a stable economy with low inflation. In this dissertation, we analyze monetary policy under uncertainty and shocks in a small open economy. However, to understand the appropriate monetary policy applications, first the sources of the uncertainty and shocks and their effects on the economy should be clearly identified. The uncertainties that we analyzed are inflation uncertainty and exchange rate risk. These uncertainties can be controlled by the government with monetary policy. In other words, inflation uncertainty would be controlled with inflation and exchange rate risk would be controlled with central bank accounts. On the other hand, it is either not easy or not possible for the government to control the shocks, which are under consideration in this dissertation. To be more specific, we will analyze unexpected exchange rate shocks, parity and capital flights. In this respect, firstly, in Chapter 2, the relation between inflation and inflation uncertainty is elaborated on. In Chapter 3, the outcome of exchange rate risk on a small open economy is pointed out. In Chapter 4, we analyze the effect of the relative exchange rate of the developed countries on a small open economy's trade balance, empirically. In Chapter 5, the asymmetric effects of an unexpected exchange rate shock are discussed. Finally, in Chapter 6 we analyze the effects of

capital flows for the overall economy. All the empirical analyses in the dissertation are based on a case study on Turkey, except Chapter 2, which analyzes G-7 economies.

In Chapter 2, the relationship between inflation and inflation uncertainty is analyzed. This relationship is important for policymakers as the cost of inflation and inflation uncertainty on growth and welfare are significant. Although, this study is not the first one on this area, the contribution of this chapter is on the methodological side. We deal with the misspecification problems.

The relationship between a variable and its volatility and the nature of the correlation between them has been widely examined in the literature. The most common application in the literature is between inflation and inflation volatility. The modeling experience in the literature starts under the assumption of constant variance. In Engle (1982), the autoregressive conditional heteroscedasticity (ARCH) model allows the conditional variance to change over time as a function of past errors leaving the unconditional variance constant. The ARCH(p) specification he suggests is:

$$y_t = \beta \cdot x_t + \varepsilon_t \quad (\text{Eq. 1})$$

$$\varepsilon_t \approx N(0, h_t) \quad (\text{Eq. 2})$$

$$h_t^2 = \alpha_0 + \sum_{n=1}^p \alpha_n \cdot \varepsilon_{t-n}^2 \quad (\text{Eq. 3})$$

The ARCH method enhanced the literature so that time varying variance could be used. This measure is often used to measure the risk.

Bollerslev (1986) suggests a natural generalization of the ARCH process called generalized ARCH (GARCH) that allows for the past conditional variances in the current conditional variance equation. In other words, he modified Eq. 3 as:

$$h_t^2 = \alpha_0 + \sum_{n=1}^p \alpha_n \cdot \varepsilon_{t-n}^2 + \sum_{n=1}^q \beta_n \cdot h_{t-n}^2 \quad (\text{Eq. 3'})$$

Therefore, conditional variance could be modeled more parsimoniously rather than modeling conditional variance with long lag length ARCH process.

Engle, Lilien and Robins (1987) introduce the ARCH-M model, which extends the ARCH model to allow the conditional variance to affect the mean. In this way, they better specify the mean equation they obtain (constant unbiased estimates) and model the volatility more efficiently. The specification is as follows:

$$y_t = \beta \cdot x_t + \lambda \cdot h_t + \varepsilon_t \quad (\text{Eq. 1''})$$

$$\varepsilon_t \approx N(0, h_t^2) \quad (\text{Eq. 2''})$$

$$h_t^2 = \alpha_0 + \sum_{n=1}^p \alpha_n \cdot \varepsilon_{t-n}^2 + \sum_{n=1}^q \beta_n \cdot h_{t-n}^2 \quad (\text{Eq. 3''})$$

This method allows us to assess the relationship between risk and return. However, ARCH-M imposes the direction of the relation such that risk affects the return.

Understanding the direction of causation between a variable of interest and the volatility of the variable is important. If inflation causes inflation uncertainty, then a cold turkey type disinflation program should be implemented to stabilize the economy. However, if inflation uncertainty causes inflation, then a progressive policy should be used to stabilize the economy.

To understand the direction of the relation between inflation and its volatility, some have used a two-step procedure. They estimate the conditional variance of inflation by GARCH and Component-GARCH methods, then perform the Granger causality tests between these generated conditional variance measures and the inflation series (see, for example Grier and Perry, 1998). However, the two-step procedure has some drawbacks. If the inflation affects the inflation uncertainty, then the inflation variable should be included in the GARCH specification in the first step. Similarly, if the inflation uncertainty affects the inflation, then the inflation uncertainty measure must be present in the first step of the inflation specification. Thus, the inflation and inflation uncertainty specifications should be estimated jointly as a one step procedure rather than a two-step procedure.

In this chapter, we argue that more lags of inflation and inflation uncertainty should be included in each other's specifications. Failure to do this is likely to lead to biased estimates. The specification we used in the paper is as follows:

$$\pi_t = \beta_0 + \sum_{i=1}^n \beta_i \pi_{t-i} + \sum_{i=0}^{n-1} \delta_i \sigma_{\varepsilon_{t-i}}^2 + \varepsilon_t \quad (\text{Eq. 1p})$$

$$\sigma_{\varepsilon_t}^2 = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \alpha_2 \sigma_{\varepsilon_{t-1}}^2 + \sum_{i=1}^n \mu_i \pi_{t-i} \quad (\text{Eq. 2p})$$

The analyses of the causality between inflation and inflation uncertainty for the G-7 countries by addressing the misspecification problems elaborated on above suggests that inflation causes inflation uncertainty for all the G-7 countries. However, inflation uncertainty causes inflation for Canada, France, Japan, the UK and the US. Furthermore, we find that in four countries (Canada, France, the UK and

the US) increased uncertainty lowers inflation while in only one country (Japan) increased uncertainty raises inflation.

To sum up, the aim of Chapter 2 is to assess the causality between inflation and inflation uncertainty for the G-7 countries by addressing the misspecification problems. With the specification we suggest, the inflation and inflation uncertainty measures are likely to be persistent and highly correlated with each other.

In Chapter 3, we analyze the results of the exchange rate risk for the economic activity for a small open developing economy, theoretically and empirically. On the theoretical side, we develop a deterministic model for a developing economy, which takes all the relations of the economy into account. The reduced form model suggests that exchange rate risk decreases the growth of the economy, increases the prices and depreciates the exchange rate.

On the empirical side of Chapter 3, VAR methodology is used to assess the effect of exchange rate risk on the economy. The empirical model mimics the deterministic model, in other words the VAR is settled up following the reduced model. The results of the empirical analysis confirm the results of the theoretical model: the higher exchange rate risk is associated with a depreciation of the local currency, an increase in prices and a decrease in output.

In Chapter 3, our contribution on the exchange rate risk measurement constitutes importance. To measure the exchange rate risk, three measures were used from the central bank's (CB) balance sheet: the ratio of the total foreign exchange

liabilities to (1) the total reserves, (2) the CB's reserves and (3) the Turkish lira liabilities. This way of measuring has some advantages to other econometrically heavy measures. First, these variables directly measure the strength of the CB to stabilize the real exchange rate. Second, these variables are directly observable by the public; and third, they are not subject to specification tests like the one in econometric models.

To sum up, in Chapter 3, both the deterministic model and the empirical model based upon the deterministic model, for Turkey, suggest that exchange risk is detrimental for the economy. When there is exchange rate risk in the economy, the real exchange rate depreciates, prices increase and economic activity in the economy decreases.

In Chapter 4, another important issue for exchange rate policy choice is discussed. Exchange rate fluctuations would affect the aggregate demand components both from the demand and supply perspectives. However, for each of the aggregate demand components, it would be the case that demand and supply effects would be complex and the resultant effects of exchange rate fluctuations would be asymmetric. In this respect, we analyze the asymmetric effects of unanticipated exchange rate fluctuations on the components of GNP, prices, money supply and interest rates, for Turkey, by using three kinds of models-VAR, reduced model and structural form models, with two estimation techniques, least square (LS) and maximum likelihood (ML). The methodology used in Chapter 4 is a two-step procedure, which is common in the literature. The shocks are calculated as the residual of the well-defined exchange rate equation and then separated to its positive

and negative components. Then, positive and negative components of the unexpected shocks are included to the models and their effects are analyzed.

The results of the models suggest that when there is an unexpected shock to the exchange rate, whether it is unexpected appreciation or depreciation, the economy is adversely affected in Turkey. To be more precise, the LS estimations suggest that in the face of unanticipated currency depreciation private investment decreases, which results in output contraction; whereas in the face of unanticipated currency appreciation exports and prices decrease, while government investment increases. On the other hand, ML estimations show that in the face of currency depreciation private investment, exports, money supply and interest rates decrease whereas government investment increases. In the face of currency appreciation government consumption and government investment increase while exports, Treasury bond interest rate and prices decrease with ML estimates. Therefore, both in the face of unexpected currency appreciation and depreciation, the economy contracts indicating that policymakers should prevent the fluctuations in the exchange rate with the appropriate policies.

It is generally not the case that exports and imports of a country are to the same countries. Therefore, it is common in many countries that exports are denominated in one developed country's currency and imports are denominated in another developed country's currency. In this case, our conjecture is that, for a small open economy, if the currency denomination of trade is asymmetric, a change in the relative currency of developing countries, in other words a change in the parity of the developed countries' currencies, affects the trade balance.

In Chapter 5, we empirically analyze the effects of a change in the relative currency of two developed countries, in other words change in the USD-Euro parity, on the trade balance of a small open economy. Our case study country is Turkey, which is a small open economy that is a member of the European Customs Union with no restrictions on the trade of most of goods. About half of the exports of the country is to European Union countries and mostly in Euros and imports are denominated mostly in US dollars. Therefore, a change in USD-Euro parity has asymmetric effects on imports and exports in Turkey, meaning an influential effect on trade balance, which makes it interesting to examine Turkey's case. The methodology used for the empirical analysis is the VAR method that is identified by block exogeneity. The advantage of the block exogeneity identification is that parity, which is not affected by the Turkish economy, is determined only by its own lags and the other variables have no effect on the determination of parity with this identification, but the variables of the Turkish economy are explained by parity. An improvement in the USD-Euro parity improves the trade balance of the country (which is called Harberger-Laursen-Meltzler effect), appreciates the local currency and increases the relative income.

To sum up, Chapter 5 of the dissertation suggests that when designing a policy, a policymaker should concern the possible developments in the developed countries' currencies. Otherwise, while expecting an improvement in the competitiveness of the country, the result would be both a worsening in the trade balance and a decrease in the economic activity.

Chapter 6 deals with the macroeconomic consequences of capital flows. VAR methodology is built up in order to capture the effects of capital flows. The contribution of this chapter is that while other studies examine only one specific effect of capital flows, this chapter examines all, simultaneously. Moreover, this chapter covers 2000 and 2001 crises and presents extensive robustness tests. The empirical results suggest that an increase in capital flows contributes to economic growth, decreases prices and interest rates, causes real appreciation and increases money supply. Therefore, the results support the argument that capital outflows should be prevented.

Overall, this dissertation suggests that the policymakers should be concerned with the possible deviations in the economy when setting up their policies. The issues analyzed in this respect are the relation between inflation and inflation uncertainty, which has welfare consequences; the exchange rate risk, which is detrimental for the economy; the unexpected shock to the exchange rate, which is concluded as contractionary; the effects of the change in the parity, which can be treated as an exogenous shock on the trade balance, and the capital flows, which effects macroeconomic policy.

CHAPTER 2

INFLATION AND INFLATION UNCERTAINTY IN THE G-7 COUNTRIES

2.1. Introduction

The relationship between inflation and inflation uncertainty has always been of interest among economists. As the cost of inflation and inflation uncertainty on growth and welfare are significant, it is beneficial to determine the direction of the causality between the rate of inflation and uncertainty.

In his Nobel lecture, Friedman (1977) points out the potential of increased inflation to create nominal uncertainty, which lowers welfare and output growth. Ball (1992) formalizes and supports Friedman's hypothesis in a game theoretical framework. Hence, Friedman and Ball argue that high inflation creates higher inflation uncertainty. Cukierman and Meltzer (1986) and Cukierman (1992), on the other hand, argue that increases in inflation uncertainty raise the optimal inflation rate by increasing the incentive for the policy maker to create inflation surprises in a game theoretical framework. Hence, the causality runs from inflation uncertainty to inflation.

On the empirical side of the inflation uncertainty literature, Baillie, Chung and Tieslau (1996) consider the application of long-memory processes to the description of inflation for ten countries using the ARFIMA (Auto-Regressive Fractionally Integrated Moving Average) and GARCH (Generalized Auto-Regressive Conditional Heteroskedasticity) processes. For three high inflation countries, they find that inflation and the volatility of inflation interact in a way that is consistent with the Friedman hypothesis. Grier and Perry (1996) analyze the real effect of inflation on the dispersion of real prices in the economy, while Grier and Perry (1998) perform the Granger method to test the direction between average inflation and uncertainty. On the other hand, Grier and Perry (2000) test four hypotheses about the effects of real and nominal uncertainty on the inflation and output growth in the United States, while Kntonikas (2002) examine the relationship between inflation and inflation uncertainty using British data. However, the results are mixed at best.

While the empirical studies discussed above use the GARCH type of specifications as their common method to assess the relationship between inflation and inflation uncertainty, some studies make use of a two-step procedure. For example, Grier and Perry (1998) estimate the conditional variance of inflation by GARCH and Component-GARCH methods, then perform the Granger causality tests between these generated conditional variance measures and the inflation series. However, Pagan (1984) criticizes this two-step procedure for its misspecifications due to the use of generated variables from the first stage as regressors in the second stage. Pagan and Ullah (1988) suggest using the Full Information Maximum Likelihood (FIML) method to address these issues. If the rate of inflation affects

inflation uncertainty, then the inflation variable should be included in the GARCH specification in the first step. Similarly, if the inflation uncertainty affects rate of the inflation, then the inflation uncertainty measure must be present in the first step of the inflation specification. Thus, the rate of inflation and inflation uncertainty specifications should be estimated jointly as a one step procedure rather than a two-step procedure. Other studies, like Baillie, Chung and Tieslau (1996) and Kontonikas (2002), address these issues. However, they include just one lag of the inflation variable in the GARCH specification and the current value of the conditional variance in the inflation specifications. These inflation and inflation uncertainty measures will probably be persistent and highly correlated with each other. Thus, further lags of inflation and inflation uncertainty should be included in each other's specifications. Failure to do this is likely to lead to biased estimates.

The aim of this paper is to assess the causality between inflation and inflation uncertainty for the G-7 countries by addressing the misspecification problems discussed above. The estimates we gather with the modified specifications suggest that the rate of inflation causes inflation uncertainty for all the G-7 countries. However, inflation uncertainty causes inflation only for Canada, France, Japan, the UK and the US. Furthermore, we find that in four countries (Canada, France, the UK and the US) increased uncertainty lowers inflation while in only one country (Japan) increased uncertainty raises inflation.

The paper proceeds as follows: Section 2.2 presents the general method that is used in previous empirical studies to analyze the relationship between inflation and inflation uncertainty. Section 2.3 introduces a specification that overcomes the

problems of the previous studies. In section 2.4, the estimates are discussed and the conclusions are given in Section 2.5.

2.2. The General Method

The Generalized Autoregressive Conditional Heteroskedasticity (GARCH) specification, which is generally used for inflation and time-varying residual variance as a measure of inflation uncertainty, is as follows:

$$\pi_t = \beta_0 + \sum_{i=1}^n \beta_i \pi_{t-i} + \varepsilon_t \quad (\text{Eq 2.1})$$

$$\sigma_{\varepsilon_t}^2 = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \alpha_2 \sigma_{\varepsilon_{t-1}}^2 \quad (\text{Eq 2.2})$$

where π_t is the rate of inflation, ε_t is the residual of Equation (2.1), $\sigma_{\varepsilon_t}^2$ is the conditional variance of the residual term taken as inflation uncertainty at time t, and n is the lag length. Equation (2.1) is an autoregressive representation of inflation. Equation (2.2) is a GARCH (1,1) representation of the conditional variance (Grier and Perry, 1996; 1998; 2000).

If the rate of inflation affects inflation uncertainty and inflation uncertainty affects the rate of inflation then the inflation and inflation uncertainty measures should appear in the inflation uncertainty and inflation specifications, respectively. Thus, an alternative specification that is generally used is the Component GARCH model (Grier and Perry, 1998; and Kontonikas, 2002):¹

¹ The GARCH-in-Means specification allows for inflation uncertainty to affect the inflation rate. The extension of the specification is elaborated on later in the text.

$$\pi_t = \beta_0 + \sum_{i=1}^n \beta_i \pi_{t-i} + \gamma \sigma_{\varepsilon_t}^2 + \varepsilon_t \quad (\text{Eq. 2.3})$$

$$\sigma_{\varepsilon_t}^2 = q_1 + \alpha_1 (\varepsilon_{t-1}^2 - q_{t-1}) + \alpha_2 (\sigma_{\varepsilon_{t-1}}^2 - q_{t-1}) + \lambda \pi_{t-1} \quad (\text{Eq. 2.4})$$

where

$$q_t = \alpha_0 + \rho q_{t-1} + \alpha_3 (\varepsilon_{t-1}^2 - \sigma_{\varepsilon_{t-1}}^2) \quad (\text{Eq. 2.5})$$

However, assuming that just the current value of uncertainty measure affects the level of inflation and just the first lagged value of inflation affects the inflation uncertainty measure might be too restrictive. Both of these series are persistent and highly correlated. Therefore, excluding further lags would lead to biased estimated parameters.

2.3. The Full Information Maximum Likelihood Specification with Extended Lags

In the analysis of this section, we include further lags of inflation and inflation uncertainty in the inflation uncertainty and inflation specifications respectively. When we test the joint significance of these lags, following Baillie, Chung and Tieslau (1996), we will refer to them as Granger causality tests. To be specific, we estimate Equations (2.1') and (2.2')² to see whether all δ 's are jointly

² We include not only the lag values of inflation uncertainty but the current value of the uncertainty measure in the inflation equation. The reason for this is that the contemporaneous value of the

statistically significant (to test if inflation uncertainty Granger causes inflation) and all μ 's are jointly statistically significant (to test if inflation Granger causes inflation uncertainty).

$$\pi_t = \beta_0 + \sum_{i=1}^n \beta_i \pi_{t-i} + \sum_{i=0}^{n-1} \delta_i \sigma_{\varepsilon_{t-i}}^2 + \varepsilon_t \quad (\text{Eq. 2.1'})$$

$$\sigma_{\varepsilon_t}^2 = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \alpha_2 \sigma_{\varepsilon_{t-1}}^2 + \sum_{i=1}^n \mu_i \pi_{t-i} \quad (\text{Eq. 2.2'})$$

In order to assess the Granger causality test within the Component GARCH specification, we estimate the following equations:

$$\pi_t = \beta_0 + \sum_{i=1}^n \beta_i \pi_{t-i} + \sum_{i=0}^{n-1} \gamma_i \sigma_{\varepsilon_{t-i}}^2 \quad (\text{Eq. 2.3'})$$

$$\sigma_{\varepsilon_t}^2 = q_1 + \alpha_1 (\varepsilon_{t-1}^2 - q_{t-1}) + \alpha_2 (\sigma_{\varepsilon_{t-1}}^2 - q_{t-1}) + \sum_{i=1}^n \lambda_i \pi_{t-i} \quad (\text{Eq. 2.4'})$$

Moreover, following Pagan and Ullah (1988), we estimate Equations (2.1') and (2.2') jointly and equations (2.3'), (2.4') and (2.5) jointly using the Full Information Maximum Likelihood Method and considering various lag value, n.

2.4. Estimates

In our estimates, we used the monthly consumer price index inflation taken from the International Monetary Fund-International Financial Statistic tape for the

conditional variance is the deterministic function of squared lag values of residuals and conditional variances; hence, the contemporaneous value of the conditional variance is exogenous.

January 1957-December 2001 period. We report the test statistics of the Granger causality tests for Canada, France, Germany, Italy, Japan, the UK and the US in Table 1. In the first column, we test the null hypothesis that inflation does not Granger-cause inflation uncertainty, whereas the second column represents the results of the analysis with the null hypothesis that inflation uncertainty does not Granger-cause inflation. Then we give the results of the two methods used to test the null hypotheses separately for the G-7 countries: GARCH (1,1) and Component GARCH (1,1). For each country, we applied the tests for 4, 8 and 12 lags. The results are given for each country in the rows. The signs in parentheses next to the F-statistics indicate the direction of effects in the causality tests.

Table 1 suggests overall that the rate of inflation Granger-causes inflation uncertainty for all the G-7 countries. However, inflation uncertainty Granger causes inflation for Canada, France, Japan, the UK and the US. Furthermore, we find that in four countries (Canada, France, the UK and the US) increased uncertainty lowers inflation while in only one country (Japan) increased uncertainty raises inflation (Table 1).³

³ In order to make the VAR specification symmetric, we first increase the lag order in the GARCH and Component of GARCH specifications to (4,1), (8,1) and (12,1). Then we increase the lag orders of the inflation variable in the inflation equation (n in equations (1'), (2'), (3') and (4')). The results were found to be robust.

**Table 1. Granger Causality Tests between Inflation and Inflation Uncertainty
after the Specification Issue are Addressed**

	H ₀ : Inflation does not Granger-cause inflation uncertainty		H ₀ : Inflation uncertainty does not Granger-cause inflation	
	GARCH(1,1)	Component	GARCH(1,1)	Component
(A) Canada				
Four Lags	13.12**(+)	15.64***(+)	5.01	7.47
Eight Lags	30.87***(+)	30.82***(+)	17.38**(-)	17.33**(-)
Twelve Lags	38.49***(+)	32.30***(+)	50.04***(-)	28.48***(-)
(B) France				
Four Lags	14.41***(-)	32.41***(-)	16.33***(-)	46.21***(-)
Eight Lags	29.66***(+)	34.31***(+)	22.09***(-)	27.94***(-)
Twelve Lags	68.80***(+)	68.19***(+)	40.70***(-)	25.29**(-)
(C) Germany				
Four Lags	8.87	12.84***(-)	6.56	1.86
Eight Lags	28.44***(-)	27.82***(-)	12.28	11.70
Twelve Lags	42.79***(+)	38.90***(+)	11.18	13.69
(D) Italy				
Four Lags	15.04***(-)	182.21*** (-)	3.87	4.00
Eight Lags	18.61**(+)	21.34**(+)	9.71	12.44
Twelve Lags	32.71***(+)	19.12	16.48	27.91***(+)
(E) Japan				
Four Lags	39.98***(+)	39.64***(+)	25.92***(+)	25.58***(+)
Eight Lags	76.71***(+)	73.34***(+)	30.61***(+)	35.30***(+)
Twelve Lags	51.01***(+)	50.34***(+)	9.97	12.77
(F) The UK				
Four Lags	24.19***(+)	34.65***(+)	6.47	12.83**(-)
Eight Lags	58.42***(+)	53.54***(+)	29.85***(-)	0.04
Twelve Lags	91.04***(+)	60.57***(+)	63.12***(-)	29.91***(-)
(G) The US				
Four Lags	13.40***(+)	58.26***(+)	4.82	5.86
Eight Lags	44.25***(+)	44.67***(+)	20.29***(-)	17.46**(-)
Twelve Lags	33.24***(+)	34.26***(+)	23.78**(-)	22.59**(-)

Note: ***, ** and * indicate significance at the 0.01, 0.05 and 0.10 levels, respectively. A (+) indicates that the sum of the coefficients are positive and significant. A (-) indicates that the sum of the coefficients are negative and significant.

In sum, our results support the Friedman-Ball hypothesis that inflation increases the inflation uncertainty for all the G-7 countries and the empirical studies on this subject (Baillie, Chung and Tieslau, 1996; Grier and Perry, 1998; Kontonikas, 2002; Fountas, Karanasos and Karanassou, 2000). On the other hand, we find a negative causality from inflation uncertainty to inflation for four countries. These results are similar to the empirical evidence of Grier and Perry (1998) and Holland (1995) for the US and reject the hypothesis of Cukierman and Meltzer (1986). The intuition behind this result is that increased inflation has real costs through its impact on uncertainty. When uncertainty is high, the central bank is able to reduce these real costs at the margin by reducing inflation. These last two studies, Grier and Perry (1998) and Holland (1995), explain the institutional reasons why inflation responds to increased uncertainty across countries due to central bank independence.⁴ These studies claim that countries with more independent central banks realize a negative causality from inflation uncertainty to inflation. Our results suggest that the only country supporting Cukierman and Meltzer's view is Japan.

We also repeated the analysis of Grier and Perry's (1998) two-step estimates for the sake of completeness. The estimates are reported in Table 2. Here the lag lengths are taken as 4, 8 and 12, instead of including the first lag only. A comparison of the two tables suggests that inflation Granger-causes inflation uncertainty for most of the countries in both specifications. In Table 1, inflation uncertainty Granger causes inflation for Canada, France, Japan, the UK and the US whereas in Table 2 this relationship is valid for France, Germany, Japan and the UK. Furthermore, Table

⁴ In Jiang 2004, measures of inflation uncertainty are not correlated with measures of central bank independence. Therefore, the reason behind the differing results on the causality between inflation uncertainty and inflation across countries, which is the result of this chapter, would be a further research topic.

Table 2. Granger Causality Tests between Inflation and Inflation Uncertainty as used in Grier and Perry (1998)

	H ₀ : Inflation does not Granger-cause inflation uncertainty		H ₀ : Inflation uncertainty does not Granger-cause inflation	
	GARCH(1,1)	Component	GARCH(1,1)	Component
(A) Canada				
Four Lags	9.58***(+)	16.91***(+)	1.02	1.08
Eight Lags	6.09***(+)	9.75***(+)	1.69	0.82
Twelve Lags	4.57***(+)	7.10***(+)	1.72	1.68
(B) France				
Four Lags	3.40***(+)	25.69***(+)	4.28***(+)	4.86***(+)
Eight Lags	3.43***(+)	14.32***(+)	2.39**(+)	1.99**(+)
Twelve Lags	3.87***(+)	12.68***(+)	2.95***(-)	2.38***(+)
(C) Germany				
Four Lags	1.75	1.71	2.42**(+)	1.66
Eight Lags	1.20	3.04***(+)	3.14***(+)	3.37***(+)
Twelve Lags	0.90	2.18**(-)	3.01***(+)	3.04***(+)
(D) Italy				
Four Lags	34.07***(+)	29.97***(+)	3.99***(+)	1.72
Eight Lags	19.68***(+)	15.59***(+)	1.44	1.35
Twelve Lags	14.61***(+)	11.95***(+)	0.87	0.91
(E) Japan				
Four Lags	40.72***(+)	171.16***(+)	13.14***(+)	17.68***(+)
Eight Lags	21.92***(+)	88.82***(+)	4.47***(+)	4.59***(+)
Twelve Lags	15.23***(+)	59.64***(+)	3.27***(+)	3.33***(+)
(F) The UK				
Four Lags	83.29***(+)	76.88***(+)	4.51***(+)	6.90***(+)
Eight Lags	48.52***(+)	38.04***(+)	2.33**(+)	1.89
Twelve Lags	31.92***(+)	27.67***(+)	2.14**(+)	3.47***(-)
(G) The US				
Four Lags	10.61***(+)	15.49***(+)	2.45**(+)	1.95
Eight Lags	5.83***(+)	7.55***(+)	1.25	0.91
Twelve Lags	4.00***(+)	5.16***(+)	1.18	0.73

Note: ***, ** and * indicate significance at the 0.01, 0.05 and 0.10 levels, respectively. A (+) indicates that the sum of the coefficients is positive and significant. A (-) indicates that the sum of the coefficients is negative and significant.

2 suggests that in Germany, the US, France and Japan increased uncertainty raises inflation. In contrast, Table 1 illustrates that for Canada, France, the UK and the US increased uncertainty lowers inflation while in Japan increased uncertainty raises inflation. Thus, our results suggest a further relationship between inflation and inflation uncertainty that Grier and Perry (1998) could not find.

Table 3 reports the causality tests with one lag as reported in Baillie et al (1996) and Kontanikas (2002) did. The Granger causality of inflation to inflation uncertainty cannot be observed for Canada, France, Germany and Italy (as observed in Table 1 with extended lags). Moreover, the empirical evidence on the Granger causality from inflation uncertainty to inflation is weaker for some of the countries and cannot even be observed for the US. Thus, increasing the lag length alters the conclusion gathered from the causality tests performed in the literature on the inflation-inflation uncertainty relationship.

Table 3. Granger Causality Tests between Inflation and Inflation Uncertainty after the Specification Issues are Addressed with 1 lag

	H ₀ : Inflation does not Granger-cause inflation uncertainty		H ₀ : Inflation uncertainty does not Granger-cause inflation	
	GARCH(1,1)	Component	GARCH(1,1)	Component
(A) Canada	1.90	1.54	7.58***(-)	0.44
(B) France	0.49	1.32	2.31	6.90***(-)
(C) Germany	0.26	1.39	0.72	0.01
(D) Italy	0.20	2.46	2.56	2.72*(-)
(E) Japan	13.26***(+)	10.21***(+)	8.41***(+)	31.81***(+)
(F) UK	2.10	26.94***(+)	0.03	22.89*** (+)
(G) US	12.26***(+)	3.50*(+)	0.92	1.30

Note: ***, ** and * indicate significance at the 0.01, 0.05 and 0.10 levels, respectively. A (+) indicates that the sum of the coefficients are positive and significant. A (-) indicates that the sum of the coefficients are negative and significant.

2.5. Conclusion

The literature on the causality between inflation and inflation uncertainty either applied as a two-step procedure, which uses generated variables as regressors, or made the lag length too narrow to assess this relationship. Both of these issues lead to biased parameter estimates. This paper uses the Full Information Maximum Likelihood method with extended lags to overcome these problems. The estimates we gathered with the new set of specifications suggest that inflation Granger-causes inflation uncertainty for all the G-7 countries, supporting the Friedman-Ball hypothesis. However, inflation uncertainty Granger causes inflation for Canada, France, Japan, the UK and the US. Furthermore, we find that in four countries (Canada, France, the UK and the US) increased uncertainty lowers inflation while in only one country (Japan) increased uncertainty raises inflation.

CHAPTER 3

THE EFFECTS OF EXCHANGE RATE RISK ON ECONOMIC PERFORMANCE: THE TURKISH EXPERIENCE

3.1. Introduction

The main objective of policymakers is to lead their economies to a stable growth path. In order to avoid fluctuations in the overall economy, it is important to align various policy variables to stabilize the economy and exchange rate is a useful policy tool in this respect, as it is effective on both external and internal balance. So, how the policymakers should implement the exchange rate policy becomes a hot topic. In other words the choice between fixed exchange rate regime and flexible exchange rate regime is an open question. The answer to this question would be easily given as flexible exchange rate regime, if exchange rate risk that arises with this regime is proved to be not harmful for the economy. Therefore, we should analyze whether exchange rate risk has a significant influence on the economic performance or not to understand the consequences of the flexible exchange rate regime. The aim of this paper is to find out the effects of the exchange rate risk on macroeconomic variables both theoretically and empirically. The results of our models suggest that the exchange rate risk decreases output, increases inflation and causes depreciation for Turkey during the 1987:02- 2002:09 period.

Although there are various studies that analyze the influences of exchange rate risk on the economy, these studies restrict themselves to partial analysis. They suggest negative effects of exchange rate volatility on investment, capital flows and trade, and positive effects on interest rates, inflation and exchange rates, individually. However, to the best of our knowledge this is the first study that attempts to combine the literature on exchange rate risk, and derive the macroeconomic consequences of exchange rate risk. We derive a theoretical model that is based on Kamin and Rogers (2000). The distinguishing feature of Kamin and Rogers (2000) model is that it incorporates all the macroeconomic relations of a developing economy. We then extend this model by including exchange rate risk, concerning the previous studies.

The effects of exchange rate volatility on growth and investment are discussed together in the literature. Corbo (1995) estimates separate growth and investment equations and he distinguishes two mechanisms through which uncertainty could affect long-term growth: its effect on the rate of investment and the overall level of efficiency or total factor productivity. Using the standard deviation of the real exchange rate, he estimated a 'new growth theory' type of growth model, in which a country's growth performance is associated with the initial productivity gap with an industrial country, the rate of investment, initial human capital levels, economic policies and uncertainty. Similarly, investment to GDP ratio is modeled as the theory suggests. The methodology is a pooled regression that uses random effects for a broad range of countries. His results suggest that real exchange rate uncertainty has a negative effect on growth and investment. Aizenman and Marion (1996) find significant negative effects of real exchange rate volatility on investment and growth using standard deviation of real exchange rate in a cross country regression analysis

that covers a broad range of control variables. Another study examining the effects of real exchange volatility on investment and growth is Bleaney and Greenaway (2000). They estimate a pooled regression for 14 sub-Saharan African countries over 1980-1995. Their results suggest that the effect of exchange rate volatility, which is measured by a GARCH (1,1) process, is negative for investment but not significant for growth. These studies analyze the influences of exchange rate risk on growth performance of the economy, however, all of them are based on a single growth equation incorporating the total factor productivity framework, which is a long-run concept, or an investment equation. However, there are many transmission mechanisms that output would be affected from exchange rate risk that will be discussed in details below. Our aim in this study is to analyze the effect of exchange rate risk on economic performance by incorporating all the transmission mechanisms discussed in the literature.

In this paper, we use central bank balance sheet indicators as a measure of exchange rate risk. When the central bank is exposed with exchange rate volatility and public's perception, the central bank's behavior and response is the reason for the choice. The central bank considers the real exchange variability a threat to the stability of financial markets due to high dollarization and the vulnerability of the Turkish economy to current account crises (see, Berument, 2003). However, even if the CB fully intends to stabilize the real exchange rate, the CB does not have complete control over the foreign exchange market. The CB has a limited set of tools. Stabilizing the foreign exchange market is costly. Maintaining a strong balance sheet helps in the stabilization effort. The stronger its balance sheet is, the stronger the policy implementation will be. Even if the CBRT does not take any action to

stabilize the real exchange rate when it has a strong balance sheet, speculation or volatility will be lower since the speculators know that the CB has a set of financial tools available for intervening in markets. Thus, we used the CB's Total Foreign Exchange (FX) liabilities as an indicator of exchange rate risk. The higher the CB's FX liabilities, the less power the CB has to stabilize the exchange rate and the higher the exchange rate risk will be. Even if the speculators are not active, the public will observe the CB's balance sheet and realize that if there is a shock to FX markets CB will be less willing to intervene in FX markets and currency will be more volatile.

Next, using our theoretical model and the exchange rate risk measure we suggest, we estimate a VAR model to empirically analyze the effects of exchange rate risk on the economic performance for Turkish data. The major advantage of using VAR approach in this study is that VAR does not impose exogeneity on the variables in the system (as Cote (1994) also suggests) and we can exploit the dynamic relationships between the variables.

This study focuses on Turkey, which is a developing-small-open economy that is not under heavy government regulation. Therefore, it is possible to observe the effects of the financial markets on the real sector. Turkey has also suffered from high and persistent inflation without running hyperinflation, along with volatile growth pattern for almost three decades. This provides a unique environment for observing the interrelationships among certain macroeconomic variables. This high inflation plays a magnifying role and allows us to avoid making a *type 2 error* – not rejecting the null hypothesis even if the null is false.

To summarize, this paper assesses the effect of exchange rate risk for a small open developing economy, Turkey, within a theoretical framework. To assess the effects of exchange rate risk on the economic performance, most of the literature concentrates on the commitment of fixed exchange rate regime as a proxy for exchange rate risk (see, for example, Agénor and Montiel, 1999; Chapter 7). However, under the influence of the Central Bank of Republic of Turkey (CBRT), the value of the Turkish lira against major currencies is aligned daily, thus the real exchange rate is aligned continuously. To measure the exchange rate risk, three measures were used from the CBRT's balance sheet: the ratio of the total foreign exchange liabilities to (1) the total reserves, (2) the CBRT's reserves and, (3) the Turkish lira liabilities. This way of measuring has some advantages to other econometrically heavy measures. First, these variables directly measure the strength of the CBRT to stabilize the real exchange rate. Second these variables are directly observable by the public, and third, they are not subject to specification tests like the one in econometric models. The empirical evidence provided in this paper is parallel to the economic priors as outlined in the theoretical model. Higher exchange rate risk is associated with a depreciation of the local currency, an increase in prices and a decrease in output. Furthermore, we present several robustness tests. Our results are similar when we utilize the commonly used volatility measure.

Section 3.2 presents the theoretical model and the related literature. Section 3.3 discusses the various exchange rate measurement techniques and the one used in this chapter. Section 3.4 introduces the data, section 3.5 summarizes the estimates and finally section 3.6 concludes.

3.2. The Theoretical Model

Total gross domestic product (GDP), Y , is divided into two components; domestic demand, DD and net exports, NX in Eq (3.1):

$$Y = DD + NX \quad (\text{Eq. 3.1})$$

The effect of exchange rate volatility on international trade is discussed in the literature in connection to the choice of exchange rate regimes. Proponents of fixed exchange rates argue that the negative effects of volatility on exports are significant, whereas opponents suggest the opposite effects are not significant. Cote (1994), which is a survey study, analyzes the exchange rate volatility and trade literature extensively. He suggests that exchange rate volatility can affect trade directly, through uncertainty and adjustment costs, and indirectly, through its effect on the structure of output and investment and on government policy and he states that the literature is based on a partial equilibrium approach that precludes inferences about welfare. Cote first summarizes the theoretical models on this area. An early example he provides is Clark (1973), who models the negative effect of exchange rate volatility on the firms' export decision. Baron (1976) and Hooper and Kolhagen (1978) are theoretical studies similar to Clark (1973) in methodology and results but with different assumptions. On the other hand, De Grauwe (1988) derives another model with relaxing the previous models' assumptions and concludes that the effect of uncertainty on exports needs not be negative. There are other studies suggesting the same conclusion, Gros (1987) and Franke (1991). Cote (1994) indicates after reviewing the theoretical literature that microeconomic theory does not allow one to

draw any firm conclusion on the consequences of exchange rate volatility for international trade and the effect depends very much on the structure of the firm. Next, he reviews the empirical literature on the area. As there are various studies on this area, it is more meaningful to state the conclusion of Cote (1994), which analyzes all of the studies. He suggests that the evidence on the effect of exchange rate volatility is mixed and it is difficult to compare the results of the different studies since the sample period, countries and the measure of the risk vary widely. However, a large number of studies favor that exchange rate uncertainty decreases the level of trade (De Grauwe and Verfaillie 1988, Koray and Latrapes 1989, Peree and Steinherr 1989, Binismaghi 1991 and Savvides 1992).

There are also recent studies analyzing the effects of volatility on trade. Daly (1999) uses an eight-country dataset for the period 1978-1992 and estimates models of bilateral trade flows in which the null-hypothesis of zero exchange rate volatility effect was tested against the alternative hypothesis of non-zero volatility effect. His results suggest that the effect is not significant. Siregar and Rajan (2002) study the effects of exchange rate variability using standard deviation and GARCH estimation of exchange rate on Indonesia's export demand. Their results indicate that exchange rate volatility adversely affected export performance of Indonesia during the pre-crises period. Tenreyro (2003) uses the standard deviation of exchange rate as a measure for uncertainty. His findings suggest that exchange rate volatility does not affect trade much for a broad sample of countries from 1970 to 1997 via OLS estimation based on log-linearized form of the gravity equation. Frey (2003) finds that the coefficients of the exchange rate uncertainty, which is the conditional variance of the nominal-effective exchange rate (GARCH estimation), are

significantly negative for three out of five countries. Das (2003) provides an empirical investigation of the relationship between the volatility of exchange rates and the level of international trade for a group of developing countries that exhibit structural break in their exchange rate series. His results show that uncertainty that is measured as the moving sample standard deviation exerts a significant negative effect on export demand for the four developing countries under concern with the pooled regression techniques. Although there is no consensus on the effects of exchange rate volatility on exports, in this study we assume that it is negative considering that a large number of these studies suggest this result.

In Eq (3.2), net exports are related positively to the real exchange rate, RER (defined so that an increase indicates depreciation), negatively to output, Y and real exchange rate risk, σ :

$$NX = a_{21}RER - a_{22}Y - a_{23}\sigma \quad (\text{Eq 3.2})$$

There is a long list in the literature explaining the variables that affect the domestic demand in Eq (3.3): real interest rate r , fiscal deficit FISCDEF, the stock of real bank credit RCREDIT, the nominal interest rate i , the inflation rate Π , the real exchange rate RER and the real wage RW. As the real exchange rate affects net exports positively, additional effects on aggregate demand are assumed to be negative:

$$DD = -a_{31}r + a_{32}FISCDEF + a_{33}RCREDIT - a_{34}i - a_{35}\Pi - a_{36}RER + a_{37}RW \quad (\text{Eq 3.3})$$

In Eq (3.4) the supply of bank credit is explained by the bank's main sources of funds, real domestic money, RM, and borrowing from abroad proxied by capital flows KA:

$$\text{RCREDIT} = a_{41}\text{RM} + a_{42}\text{KA} \quad (\text{Eq 3.4})$$

The standard money demand equation is given in Equation (3.5):

$$\text{RM} = a_{51}Y - a_{52}i - a_{53}\sigma \quad (\text{Eq 3.5})$$

There is only one study, Berument and Gunay (2003) examining the effect of exchange rate risk on interest rates. Their study uses the monthly Turkish data for 1986-2001 period and they analyze the relation within the uncovered interest rate parity condition. Using the conditional variance of the exchange rate as a measure for the exchange rate risk, they conclude that there is a positive relation between the exchange rate risk and interest rates. That is because the exchange rate fluctuations introduce a risk on a return of an asset in foreign currency and foreign investors want to be compensated with higher risk premium. Therefore, referring to Berument and Gunay (2003), we assume that interest rates increase with increasing exchange rate variability, in this study.

The central bank's reaction function for the nominal interest rate includes inflation Π , output Y , capital flows KA , and real exchange rate risk σ .

$$i = a_{61}\Pi + a_{62}Y - a_{63}\text{KA} + a_{64}\sigma \quad (\text{Eq 3.6})$$

Eq (3.7) presents the CPI inflation rate as in Kamin (1996). It is determined by inflation Π , output Y and the rate of nominal exchange rate E' .

$$\Pi = a_{71}RER + a_{72}Y + a_{73}E' \quad (\text{Eq 3.7})$$

Another effect of exchange rate volatility is introduced to be on capital flows in the literature. Cushman (1988) suggests that exchange rate volatility discourage foreign direct investment on a risk averse firm setting. Goldberg and Kolstad (1995) examine the relation between exchange rate volatility and foreign direct investment within a theoretical framework and conclude that exchange rate variability increase the share of production activity that is located offshore. Moreover, their empirical findings for UK, US, Canada and Japan, support the main theoretical results. Russ (2003) theoretically explains the negative effects of exchange rate variability on foreign direct investment and supports the idea that firms expand their overseas production in the face of exchange rate uncertainty. The empirical studies point to a negative influence of exchange rate volatility on FDI (Campa, 1993 on FDI in the US and Benassy-Quere et al. 2001 on FDI in emerging countries). So, in our model, we also take the effect of exchange rate volatility on capital flows as negative.

Eq (3.8) is the interest parity condition. Net capital flows KA is determined by nominal interest rate i , the rate of nominal exchange rate E' , US interest rate i^{US} and the real exchange rate risk σ .

$$KA = a_{81}i - a_{82}E' - a_{83}i^{US} - a_{84}\sigma \quad (\text{Eq 3.8})$$

In the equilibrium real exchange rate determination literature, exchange rate volatility positively affects exchange rates. The idea is theoretically introduced in Obsfeld and Rogoff (1998). They suggest that the level risk premium in the exchange rate is potentially quite large and may be an important missing fundamental in

empirical exchange rate equations. Gonzaga and Terra (1997) and Chou and Chao (2001) empirically support the theory that exchange rate risk positively affects exchange rates. In our model, this theory is taken into account.

In Eq (3.9), exchange rate depreciation is a function of domestic inflation Π , foreign inflation Π^{US} , real exchange rate RER and the real exchange rate risk σ .

$$E' = a_{91}\Pi - a_{92}\Pi^{US} + a_{93}RER + a_{95}\sigma \quad (\text{Eq 3.9})$$

In Eq. (3.10), the real exchange rate is determined by the balance of payment pressures and the real exchange rate risk.

$$RER = -a_{101}NX - a_{102}KA + a_{103}\sigma \quad (\text{Eq 3.10})$$

The non-interest fiscal deficit FISCDEF declines in response to increases in output Y, reflecting higher tax revenues. Increases in net capital inflows KA are assumed to raise the fiscal deficit because they allow the government both to borrow more abroad and to pursue less austere policies. Higher inflation Π prompts the government to tighten fiscal policies.

$$FISCDEF = -a_{111}Y + a_{112}KA - a_{113}\Pi \quad (\text{Eq 3.11})$$

The real wages RW depends positively on output Y but negatively on inflation Π following the contractionary devaluation hypothesis.

$$RW = a_{121}Y - a_{122}\Pi \quad (\text{Eq 3.12})$$

To summarize there are various studies analyzing the influences of exchange rate risk on the economy, however in all these studies only one aspect is considered.

Our contribution to the literature is that we combine all the literature and we analyze the effects of exchange rate risk on the economy by considering all the transmission mechanisms within a theoretical model. In our model, trade and capital flows are negatively affected from exchange rate risk while interest rate and exchange rate increases with the uncertainty.

Next, by substituting the endogenous variables, we reduce the model.

(1) We substitute Eq (3.9) to Eq (3.7):

$$\Pi = a_{71}RER + a_{72}Y + a_{73}(a_{91}\Pi - a_{92}\Pi^{US} + a_{93}RER + a_{94}\sigma)$$

Rewriting this we get:

$$(1 - a_{73}a_{91})\Pi = (a_{71} + a_{73}a_{93})RER + a_{72}Y - a_{73}a_{92}\Pi^{US} + a_{73}a_{94}\sigma$$

or

$$\Pi = a_{11}RER - a_{12}Y - a_{13}\Pi^{US} + a_{14}\sigma \quad (\text{Eq 3.1'})$$

(2) We combine Eq (3.8), Eq (3.9) and Eq (3.6):

$$KA = a_{81}(a_{61}\Pi + a_{62}Y - a_{63}KA + a_{64}\sigma) - a_{82}(a_{91}\Pi - a_{92}\Pi^{US} + a_{93}RER + a_{94}\sigma) - a_{83}\Pi^{US} - a_{84}\sigma$$

Substituting this equation into Eq (3.10):

$$RER = -a_{101}(a_{21}RER - a_{22}Y - a_{23}\sigma) - [a_{102}/(1 + a_{81}a_{63})] * [(a_{81}a_{61} - a_{82}a_{91}\Pi) + a_{81}a_{62}Y + a_{82}a_{92}\Pi^{US} - a_{82}a_{93}RER - a_{83}\Pi^{US} + (a_{81}a_{64} - a_{82}a_{94} - a_{84})\sigma]$$

This equation can be restated as:

$$\begin{aligned}
RER = & \left[\frac{1}{1 + a_{101}a_{21} + \frac{a_{102}a_{82}a_{93}}{1 + a_{81}a_{63}}} \right] * \left\{ a_{101}a_{22} - \frac{a_{102}a_{81}a_{62}}{1 + a_{81}a_{63}} \right\} * Y - \\
& \frac{a_{102}(a_{81}a_{61} - a_{82}a_{91})}{1 + a_{81}a_{63}} * \Pi + \frac{a_{102}a_{83}}{1 + a_{81}a_{63}} * i^{US} - \frac{a_{102}a_{82}a_{92}}{1 + a_{81}a_{63}} * \Pi^{US} \\
& + \frac{a_{101}a_{23} - a_{102}(a_{81}a_{64} - a_{82}a_{94} - a_{84})}{1 + a_{81}a_{63}} \sigma
\end{aligned}$$

or

$$RER = a_{21}Y - a_{22}\Pi - a_{23}i^{US} - a_{24}\Pi^{US} - a_{25}\sigma \quad (\text{Eq 3.2'})$$

(3) We insert Eq (3.4), Eq (3.5), Eq (3.8), Eq (3.9), Eq (3.11), Eq (3.12) into Eq (3.3).

$$\begin{aligned}
DD = & -a_{31}r + a_{32}[-a_{111}Y + a_{112}\{a_{81}i - a_{82}(a_{91}\Pi - a_{92}\Pi^{US} + a_{93}RER + a_{94}\sigma) - \\
& a_{83}i^{US} - a_{84}\sigma\} - a_{113}\Pi] + a_{33}[a_{41}\{a_{51}Y - a_{52}i - a_{53}\sigma\} + a_{42}(a_{81}i - a_{82}[a_{91}\Pi - a_{92} \\
& \Pi^{US} + a_{93}RER + a_{94}\sigma] - a_{83}i^{US} - a_{84}\sigma)] - a_{34}i - a_{35}\Pi - a_{36}RER + a_{37}(a_{121}Y - \\
& a_{122}\Pi).
\end{aligned}$$

Combining this equation with Eq (3.1) and Eq (3.2) we get output equation.

$$\begin{aligned}
Y = & (-a_{32}a_{111} + a_{33}a_{41}a_{51} + a_{37}a_{121} - a_{22})Y + (a_{32}a_{81}a_{112} - a_{33}a_{41}a_{52} + a_{33}a_{42}a_{81} - \\
& a_{34})i - a_{31}r + (a_{32}a_{112}a_{82}a_{92} - a_{33}a_{42}a_{82}a_{92})\Pi^{US} + (-a_{32}a_{112}a_{82}a_{91} - a_{32}a_{113} - \\
& a_{33}a_{42}a_{82}a_{91} - a_{35} - a_{37}a_{22})\Pi - (a_{32}a_{112}a_{83} - a_{33}a_{83})i^{US} + (a_{21} - a_{112}a_{82}a_{93} - \\
& a_{33}a_{93}a_{42}a_{82} - a_{36})RER + (-a_{32}a_{112}a_{84} - a_{33}a_{53}a_{41} - a_{33}a_{42}a_{82}a_{94} - a_{33}a_{42}a_{84} - a_{23}) \\
& \sigma
\end{aligned}$$

The above equation can be rewritten as:

$$Y = a_{31} \cdot i - a_{32} \cdot r + a_{33} \cdot \Pi^{US} + a_{34} \cdot \Pi - a_{35} \cdot i^{US} - a_{36} \cdot RER + a_{37} \cdot \sigma \quad (\text{Eq 3.3'})$$

Therefore, we have 3 reduced equations:

$$\Pi = a_{11} \cdot RER - a_{12} \cdot Y - a_{13} \cdot \Pi^{US} + a_{14} \cdot \sigma \quad (\text{Eq 3.1'})$$

$$RER = a_{21} \cdot Y - a_{22} \cdot \Pi - a_{23} \cdot i^{US} - a_{24} \cdot \Pi^{US} - a_{25} \cdot \sigma \quad (\text{Eq 3.2'})$$

$$Y = a_{31} \cdot i - a_{32} \cdot r + a_{33} \cdot \Pi^{US} + a_{34} \cdot \Pi - a_{35} \cdot i^{US} - a_{36} \cdot RER + a_{37} \cdot \sigma \quad (\text{Eq 3.3'})$$

When these three equations are analyzed it is possible to observe the effects of exchange rate risk on the economy. These effects may be captured by the signs of risk in these three equations. The first equation (the equation for inflation) a_{14} is positive if $a_{73} \cdot a_{91} > 1$, so that inflation increases with the increasing exchange rate risk. In the second equation, the real exchange rate depreciates with increasing risk, i.e. a_{25} is positive if $(a_{101} \cdot a_{23} + a_{102} \cdot a_{82} \cdot a_{94} + a_{102} \cdot a_{84}) > (a_{102} \cdot a_{81} \cdot a_{64})$. In the third equation, output always decreases with increasing risk, a_{37} is always negative independent of any conditions.

3.3. Measuring the Exchange Rate Risk

Our second contribution in this study is on the methodological side. The main focus of this paper is to analyze the effects of exchange rate risk on the economy. How the risk is measured is an important point that should be elaborated on. In the literature, there are various methods that are used to measure the exchange rate risk. Cote (1994) presents a detailed literature survey for the measurement of risk. A

commonly used exchange rate risk measurement is the standard deviation of the exchange rate, however there are criticisms. Firstly, exchange rate has a skewed distribution, i.e. the exchange rate has a greater proportion of large price changes than would a data set that is normally distributed. Secondly, the exchange rate is characterized by volatility clustering, which means that successive price changes do not seem to be independent. There are various studies that use standard deviation; Corbo, 1995; Aizenman and Mariaon, 1996; Tenreiro, 2003 and Das, 2003.

The Autoregressive Conditional Heteroskedastic models is another alternative for measuring the risk. This type of model specifies the conditional variance as a deterministic function of lagged squared residuals. Thus, this type of specification does not allow the uncertainty measure to be affected by the state of the economy, nor does it allow this measure to be entered in to a VAR specification directly to assess the dynamic relationship between the risk and economic performance.⁵ Pozo (1992) uses GARCH models to compare real exchange rate volatility across regimes over the 1900-40 period. He concludes that the higher volatility during flexible regimes is a result of an explosion of volatility at the start of the period. After that initial explosion, the level of uncertainty experienced during both regimes is similar. Brooks and Burke (1998) compare the GARCH models with each other for forecasting exchange rate volatility. Furthermore, Daly (1999) presents a good literature survey for the usage of various methodologies of measuring exchange rate volatility, standard deviation, ARCH, GARCH, EGARCH, ARCH-M and MARCH models, their advantages and disadvantages.

⁵ Autoregressive Conditional Heteroskedastic specifications define the variability as a function of the lagged squared residuals but VAR specifications define the variability as a function of lagged dependent variables in the VAR system. Since both of them cannot be true at the same time, there is a specification problem if one uses an Autoregressive Conditional Heteroskedastic specification generated risk measure in a VAR setting.

Kalman filtering could be used to assess the risk. This method also allows the parameters in the exchange rate rules to vary. Even if the exchange rate rule is not known by the public for the time period considered, Kalman filtering generated variables are mostly exogenous to the public as set by the CBRT. Thus, it may not represent the public's perception of the exchange rate risk. Moreover, the perception is likely to be affected by the state of the economy or the power of the central bank to influence the exchange rate, but the Kalman filtering method does not allow for that.

In this paper we do not use these measures to assess the exchange rate risk, instead, we use central bank balance sheet indicators, which reflect the CB's strength to affect the exchange rate volatility. These measures (1) can be observed by the public easily and (2) show that the CB has the power to align the exchange rate. In the literature there are only a few studies that try to identify the relationship between Central Bank balance sheet indicators and real exchange rate. Gagnon (1996), Lane and Miles-Ferretti (2000 and 2001) derive the relation between net foreign assets and the real exchange rate both in a theoretical and empirical framework.

In this respect, the variables we used as a representative of the exchange rate risk in this study are ratios of the total foreign exchange liabilities of the CBRT, *FXL*, to central bank reserves; the ratio of *FXL* to total reserves, and the ratio of *FXL* to Turkish lira liabilities as measured by the variable *Central Bank money*. Our reason for using these variables is that whenever these ratios increase, it becomes more difficult for the central bank to keep the domestic currency stable. This would be a negative signal for the market and exchange rate volatility would be likely to occur.

Lastly, following Strongin (1995), in order to avoid double counting the Total Foreign Exchange Liabilities in both the nominator and denominator, we used the lag value of variables in the denominator.⁶

Table 4 and Table 5 present the correlation analysis between the variables that are gathered from the CBRT’s balance sheet and the 3-monthly moving standard errors of the real exchange rate in order to show the relation between the exchange rate risk and the central bank balance sheet variables we used. The results show that these variables are highly correlated with exchange rate volatility; therefore, we would take these variables as a proxy for the exchange rate volatility. Therefore, our contribution to the literature on the methodology is to suggest a new exchange rate risk measurement, in other words we suggest using central bank balance sheet indicators as a proxy for the exchange rate risk.

Table 4. Cross correlations between real exchange rate volatility (as measured with moving standard deviation) and lags of exchange rate risk proxies

	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0
FXL_t/RES_{t-1}	-0.04	-0.03	-0.02	-0.04	-0.05	-0.03	0.29	0.28	0.29	0.31	0.30
FXL_t/TRES_{t-1}	0.12	0.19	0.25	0.28	0.28	0.28	0.26	0.26	0.28	0.28	0.28
FXL_t/TLL_{t-1}	-0.04	-0.03	-0.02	-0.04	-0.05	-0.03	-0.02	-0.03	0.01	0.22	0.31

⁶ The basic results of the paper remain robust when the current values of the variables in the denominator are used.

Table 5. Cross correlations between real exchange rate volatility (as measured with moving standard deviation) and leads of exchange rate risk proxies

	0	1	2	3	4	5	6	7	8	9	10
FXL_t/RES_{t-1}	0.30	0.27	0.24	0.22	0.21	0.06	0.02	0.01	0.33	0.16	0.15
$FXL_t/TRES_{t-1}$	0.28	0.26	0.23	0.21	0.19	0.18	0.17	0.16	0.16	0.14	0.13
FXL_t/TLL_{t-1}	0.31	0.13	0.13	0.04	0.06	0.02	0.01	0.07	0.16	0.15	0.11

3.4. Data

The ratios of Foreign Exchange Liabilities of the CBRT to (1) Reserves; FXL_t/RES_{t-1} (2) Total Reserves; $FXL_t/TRES_{t-1}$ and (3) the Central Bank money as a measure of Turkish lira liabilities, FXL_t/TLL_{t-1} are taken as proxies of exchange rate risk. Then we took the real value of foreign currency as the real exchange rate, rer_t ; output, y_t ; and prices, p_t , by using monthly data covering the period from 1987:2 to 2002:9. All variables in this study are obtained from the CBRT's data delivery system (<http://tcmbf40.tcmb.gov.tr/cbt.html>). The variables that are used are constructed as follows: FXL_t/RES_{t-1} is the ratio of the foreign exchange rate liabilities of the CBRT to the USD (denominated) reserves of the CBRT, whereas $FXL_t/TRES_{t-1}$ is the ratio of the foreign exchange rate liabilities of the CBRT to the total USD (denominated) reserves. On the other hand, FXL_t/TLL_{t-1} is the ratio of the foreign exchange rate liabilities of the CBRT to the Turkish Lira liabilities of the CBRT. The real exchange rate, rer_t , is calculated by deflating the basket (the basket is the

TL value of 1 USD plus 1.5 DM)⁷ by the consumer price index. y_t is the logarithm of the industrial production index; p_t is the logarithm of the producer price index.

3.5. Estimates

To observe the effects of exchange rate risk on the economy, three VAR models were specified with the variables representing exchange rate risk, FXL_t/RES_{t-1} , $FXL_t/TRES_{t-1}$, and FXL_t/TLL_{t-1} in each of the models, real exchange rate, output, and prices. We also added a constant term, monthly dummies to account for seasonality, and US Treasury-bill 3-month interest rates to account for the effects of the rest of the world. Based on the Bayesian information criterion the lag order of VAR was set as 2.

In order to observe the effects, the variables representing exchange rate risk are put first in the ordering of each model. The exchange rate is expected to first respond to the risk. Output would then react to the change in the exchange rate and the exchange rate risk, therefore it is put in the third place in the ordering. Finally, because they would react to changes in real exchange rates and output, prices are included at the end of the ordering. On the other hand, the results remain robust, when ordering is changed.

⁷ The central bank openly announced this as its target variable. By this construction, an increase in the exchange rate implies a depreciation

3.5.1. Impulse Response Functions

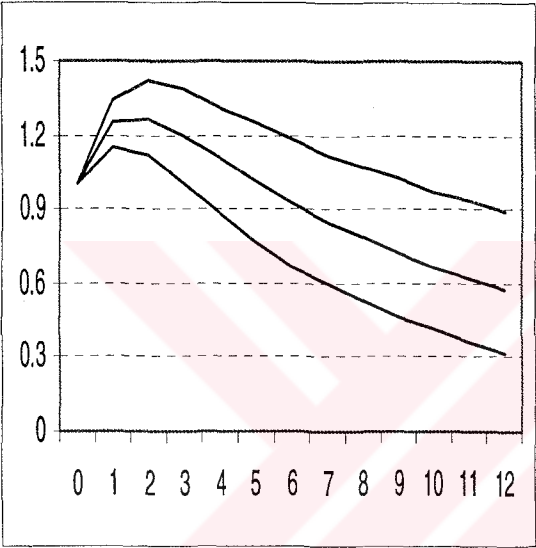
The effects of shocks to the exchange rate risk are assessed by using impulse response functions. Figures 1 to 3 report the impulse response functions of different variables, which are highly correlated with exchange rate risk to the real exchange rate, output and prices when one standard deviation shock is given to the exchange rate risk measures. The 80% confidence bands are calculated using the bootstrap method with 500 draws and the middle line is for the median of the draws.

Figure 1 reports the impulse response functions of foreign exchange rate liabilities to Central Bank reserves, real exchange rate, output and prices. The second diagram shows that a positive shock to exchange rate risk causes a real exchange rate depreciation for the whole period. For the first two months, the effect is higher; in other words, the initial effect is overshooting. Then in the long run, the real exchange rate stabilizes at a level that is higher than the initial one. The third diagram indicates that real output decreases as a response to a shock to exchange rate risk after the first month. After the second month, the effect on output of a shock to the exchange rate risk starts to recover but remains lower than the initial level for the 12 months. As the last diagram presents, prices increase due to a positive shock to the exchange rate risk for the whole period. To sum up, the results show that a shock to the exchange rate risk causes real depreciation, decreases output and increases prices.

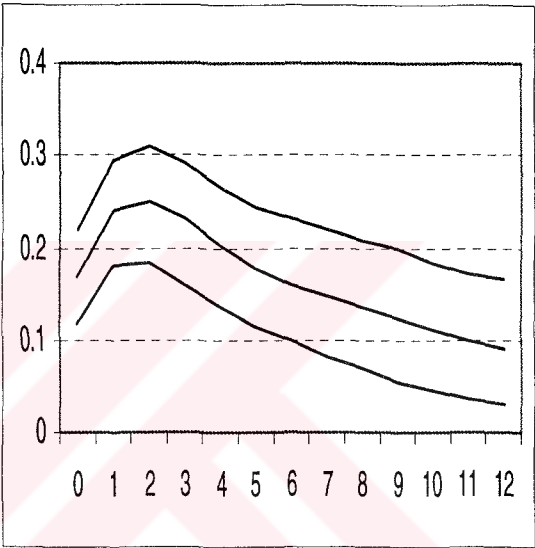
Figure 2 reports the impulse response functions of the foreign exchange rate liabilities to total reserves, the real exchange rate, output and prices. The estimates indicate that a positive shock to exchange rate risk causes a real depreciation for the

whole period. For the first months, overshooting is observed but then the real exchange rate converges to its new long run level. The third diagram indicates that output decreases as a response to a positive shock to exchange rate risk and remains lower than the initial level for 12 months. On the other hand, prices increase after a positive shock to exchange rate risk is observed, and this effect persists.

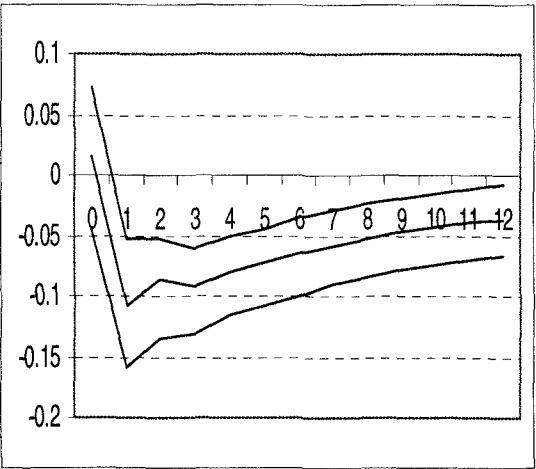
i. Response of FXL_t/RES_{t-1} to FXL_t/RES_{t-1}



ii. Response of RER_t to FXL_t/RES_{t-1}



iii. Response of y_t to FXL_t/RES_{t-1}



iv. Response of p_t to FXL_t/RES_{t-1}

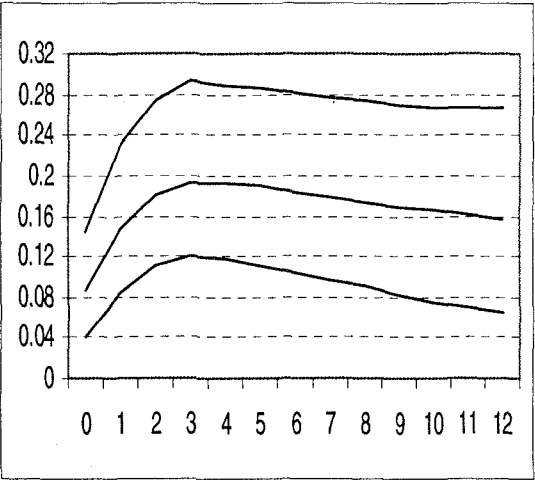
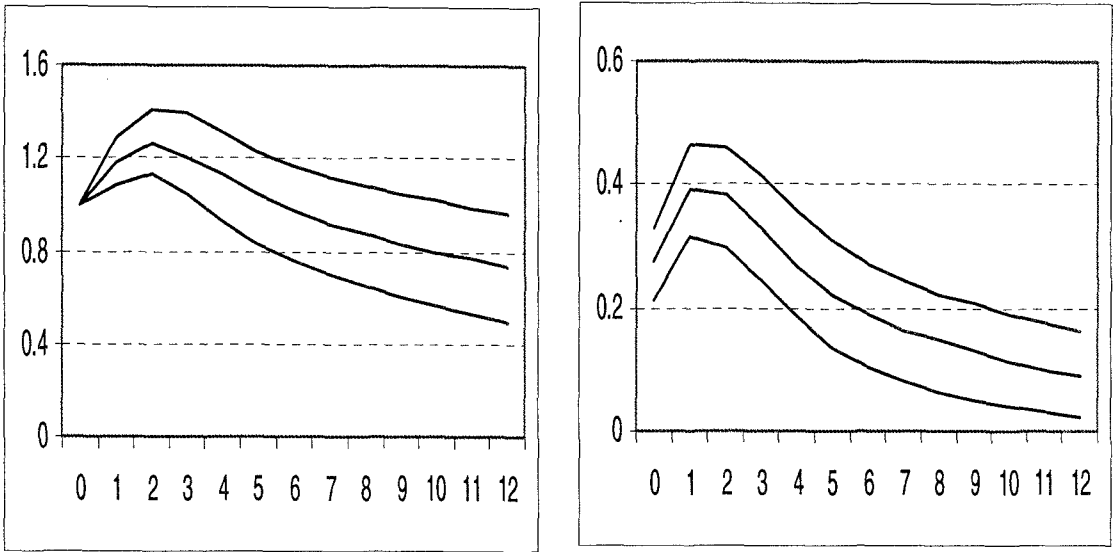


Figure 1. Impulse Response Functions with FXL_t/RES_{t-1}

i. Response of $FXL_t/TRES_{t-1}$ to $FXL_t/TRES_{t-1}$ ii. . Response of RER_t to $FXL_t/TRES_{t-1}$



iii. Response of y_t to $FXL_t/TRES_{t-1}$ iv. Response of p_t to $FXL_t/TRES_{t-1}$

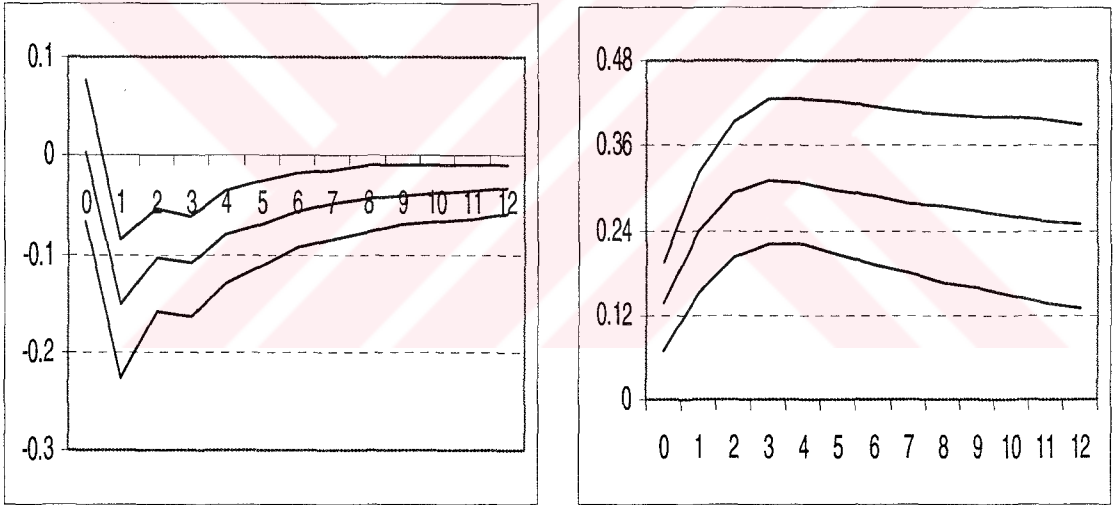
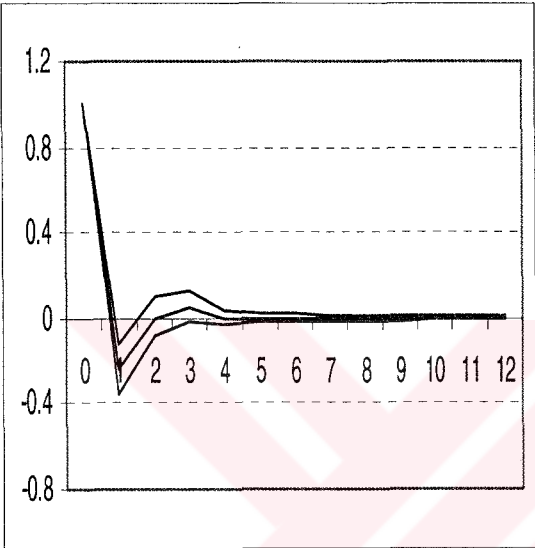


Figure 2. Impulse Response Functions with $FXL_t/TRES_{t-1}$

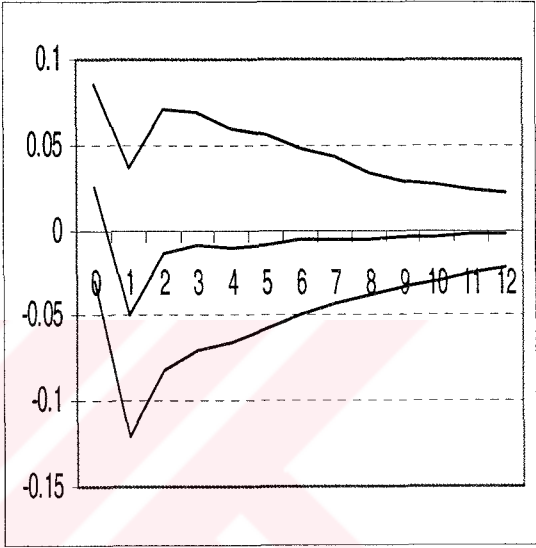
Figure 3 reports the impulse response functions of foreign exchange liabilities to Central Bank money, the real exchange rate, output and prices. The figure indicates that the responses of the real exchange rate, output and prices to a shock to exchange rate risk are statistically insignificant.

Overall, the results of impulse response analysis suggest that higher exchange rate cause an increase in prices. Therefore, exchange rate risk would be another channel of exchange rate pass-through. However, this discussion is beyond the aim of this chapter, and would be a subject for further research.

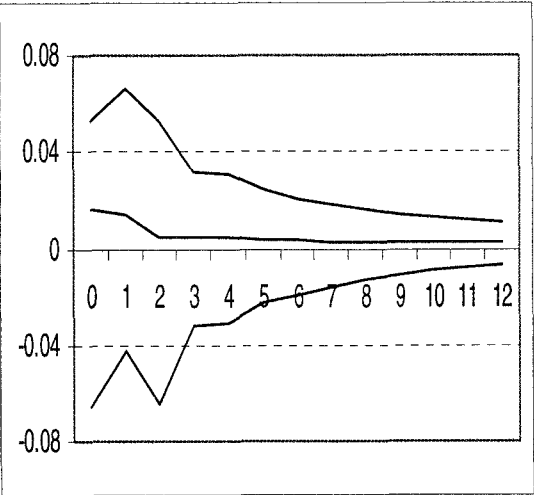
i. Response of FXL_t/TLL_{t-1} to FXL_t/TLL_{t-1}



ii. . Response of RER_t to FXL_t/TLL_{t-1}



iii. Response of y_t to FXL_t/TLL_{t-1}



iv. Response of p_t to FXL_t/TLL_{t-1}

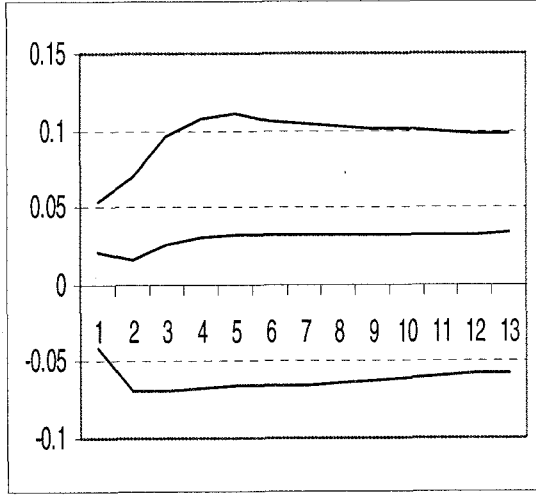


Figure 3. Impulse Response Functions FXL_t/TLL_{t-1}

3.5.2. Forecast Error Variance Decompositions

In addition to the assessment of the dynamic effects of exchange rate risk shocks by using the impulse response functions, the forecast error variance decomposition analysis is also performed to examine how exchange rate risk shocks contribute to the variability of key economic aggregates.

Table 6 reports the forecast error variance decomposition of the macroeconomic variables due to FXL_t/RES_{t-1} . On the left, the time horizons at which forecast errors are calculated are shown. The numbers in parentheses are standard errors. The results suggest that the shocks do contribute significantly to macroeconomic fluctuations. 38-45% of the variation in the real exchange rate, 12-19% of the variation in output and around 30% of the variation in prices are explained by the exchange rate risk variable.

In Table 7, $FXL_t/TRES_{t-1}$ is used as a proxy for exchange rate risk and the forecast error variance decomposition of the macroeconomic variables due to this variable is reported. This set of estimates also suggests that the shocks contribute significantly to macroeconomic fluctuations. Although the contribution of exchange rate risk shocks to output is smaller, the basic results are robust.

Table 6. Forecast Error Variance Decompositions: Contribution of FXL_t/RES_{t-1} to Changes in Key Macroeconomic Variables *

	FXL_t/RES_{t-1}	rer_t	y_t	p_t
Period 6	89% (0.01)	38% (0.09)	12% (0.04)	30% (0.08)
Period 12	92% (0.01)	43% (0.08)	17% (0.04)	29% (0.01)
Period 18	89% (0.01)	45% (0.06)	18% (0.04)	28% (0.13)
Period 24	87% (0.02)	44% (0.06)	19% (0.03)	26% (0.14)

* Numbers in parentheses report the standard errors.

Table 7. Forecast Error Variance Decompositions: Contribution of $FXL_t/TRES_{t-1}$ to Changes in Key Macroeconomic Variables *

	$FXL_t/TRES_{t-1}$	rer_t	y_t	p_t
Period 6	92% (0.02)	43% (0.08)	9% (0.05)	42% (0.08)
Period 12	93% (0.00)	45% (0.06)	11% (0.05)	40% (0.09)
Period 18	93% (0.01)	46% (0.05)	12% (0.05)	38% (0.10)
Period 24	93% (0.01)	45% (0.05)	12% (0.04)	36% (0.10)

* Numbers in parentheses report the standard errors.

Table 8 reports the forecast error variance decomposition of the macroeconomic variables due to exchange rate risk, which is taken as FXL_t/TLL_{t-1} . However, these results indicate that exchange rate risk shocks do not influence the fluctuations of real exchange rate, output and prices, even if the last set of the results

on the effect of the exchange rate risk on economic performance is not robust. In all these specifications, the exchange rate risk measure is usually explained by itself, suggesting that this variable is mostly exogenous.

Table 8. Forecast Error Variance Decompositions: Contribution of FXL_t/TLL_{t-1} to Changes in Key Macroeconomic Variables *

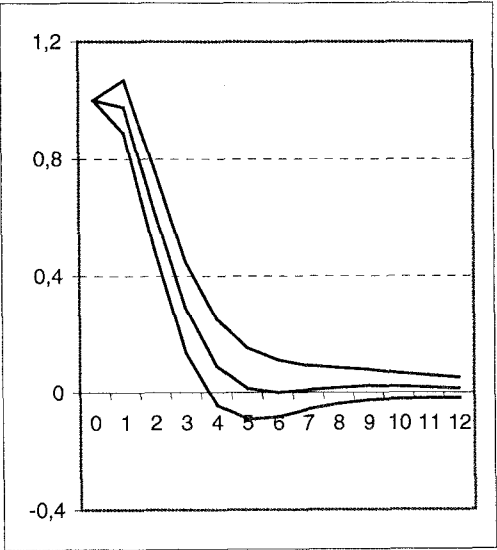
	FXL_t/TLL_{t-1}	rer_t	y_t	p_t
Period 6	78% (0.06)	0% (0.02)	0% (0.02)	1% (0.05)
Period 12	77% (0.05)	0% (0.02)	0% (0.02)	1% (0.06)
Period 18	77% (0.06)	0% (0.02)	0% (0.02)	1% (0.06)
Period 24	76% (0.06)	0% (0.02)	0% (0.02)	1% (0.06)

* Numbers in parentheses report the standard errors.

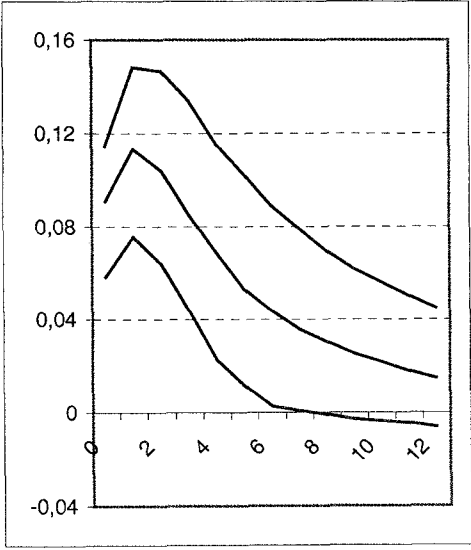
One could argue that the variables used to assess the exchange rate risk might be misleading. Thus, we measured the exchange rate risk with the moving standard deviation with 3-monthly window as in Table 4 and 5. Figure 4 and Table 9 report the impulse response functions and forecast error variance decompositions with this measure. The results remain robust.

A decrease in the CBRT’s foreign exchange liabilities might be mimicking the decrease in money supply in the market. Therefore, our estimates would be reporting the effect of the tight monetary policy but not the exchange rate risk. In order to account for that, we included reserve money as the first variable in the VAR specification. These results are not elaborated on here but are reported in Appendix A. Overall, the basic conclusion was robust.

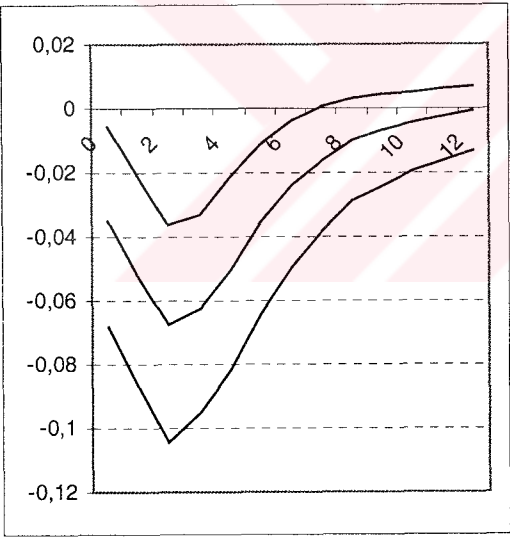
i. Response of Volatility to Volatility_t



ii. . Response of RER_t to Volatility_t



iii. Response of y_t to Volatility_t



iv. Response of p_t to Volatility_t

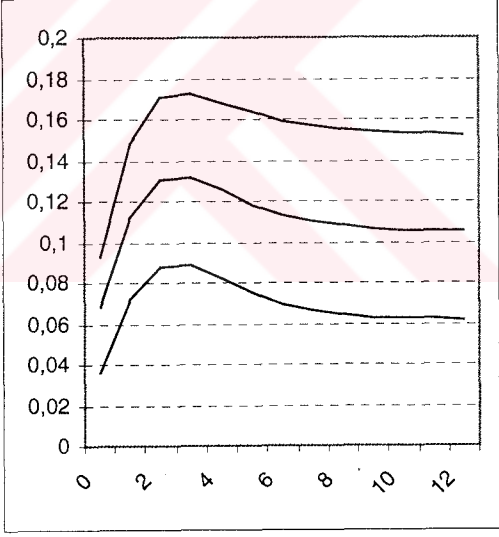


Figure 4. Impulse Response Functions with Volatility_t

Table 9. Forecast Error Variance Decompositions: Contribution of Volatility to Changes in Key Macroeconomic Variables *

	<i>Volatility</i>	<i>rer_t</i>	<i>y_t</i>	<i>p_t</i>
Period 6	86% (0.02)	19% (0.10)	14% (0.07)	45% (0.11)
Period 12	87% (0.02)	17% (0.10)	13% (0.07)	48% (0.09)
Period 18	86% (0.03)	17% (0.10)	13% (0.07)	47% (0.10)
Period 24	85% (0.03)	16% (0.10)	13% (0.07)	47% (0.10)

* Numbers in parentheses report the standard errors.

Another question that would arise about the exchange rate risk and the central bank behavior is the causality between the exchange rate risk and the central bank intervention to the market. Whether the central bank intervenes to the market to decrease the exchange rate risk or exchange rate risk changes with the signals of intervention would be an interesting issue to analyze. However, the answer to this question is beyond the objective of this chapter and would be analyzed in further research.

3.6. Conclusion

This paper assesses the effect of exchange rate risk for a small open developing economy: Turkey. In order to identify the effects of exchange rate risk on the economy, a deterministic small open economy model is built, which covers all

the relations in the economy. Following the theoretical model, empirical analysis using VAR methodology are performed for Turkey.

On the methodological side, to measure the exchange rate risk, three measures were used from the CBRT's balance sheet: the ratio of the total foreign exchange liabilities to (1) the total reserves, (2) the CBRT's reserves and (3) the Turkish lira liabilities. This way of measuring has some advantages to other econometrically heavy measures. First, these variables directly measure the strength of the CBRT to stabilize the real exchange rate. Second these variables are directly observable by the public; and third, they are not subject to specification tests like the one in econometric models.

The results of both the theoretical model and the empirical model suggest that the higher exchange rate risk is associated with a depreciation of the local currency, an increase in prices and a decrease in output. Therefore, policymakers should pay attention to prevent the exchange rate risk.

The analyses in this chapter are on the effects of an increase (or decrease in exchange rate risk. However, there is another issue: positive exchange rate risk, in other words exchange rate risk of appreciation. The effects of exchange rate risk of appreciation and depreciation on economy would be asymmetric. The asymmetric effects of exchange rate risk is beyond the objectives of this chapter, but it will be analyzed in details in the next chapter.

CHAPTER 4

ASYMMETRIC EFFECTS OF EXCHANGE RATE FLUCTUATIONS ON ECONOMIC PERFORMANCE: TURKISH EXPERIENCE

4.1. Introduction

The 1990's may be regarded as being years when the world economy was in currency turmoil. These years were characterized by the near-breakdown of the European Exchange Rate Mechanism in 1992-93, the Latin American Tequila Crisis following Mexico's peso devaluation in 1994-95, and the severe crises that swept through East Asia in 1997-98. These crises resulted in a debate on the degree of fluctuations in the exchange rate in the face of external and internal shocks. Before deciding the desirability of exchange rate fluctuations, it is necessary to determine the effects of fluctuations.

There are various studies that try to extract the possible effects of exchange rate shocks on the economy. The traditional view, as in Dornbusch (1988), suggests that the depreciation of the domestic currency may stimulate economy through an initial increase in the prices of foreign goods compared to domestic goods. Thus,

spending switches from foreign goods to domestic goods as a result of increased competition. However, there are some other studies supporting the view that there are contractionary effects of currency depreciation. Meade (1951) suggests that if the Marshall-Lerner condition does not hold, then depreciation would result in a contraction of the output. Moreover, Krugman and Taylor (1978) discuss how windfall profits in export and import competing industries may rise with depreciation. If there is a lag between wage and price adjustments and if the marginal propensity to save from profits is higher than that from wages, national savings could go up and real output could decrease. With a devaluation input costs would increase for countries importing intermediate goods, so production would decrease, as Bruno (1979) suggests.

On the empirical studies side, Edwards (1985) suggests that the initial contractionary effects of a real devaluation are reversed after one year and devaluation is neutral in the long run. Edwards (1989) finds that in developing countries devaluations reduce output in a pooled time-series/cross section sample. Agenor (1991) points out that unanticipated devaluations increase the level of output, whereas anticipated devaluations decrease the level of output. Copelman and Werner (1996) show that declines in output are observed after a devaluation in Mexico. Domac (1997), based on Turkish data for the 1960-1990 period, shows that unanticipated devaluations have positive effects on output but anticipated devaluations do not exert any significant effect on output. On the other hand, Kamin and Rogers (2000) find that the response of output to a depreciation is permanent and negative. Finally, parallel to Kamin and Rogers (2000), Berument and Pasaogulları (2003) argue that real depreciations are contractionary even if external factors like

world interest rates, international trade and capital flows are controlled for Turkey. Moreover, they found that real exchange rate depreciations are inflationary for Turkey.

Although it needs not to be the case that the effects of unexpected exchange rate depreciation are similar to the effects of unexpected exchange rate appreciation for the economy, there are only a few studies discussing the asymmetric effects of exchange rate shocks, in a macroeconomic framework. Most of the studies on this area discuss these asymmetric effects within a micro-economic modeling framework. Froot and Klemperer (1989) and Knetter (1989) point out that the asymmetric response of stock prices to currency movements may occur due to asymmetric pricing-to-market (PTM) behavior. When the domestic currency appreciates, exporting firms with a market share objective do not permit local currency prices to increase because of the risk of losing their share, so they decrease their profit margins. On the other hand, under currency depreciations, exporting firms with a market share objective maintain rather than increase their profit margins as a result of their focus on sales volume. Other studies supporting the same arguments are Marston (1990) and Goldberg (1995). Another type of asymmetric effect of the exchange rate is proposed by Baldwin and Krugman (1989) and Dixit (1989). They argue that new export competitors enter the market during depreciation periods. However, these competitors remain in the market when the currency appreciates (hysteretic behavior).

The asymmetric effects of exchange rate shocks within a microeconomic modeling framework will have some macroeconomic consequences. As different

strategies are observed in export-oriented firms, it is likely that total exports differ in unexpected appreciation and depreciation periods. Moreover, firms' asymmetric price strategies would result in an asymmetry in the economy-wide price level. On the other hand, as entry decisions of firms vary, investment will also be asymmetrically affected. Finally, during unexpected currency appreciation and depreciation periods, output may react asymmetrically as firms' adopt different strategies on the production side. Therefore, theoretical and empirical studies suggest that there are different channels leading to contraction and expansion in the periods of currency depreciation and appreciation. In other words, different channels will be activated in periods of depreciation and appreciation and the net effect on output would vary.

To the best of our knowledge, there are only few empirical studies discussing the asymmetric effects of exchange rate shocks in a macroeconomic framework. Kandil (2000) builds up a theoretical model based on aggregate demand and aggregate supply, and the output is determined from their equilibrium. She suggests that exchange rate fluctuations affect the equilibrium from three channels and the asymmetry may come out from the complexity of demand and supply channels. The channels that she figures out are from the goods market, money market and the supply side. In the goods market, with unexpected depreciation (appreciation), exports will be less (more) expensive and imports will be more (less) expensive, increasing (decreasing) the demand for the domestic products. In the money market, an unexpected depreciation (appreciation) led the agents to hold more (less) domestic currency and increases (decreases) the interest rate. On the supply side, an unexpected depreciation (appreciation) increases (decreases) the cost of imported

intermediate goods, decreasing (increasing) domestic output and increasing (decreasing) the cost of production and the price level. Considering only these channels from her theoretical model, Kandil (2000) decomposes the unanticipated exchange rate into depreciation and appreciation components and analyzes their effects on aggregate output and price inflation for a sample of developing countries. Kandil and Mirzaie (2002), focuses on the effect of exchange rate fluctuations in determining economic conditions across industries of the USA, using the same theoretical background in Kandil (2000). They find that given the small degree of openness for industries for the USA, exchange rate fluctuations affect prices moderately without changing output significantly. Therefore, they conclude that concerns about adverse effects of an appreciation in the US dollar on economic performance are not supported by the data for the USA.

The existing studies on the asymmetric effects of real exchange rate fluctuations on the economy undervalue the effects of real exchange rate fluctuations on aggregate demand. These studies assume that the aggregate demand would be affected from the exchange rate fluctuations only via exports and imports channels. However, it is likely that consumption and especially investment would be affected from real exchange rate fluctuations. Lizondo and Montiel (1989) present an extensive literature review on the adverse effects of real exchange rate devaluations on consumption and investment and the channels of these adverse effects. Therefore, it would be the case that not only exports and imports, but also other demand components would be affected from exchange rate fluctuations. Moreover, for each of the aggregate demand component it would be the case that demand and supply

effects would be complex and the resultant effects of exchange rate fluctuations would be asymmetric.

In order to figure out the desirability of real exchange rate fluctuations, its effects on the economy should be well identified. When the channels that real exchange rate fluctuations affecting the economy are not considered before taking a policy decision, the results would be an unexpected outcome. For example, by allowing exchange rate depreciation policy makers would loose their growth target while trying to keep external balance, because of the asymmetric effects of exchange rate fluctuations on the demand components of the economy. Therefore, it is important to point out the benefits and costs of unexpected depreciation and appreciation in the economy before deciding the appropriate economic policies. The aim of this study is to explore the asymmetric effects of unanticipated exchange rate fluctuations on the components of income, prices, money supply and interest rates, in other words this study identifies the channels that the unexpected real exchange rate fluctuations would affect the economy.

This chapter evaluates the asymmetric effects of real exchange rate movements on economic performance, in the Turkish economy. Turkey is a small, open economy with liberal financial markets; thus, the behavior of financial variables is market-determined rather than exogenously imposed. Moreover, Turkey is the only country that has had high inflation for 3 decades without running into hyperinflation; thus, the effects of exchange rate fluctuations on economic performance are sizable to observe. All these provide a unique laboratory

environment to assess the asymmetric effects of real exchange rate fluctuations on economic performance.

Empirical evidence gathered in this study suggests that in the case of unanticipated currency depreciation, private investment and exports will decrease. As a result we surmise output to contract even if government investments increase and treasury bond interest rates decrease. On the other hand, exports, treasury bond interest rates and prices decrease, while government investment and government consumption increase in the case of an unanticipated currency appreciation. Moreover, our study complements Kandil's (2000) in that the claimed effects of the demand channel are supported empirically.

On the methodology side, in the literature, there are two approaches that are used for analyzing the asymmetric effects of policies. The first approach is applying the Markov switching model presented in Hamilton (1989, 1991). Garcia and Schaller (1995) and Kakes (1998) analyze the asymmetric effects of monetary policy by applying this approach. They show that changes in interest rates have asymmetric effects over the business cycle, based on a univariate model for the growth rates of output and industrial production. Kauffman (2001) estimates a Bayesian model using Markov Chain Monte Carlo simulation methods for Austria. Her results suggest that during periods of below-average growth, monetary policy have significant negative effects over the business cycle, while the effect is insignificant during periods of normal- or above- average growth.

The second approach, which is first introduced in Cover (1992) for analyzing the asymmetric effects of monetary policy, is a widely used one not only for analyzing the asymmetric effects of monetary policy, but also for analyzing the asymmetric effects of other policies. Cover's approach is a two-step procedure. The first step estimates a money-supply process for identifying the endogenous component of monetary policy. The residuals of this equation are interpreted as the innovation in monetary policy. These monetary policy shocks are separated to its negative and positive components. In the second step, these negative and positive shocks are included in the second equation estimating the output process of the system. Using Wald coefficient test, the equality of negative and positive shocks is tested, where inequality suggests that monetary policy asymmetrically affects output. Cover's results suggest that positive money-supply shocks do not have an effect on output, while negative money-supply shocks do have an effect on output. The other studies analyzing the asymmetric effects of monetary policy are Karras (1996) for Europe, Lenz (1997) for Switzerland, and Kandil (2002) for U.S. comparing the pre-war and the 1946-1991 periods.

Cover methodology is used not only for analyzing the asymmetric effects of monetary policy but also for examining the asymmetric effects of government spending on output. Kandil (2001, 2002) suggest asymmetry on the effects of government spending on output, using the two-step procedure. Moreover, Kandil (2000) and Kandil and Mirzaie (2002), which were mentioned as the only studies examining the asymmetric effects of exchange rate fluctuations on the economy, apply Cover (1992) methodology, also.

The modeling approaches are not the same in all these papers analyzing the asymmetric effects of the policies, although they all apply Cover (1992) methodology. In some of these papers, shocks are taken as differences from trend as in Kandil (2001, 2002), in others the shocks are taken as the residuals of the equations, where the models are set up with the related variables as the theory suggests. In this study, in order to define unexpected exchange rate fluctuations, we first built up a well-defined exchange rate model, which is the one built for Mexico by Kamin and Rogers (2000) and used for Turkey by Berument and Pasaogulları (2002). Exchange rate fluctuations in this chapter are defined as the residual of the reduced form of the mentioned macro-econometric model. The advantage of using this model is that all of the relations in the economy are covered, and it is a well-defined equation with a high explanatory power.

The usual way to examine the asymmetric effects of a policy on a variable -- it is output and prices in the literature till this paper -- is to regress the variable with the positive and negative components of the policy shock. An exception is Kandil (2000) and Kandil and Mirzaie (2002). They model output and prices in accordance with their theoretical model. However, in this study, we model each variable that we analyze the asymmetric effects on, in our case the components of GDP from the expenditure side, money, prices and interest rates, and as the second step we include the negative and positive components of exchange rate fluctuations to these equations. With this methodology, we suggest that if exchange rate fluctuations improve the explanatory power of the equations, then they are effective on the economy.

Another contribution of this study to asymmetric effects literature is that it has extensive robustness tests. The results are checked by six different methods. Three kinds of models, namely VAR, structural and FPE models, are estimated by LS and 3SLS estimation techniques. LS and 3SLS techniques are used in the literature but using only one type of model is common, controlling the results with different models is a contribution of this paper.

As a summary, in this study, we analyze the asymmetric effects of unanticipated exchange rate fluctuations on the components of GNP, prices, money supply and interest rates. We estimated three kinds of models-VAR, reduced model and structural form models - for each variable under consideration by using quarterly data for Turkey in the 1987:I-2001:IV period.

Our results suggest that in the face of unanticipated currency depreciation private investment decreases, which results in output contraction. On the other hand, exports and prices decrease, while government investment increases in the face of unanticipated currency appreciation.

In order to obtain efficient and consistent variance estimates, the models are performed with 3SLS also. The results show that there are more variables affected by unanticipated currency shocks when they are compared to the OLS estimates: in the face of currency depreciation private investment, exports, money supply and interest rates decrease whereas government investment increases. On the other hand, in the face of currency appreciation government consumption and government investment

increase while exports, Treasury bond interest rate and prices decrease with 3SLS estimates.

Our results suggest that when there is high deviation of the exchange rate around its anticipated value, the economy is adversely affected in Turkey. Therefore, when designing policies and stability programs for Turkey, the possible adverse effects of unexpected shocks of exchange rate should be taken into consideration in order to achieve the targets.

The organization of Chapter 4 is as follows: Section 4.2 discuss the developments in the Turkish exchange rate, Section 4.3 presents the model, Section 4.4 summarizes the results and finally, Section 4.5 concludes.

4.2. Developments in the Turkish Exchange Rate

In the 1980's the Turkish authorities followed an exchange rate policy that aimed to prevent the real exchange rate from appreciating and thereby supporting the export-led growth strategy. Therefore, the 1980's were the years of integration with the world economy for Turkey. Exports grew impressively and high growth rates were observed.

In 1989, the capital account liberalized and in 1990 Turkey adopted convertibility of the Turkish lira. High capital inflows were realized in the 1988-1990 period and this allowed the appreciation of the currency in real terms (Figure 5). By

1990, to attract more capital inflows, the Central Bank of the Republic of Turkey (CBRT) increased interest rates. However, this policy further increased the interest rate-exchange rate spread. The reason for this was high levels of primary deficit and public sector borrowing requirements (PSBR). These were financed with short-term domestic borrowing. With the increase in interest rates, domestic debt stock grew to a level that the debt-roll over problem arose. Expectations for a devaluation increased at the end of 1993. In January 1994, the CBRT left the exchange rate policy and devalued the nominal exchange rate by 14% (Figure 6). The devaluation of the currency continued until April 1994 and the total devaluation for this period became 173% in nominal terms. The output declined by 6.2% in the same year (Figure 7). In April 1994, a new program to overcome the financial crises came in to effect.

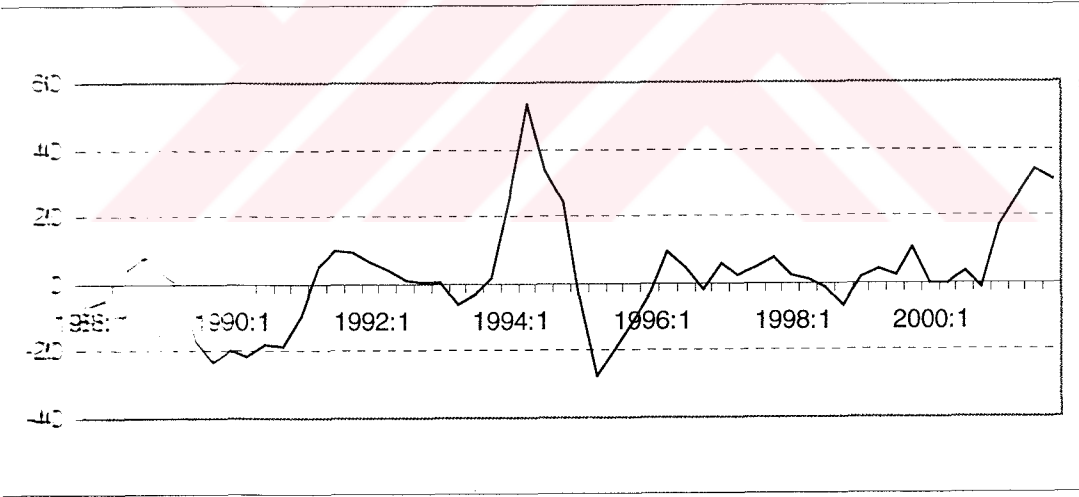


Figure 5. Change in the Real Exchange Rate (% TL/\$)

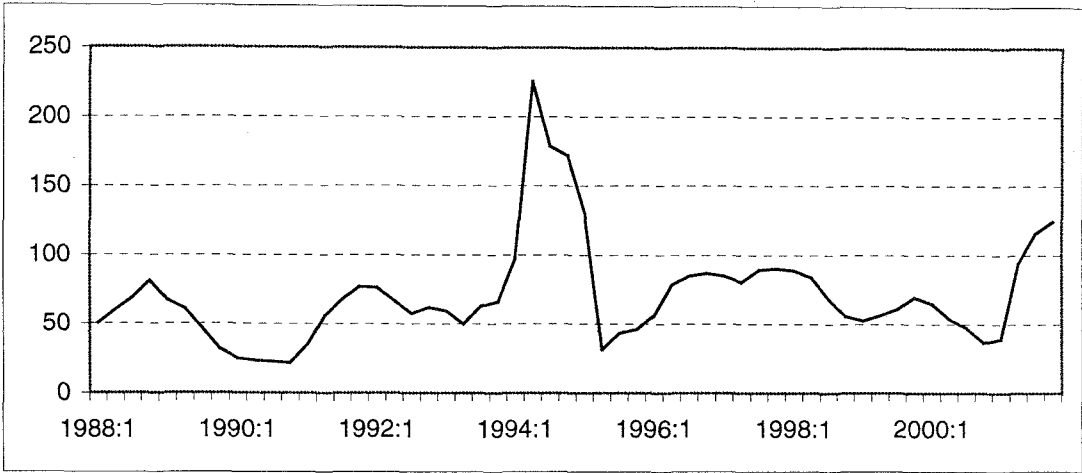


Figure 6. Change in the Nominal Exchange Rate (% TL/\$)

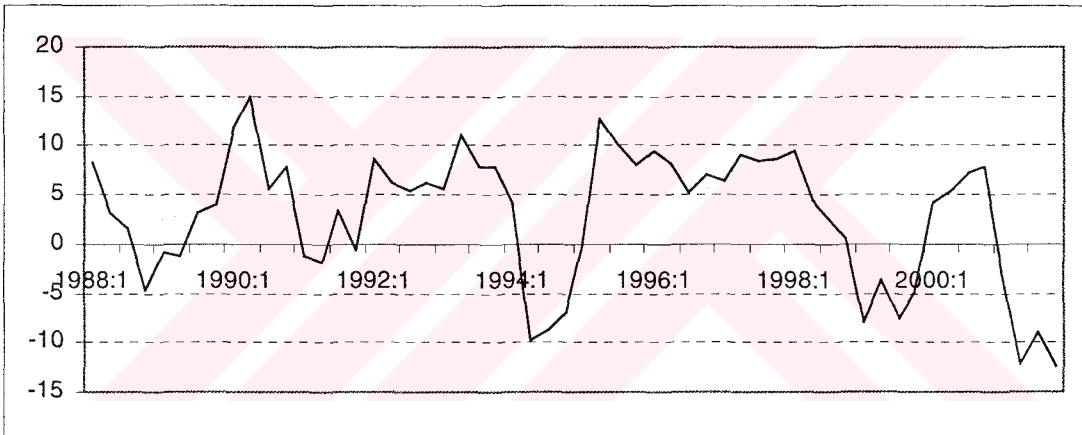


Figure 7. Growth of GNP (%)

The Turkish economy recovered from the 1994 crisis quickly and the economy grew 8% in 1995. With the increase in capital flows in the 1996-1997 period, the capital account financed the current account. The increase in central bank reserves and the loose monetary policy contributed to the growth of investments and the economy.

In December 1999, Turkey adopted another disinflation program with the support of the IMF. The aim of the program was to decrease the inflation rate to a single digit by the end of 2002. The exchange rate regime of the program was announced as the crawling peg exchange rate regime. CBRT declared an exchange rate basket path consisting of 1 USD+0.77 Euro, and announced a daily depreciation rate which adds up to a cumulative of 20 percent by the end of 2000.

The beginning of the program gave positive signals. The nominal treasury bond interest rates fell to 34.1% in January 2000 from 96.4% in November 1999⁷, inflation expectations decreased, high capital inflows were experienced and the economy grew 4.8% in the first half of 2000. However, with the high increase of imports, the current account deficit rose and these made the system fragile. As the real exchange rate appreciated with the program, the banking sector increased its foreign currency denominated debt to a level that became risky for the system. With the sudden capital outflows in November 2000, banking sector crises occurred which weakened the reserves of the CBRT by a significant amount. In February 2001, the political instability triggered the mechanism and a severe crisis arose, and the crawling exchange rate regime was abandoned. The nominal exchange rate depreciated by 94% (annual increase of the second quarter of 2001) and the output response was detrimental, output declined by 9.4% (Figures 6 and 7).

In May 2001, a new program based on a freely floating exchange rate regime, tight fiscal policy and structural reforms was implemented. The signs of recovery were observed in the first half of 2002; output grew by 4.7%.

⁷ There was no Treasury auctions in December 1999.

The developments since 1987 show that the Turkish economy experienced two severe crises that were followed by large devaluations. Different exchange rate regimes were implemented in different periods. However, none of the exchange rate regimes prevented the volatility of the Turkish lira. Both the unexpected devaluations and the appreciations of the currency affected the Turkish economy. Economic recessions followed large devaluations. Furthermore, appreciation of the currency caused problems, especially via the decrease in exports, in the economy. Therefore, it is essential for the Turkish economy, which experienced high fluctuations in its currency, to understand the effects of unexpected exchange rate shocks on the economy before designing new policies, which is the aim of this study.

4.3. Model

In the model we used, the real exchange rate is affected by prices, output and foreign interest rate.⁸ It can be represented as:

$$\begin{bmatrix} 1 & b_{12} \\ b_{21} & 1 \end{bmatrix} \begin{bmatrix} e_t \\ z_t \end{bmatrix} = \begin{bmatrix} b_{10} \\ b_{20} \end{bmatrix} + \begin{bmatrix} \gamma_{11} & \gamma_{12} \\ \gamma_{21} & \gamma_{22} \end{bmatrix} \begin{bmatrix} e_{t-1} \\ z_{t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{et} \\ \varepsilon_{zt} \end{bmatrix} \quad (\text{Eq. 4.1})$$

where e_t is for percentage change of the real exchange rate, z_t is a vector of other economic variables in interest, and ε_{et} and ε_{zt} are orthogonalized disturbances. In our study, agents' forecasts of depreciation and appreciation are approximated by a VAR model as in Eq. (4.1), which includes four lags. On the other hand, the unanticipated

⁸ The relationship between domestic interest rates and the real exchange rate is driven by the third-variable effect rather than higher domestic interest rates attracts more capital inflows that leads to appreciation of the currency in Turkey. The political environment or unsustainable fiscal deficit that leads to default risk that increases domestic interest rates and depreciates the currency due to capital inflows (see, McMillin and Koray, 1990; Koray and Chan, 1991; and World Economic Outlook, 1995). Therefore, we exclude the domestic interest rate from the real exchange rate specification.

real exchange rate shock that enters the empirical models is formed by subtracting the agents' forecasts from the actual growth of the variable, i.e., the residual of the VAR estimation. The shock that is evaluated in this way is purely random, that is, *iid.* and orthogonal to the variables in the information set. However, in this representation, VAR is under-identified. Sims (1980) suggests using a recursive system to identify the model, we constrain b_{12} to be zero for the identification. This is consistent with the practices of the CBRT where the exchange rate was a policy variable and the Central Bank depreciated the exchange rate daily with the same depreciation rate for each month.

In order to observe the asymmetric effects of exchange rate depreciation and appreciation separately, the shock is distributed to its positive and negative components, which are defined as:

$$Pos_t = [1/2]\{abs(\epsilon_{et}) + \epsilon_{et}\}, \quad (Eq. 4.2)$$

$$Neg_t = -[1/2]\{abs(\epsilon_{et}) - \epsilon_{et}\}, \quad (Eq. 4.3)$$

where ϵ_{et} is the shock to the growth of the real exchange rate, as specified in Eq. (4.1), and Pos_t and Neg_t are its negative and positive components, i.e., Pos_t is for unanticipated depreciation and Neg_t is for unanticipated appreciation.

We include Pos_t and Neg_t in the models to observe the effects of the unexpected real exchange rate appreciation and depreciation shocks. Therefore, we model the macroeconomic variable, which is assumed to be affected by real exchange rate shocks asymmetrically, as the theory suggests. Then we include positive and negative shocks in the model as follows:

$$X_t = \Gamma_0 + \Gamma_1 Y_t + \Gamma_2 Pos_t + \Gamma_3 Neg_t + \eta_t \quad (Eq 4.4)$$

where X_t is the variable under consideration, Y_t is the set of explanatory variables, Γ_2 and Γ_3 are for the effects of unanticipated depreciation and appreciation on the concerned variables *respectively*, and η_t is the error term. (See, Kandil, 2002, for the details of the methodology.)

4.4. Estimates

To gather the estimates, quarterly data from 1987:I to 2001:IV is used. The variables under consideration in this study are as follows: the GNP in 1987 prices; components of the GNP measured by expenditures in 1987 prices, i.e., durable private consumption, non-durable private consumption, government consumption, private investment, government investment, total exports and total imports; the GNP deflator; the CBRT's overnight interbank interest rate; the treasury bond interest rate; M0 money; M1R (M1 money plus the volume of repo⁹); the LIBOR interest rate; and the real exchange rate. All the data are in logarithmic first differences except interest rates. The real exchange rate is calculated by deflating the nominal exchange rate in dollars (by this construction an increase in the exchange rate implies a depreciation) by the Turkish GNP deflator and the USA GNP deflator where the USA GNP deflator is gathered from OLIS-OECD Database. On the other hand, LIBOR is from Reuters, the treasury bond interest rate is from Main Economic Indicators of State

⁹ We use M1R instead of M1, because repo volume is not negligible (e.g. in January 2001, the repo volume was 14,7 quadrillion TL while the volume of total deposits was 103 quadrillion TL and M1 was 10 quadrillion TL). Moreover, for our sample period, repo interest rate is greater than deposit interest rate (e.g. in January 2001, repo interest rate was 364 percent while deposit interest rate was only 58 percent annually).

Planning Organization and the remaining data is from the CBRT data delivery system (<http://tcmbf40.tcmb.gov.tr/cbt.html>).

A two-step procedure is used in order to determine the asymmetric effect of unanticipated shocks of the real exchange rate on the components of the GNP, prices, interest rate and money. The first step is to extract positive and negative shocks from the real exchange rate equation where it is estimated as in Equation (4.1) that also includes quarterly dummies to account for seasonality; a dummy for controlling the devaluation in the pre-1994 crisis which takes the value of 1 in 1994:I¹⁰, zero otherwise; a dummy for controlling the high appreciation after the 1994 crisis which takes the value of 1 in 1994:III, zero otherwise.¹¹ A dummy variable for controlling the September 2001 terrorist attacks in 2001:IV¹² is also added to our model in order to control for the particularly pronounced changes in the variables of the system. The second step is to include these positive and negative shocks along with other variables into the specifications. We use three types of specifications. The first one is the VAR model with four lags. The second one is the unbalanced VAR model (reduced model) that is obtained by eliminating the variables by using the final prediction error criteria. Finally, the third type is a version of the models used in State Planning Organization Quarterly Macro-Econometric Model (DPTMAKROM) to provide official statistics for Turkish policy makers, which we refer to here as

¹⁰ In 1994, the government changed the exchange rate policy and that let the exchange rate to depreciate in January 1994 (1994:I) and after April 1994 new policy for exchange rate started to be implemented and exchange rate began to appreciate (1994:III). These dates are also perceived as structural break points for the real exchange rate.

¹¹ Not including these dummies does not change the basic conclusion of the paper but gives lower t-statistics.

¹² The terrorist attacks happened at the end of 2001:III. Therefore, to control for the effects on the Turkish economy we used a dummy in 2001:IV.

structural models¹³. The specifications and the explanations of the variables that appear in the specifications are described in the Appendix B and the estimates are presented in Appendix C..

The asymmetric effects of unanticipated real exchange rate movements on the economic performance in these models are tested by using Wald tests. The inequality of the sum of the coefficients of the four lags of the positive and the negative real exchange rate shocks implies asymmetry. Table 10 represents the p-values for the Wald test for the three models. The results of the tests for asymmetry suggest that unexpected real exchange rate shocks have asymmetric effects on total private investment, government investment and total export. On the other hand, Table 11 gives the results of the Wald test for the null hypothesis (the sum of the coefficients of the unexpected positive (and negative) real exchange rate shocks is equal to zero) and the sign of the shocks. If the null is rejected then these positive and negative shocks affect the variable under consideration and the signs in the table. If we cannot reject the null hypothesis, then 0 is reported.

The OLS estimates reported in Table 11 indicate that in the face of unanticipated positive shocks (unexpected depreciations of the real exchange rate) total private investment decreases. Therefore, the resultant effect of unanticipated currency depreciation on output would be negative through the investment channel. In the face of unexpected appreciation, government investment increases, while total exports and prices decrease. Thus, we cannot surmise the net effect of an unanticipated negative shock on output. As government investment has a small ratio

¹³ DPTMAKROM models are for internal use only.

in the output, one may expect that in the face of unanticipated currency appreciation, output would be adversely affected. Therefore, a higher variability of the exchange rate around its anticipated value would be contractionary.

**Table 10. The Asymmetric Effects of the Exchange Rate:
Marginal Significance Levels**

	Test for Asymmetry		
	VAR	Reduced Model	Structural Model
Durable Private Cons.	0.84	0.05	0.89
Non-durable Private Cons.	0.31	0.31	0.95
Total Private Investment	0.03	0.15	0.04
Government Consumption	0.94	-	0.90
Government Investment	0.13	0.06	0.06
Total Exports	0.01	0.00	0.04
Total Imports	0.67	0.53	0.88
Prices	0.06	0.27	0.46
M0	0.54	-	0.70
M1R	0.39	0.03	0.28
Treasury Bond Interest Rate	0.13	0.59	0.15
Interbank Interest Rate	0.56	0.39	0.57

Note (1): In the reduced model, as FPE eliminates the variables representing the exchange rate shocks from some of the models, those probabilities are null.

When we compare our results with Kandil (2000), we observe that our results mostly support hers. Kandil (2000) theoretically claims that in the face of unanticipated currency appreciation, the reduction in net exports determines output contraction and in the face of unanticipated currency depreciation, the supply channel leads to output contraction. However, for Turkey, Kandil's empirical evidence suggests that the effect of unanticipated currency depreciation on output is contractionary, while the effect of unanticipated currency appreciation on output is

Table.11. Signs of the Unanticipated Real Exchange Rate Shocks

	VAR		Reduced Model		Structural Model	
	Positive Shocks	Negative Shocks	Positive Shocks	Negative Shocks	Positive Shocks	Negative Shocks
Durable Prv. C.	0	0	0	(+)*	0	0
Non-dur. Prv. C.	0	0	0	0	0	0
Total Prv. Inv.	(-)**	0	0	0	(-)**	0
Government C.	0	0	-	-	0	0
Government Inv.	0	0	0	(+)**	0	(+)*
Total Exports	0	(-)**	0	(-)**	0	(-)**
Total Imports	0	0	0	0	0	0
Prices	0	(-)**	0	(-)*	0	0
M0	0	0	-	-	0	0
M1R	0	0	(-)**	0	0	0
Treasury Int. R.	0	0	0	0	(-)*	0
Interbank Int. R.	0	0	0	0	0	0

Note (1): *, ** and *** are for the 10%, 5% and 1% significance levels, respectively, of the sum of the coefficients according to the Wald Coefficient Test.

(2): In the reduced model, as FPE eliminates the variables representing the exchange rate shocks from some of the models, those probabilities are null.

not statistically significant. Our results suggest that the export channel is effective in the face of unanticipated currency appreciation, thus supporting Kandil (2000). However, we find that government investment increases in the face of unanticipated currency appreciation, a consequence not suggested by Kandil (2000). Although Kandil (2000) finds that Turkey does not empirically support her model in the face of unexpected depreciation, our results support output contraction through total private investment, where Kandil (2000) argues that the supply channel leads to contraction. Overall, on the output side, our results empirically support the theoretical model proposed by Kandil (2000).

On the prices side, Kandil (2000) finds inflationary effects in the face of a currency depreciation while our results do not reveal any statistically significant

effect on prices. On the other hand, our results suggest that prices decrease in the face of currency appreciation.

In order to obtain more efficient parameter estimates, we estimate our empirical models jointly with the equations that determine proxy variables using three-stage least squares (3SLS), as suggested by Pagan (1986). The instrument variables in the estimations are the eight lags of dependent, and independent variables, two dummy variables for the financial crisis in April 1994 a dummy variable for September 2001 terrorist attacks, and the seasonal dummies¹⁴.

The results of three-stage least square estimations suggest that in the face of unanticipated exchange rate depreciation, total private investment, total exports, prices, M1R and the treasury bond interest rate decrease whereas government investment increases. On the other hand, in the face of unanticipated exchange rate appreciation exports, prices and interest rate decrease while government investment and government consumption increase as illustrated in Table 12 and Table 13.

When we compare the results of 3SLS estimates to Kandil (2000), we observe that our results on output still support hers but additional channels are in operation. In the face of currency depreciation, we suggest output contraction via the decrease in investments and exports where Kandil (2000) claim output contraction through the supply channel. Moreover, we find that government consumption increases on the demand side. On the other hand, in the face of currency appreciation, government consumption and government investment increases while

¹⁴ We included a dummy variable for the periods that repo variable was available. Therefore, the dummy takes the value 1 after 1993 and elsewhere takes the value zero.

Table 12. The Asymmetric Effects of the Real Exchange Rate–3SLS:

Marginal Significance Levels

	Test for Asymmetry		
	VAR	Reduced Model	Structural Model
Durable Private Cons.	0.74	0.01	0.97
Non-durable Private Cons.	0.03	0.10	0.84
Total Private Investment	0.02	0.02	0.04
Government Consumption	0.25	-	0.33
Government Investment	0.00	0.05	0.00
Total Exports	0.00	0.00	0.02
Total Imports	0.61	0.46	0.95
Prices	0.00	0.23	0.21
M0	0.13	-	0.41
M1R	0.13	0.02	0.16
Treasury Bond Interest Rate	0.00	0.53	0.01
Interbank Interest Rate	0.67	0.93	0.55

Note (1): In the reduced model, as FPE eliminates the variables representing the exchange rate shocks from some of the models, those probabilities are null.

Table 13. Signs of the unanticipated real exchange rate shocks – 3SLS

	VAR		Reduced Model		Structural Model	
	Positive Shocks	Negative Shocks	Positive Shocks	Negative Shocks	Positive Shocks	Negative Shocks
Durable Prv. C.	0	0	0	(+)**	0	0
Non-dur. Prv. C.	(-)**	0	0	0	0	0
Total Prv. Inv.	(-)**	0	(-)**	0	(-)**	(-)*
Government C.	0	(+)**	0	0	0	(+)**
Government Inv.	(+)**	(+)**	0	(+)**	(+)**	(+)**
Total Exports	(-)**	(-)**	0	(-)**	(-)**	(-)**
Total Imports	0	0	0	0	0	0
Prices	(-)**	(-)**	0	(-)**	0	(-)*
M0	0	(-)*	0	0	0	0
M1R	(-)**	0	(-)**	0	0	0
Treasury Int. R.	(-)**	(-)**	0	0	(-)**	(-)**
Interbank Int. R.	0	0	0	0	0	0

Note (1): *, ** and ** are for the 10%, 5% and 1% significance levels, respectively, of the sum of the coefficients according to the Wald Test.

(2): In the reduced model, as FPE eliminates the variables representing the exchange rate shocks from some of the models, those probabilities are null

exports decrease. Therefore, in these estimates, we surmise that the net effect of currency appreciation on output is contractionary.

On the monetary side, 3SLS estimates suggest that interest rates decreases in the face of both currency appreciation and depreciation. Moreover, in the face of currency appreciation, prices decrease, whereas in the face of currency depreciation money supply decreases.

4.5. Conclusion

In this study, we analyze the asymmetric effects of unanticipated exchange rate fluctuations on the components of GNP, prices, money supply and interest rates. We estimate three kinds of models-VAR, reduced model and structural form models - for each variable under consideration by using quarterly data for Turkey in the 1987:I-2001:IV period.

Our results suggest that in the face of unanticipated currency depreciation, private investment decreases, therefore we surmise that output contracts. On the other hand, exports and prices decrease, while government investment increases in the face of unanticipated currency appreciation.

In order to obtain efficient and consistent variance estimates, the models are also performed with 3SLS. The results show that there are more variables affected by unanticipated currency shocks when they are compared to the OLS estimates: in the face of currency depreciation private investment, exports, money supply and interest

rates decrease whereas government investment increases. On the other hand, in the face of currency appreciation government consumption and government investment increase while exports, Treasury bond interest rate and prices decrease with 3SLS estimates.

Our results suggest that when there is high deviation of the exchange rate around its anticipated value, the economy is adversely affected in Turkey. Therefore, when designing policies and stability programs for Turkey, the possible adverse effects of unexpected shocks of exchange rate should be taken into consideration in order to achieve the targets.



CHAPTER 5

Denomination Composition of Trade and Trade Balance:

The Empirical Evidence

5.1. Introduction

This chapter examines the effects of a change in USD-Euro parity on the trade balance for developing countries for a special case; denomination composition of trade is asymmetric. The empirical analyses for this special case are on Turkey. Turkey-where exports are mostly denominated in Euros and its imports are mostly denominated in USD- is analyzed and the results suggest that an appreciation of Euro against USD would increase the output in the long-run, appreciate the local currency and improve the trade balance for the 1985:01 2003:07 period. To the best of our knowledge, this study is the first one analyzing the effect of USD-Euro parity on the trade balance.

For many economies, the exports and imports are not denominated in the same currency. One of the reasons for this outcome is that the market share of exports and imports are not necessarily similar. In other words, countries need not export to a country they import from. This is only a simple observation about the currency denomination of trade. However, there is a new literature on the optimal

currency denomination of trade in the context of the 'new economy macroeconomics'.

Bachetta and Van Wincoop (2001) find that the two main factors determining the invoicing choice are market share and differentiation of goods. The higher the market share of an exporting country, and the more differentiated its goods, the more likely its exporters will price in the exporter's currency. The model also implies that greater country size makes invoicing in the exporter's currency more likely. In Bachetta and Van Wincoop (2001), they numerically solve the invoicing decision in a general equilibrium model. The optimal strategy depends on various preference parameters, but the intuition is far from clear. Devereux and Engel (2001) derive an analytical solution to the invoicing choice under a particular parameterization. They show that countries with lower monetary volatility may prefer to price in their own currency.

Therefore, it may be the case that countries would have their exports and imports denominated in different currencies. However, as this is a new literature, the effects of a fluctuation between currencies that denominates exports and imports on the economy has not been analyzed, whereas the change in the parity of currency that denominates exports and imports (trade related parity) would affect real exchange rate and trade balance. Black (1996) illustrates the main issue by the following hypothetical example.

Assume that Korea exports only to the United States in dollars and imports only from Japan in Yen. If e_y is the won/yen exchange rate and $e_\$$ is the won/dollar exchange rate, then export prices are $p_\$e_\$$ and import prices are $p_y e_y$. The terms of trade will then be $p_\$e_\$ / p_y e_y = p_\$/p_y e_{y/\$}$, where $e_{y/\$}$ is the yen/dollar exchange rate. If dollar prices and yen prices remain relatively stable, the terms of trade will fluctuate with the yen/dollar exchange rate, no

matter what happens to e_y or e_s . This is the key problem for Korea. Only if the yen/dollar rate follows purchasing power parity will Korea be unaffected by its fluctuations.

Black (1996) mentions this issue on the perspective of the determination of exchange rate policy, only *verbally*. However, as his example gives a direct intuition, the change in the parity would be treated as a terms of trade shock. In this perspective, the aim of this chapter is to figure out the effects of the trade related parity for a small open economy with asymmetric trade currency denomination composition, in other words for Turkey.

Denomination composition of exports and imports are not symmetric in Turkey, exports are mostly denominated in Euros whereas imports are mostly denominated in USD. Therefore, a change in USD-Euro parity has asymmetric effects on imports and exports in Turkey, meaning an influential effect on trade balance, which makes it interesting to examine Turkey's case.

When it is the case that denomination composition of trade is asymmetric, our conjecture is that the country is affected from the parity changes. As the USD-Euro parity increases (appreciation of Euro against USD), lower input prices compared to export goods prices is the result. In other words, with a rise in USD-Euro parity export prices increases in real terms compared to imports prices: thus the terms of trade improve. Therefore, one may interpret a shock to parity as a shock to the terms of trade.

In the literature, the studies on Harberger-Laursen-Meltzler effect, which suggests that trade balance improves as a result of a positive terms of trade shock, are

the closest studies on this issue. While examining the effects of terms of trade, the studies on the HLM effect consider domestic factors only. Therefore, this study is the first one analyzing the effects of an external shock on the trade balance and moreover, we combine the literature on the HLM effect with the optimal currency of trade literature.

In this respect, although there is no study on the effects of a change in parity for a small open economy with different currency denomination of exports and imports, there is an extensive literature on the effects of an exogenous change in a country's terms of trade on the trade balance of a country. Harberger (1950) and Laursen and Metzler (1959) are the influential studies in this area. They suggest that an increase in the terms of trade of a small open economy would result in an improvement in the country's trade balance, which is called as Harberger-Laursen-Metzler (HLM) effect. The idea behind their results is that an improvement in the terms of trade increases a country's real income. With the Keynesian consumption function they use, the marginal propensity to consume is less than one, resulting in an increase in private savings and therefore improvement in the trade balance. The contributions in this literature will be evaluated as the theoretical and the empirical literature, separately¹⁵.

On the theoretical side, there are dynamic papers such as Obsfeld (1982), Dornbush (1983), Svensson and Razin (1983), Persson and Svensson (1985), Bean (1986), Matsuyama (1987) and Sen and Turnovsky (1989). These papers suggest that two features of the economy are critical in determining the pattern of co movements:

¹⁵ There are some studies in the literature that contributes both theoretically and empirically to the HLM effect literature. However, for the purpose of exposition, we introduce their contributions separately as theoretical and empirical.

the persistence of the shock and the form of dependence of the discount factor, of rate of time preference, on future utility. Svensson and Razin (1983, p.100) states that 'A permanent terms of trade deterioration... causes a deterioration or improvement in the real trade balance, depending on whether... the rate of time preference decreases or increases, respectively, with the level of welfare'. Obstfeld (1982) assumes that the rate of time preference is decreasing in future utility and therefore predicts a decline in the trade balance. But these studies are lack of an explicit stochastic structure, as Backus (1993) claims. This literature suggests that the effects on the trade balance of a change in the terms of trade depend critically on its persistence.

In Backus' (1993) complete-markets economy, there is, in equilibrium, a complete mathematical separation between periods, so that an increase in foreign output that induces a decline in the terms of trade is associated with the same change in the trade balance whether it lasts one period or a hundred. He traces the difference between his conclusions to implicit differences in the asset structure: the extent to which agents can insure themselves against fluctuations that give rise to movements in the terms of trade. He examines the relation between the trade balance and the terms of trade in a two-country dynamic stochastic exchange economy with complete markets. Along an equilibrium path for this economy, the relation is governed by the substitutability between foreign and domestic goods. He finds in contrast to non-stochastic analyses of the Harberger-Laursen Meltzer effect that a positive association does not require persistent shocks or non-constant rates of time preference. This contrast highlights the role played by the structure of asset markets, complete and otherwise, in generating equilibrium co movements. He has suggested

an interpretation of co movements in the trade balance and the terms of trade based on a stochastic economy with complete markets for state-contingent claims. In this economy the sign of the relation between these two variables is determined by the elasticity of substitution between foreign and domestic goods.

Likewise, Mendoza (1992) analyzed the subject on the perfect foresight models ground. Mendoza (1992) examines macroeconomic effects of random shocks to output, the terms of trade, and the real interest rate in an intertemporal equilibrium model of a small open, endowment economy with incomplete insurance markets. Agents consume three goods; two tradable, a home good and an imported good, and one non-tradable. The model was parameterized using as guides the stylized facts for output, terms of trade, and interest rate fluctuations, and existing empirical evidence on preference parameters. Recursive numerical solution methods were used to compute moments of variability, co movement, and persistence of the endogenous variables. The model mimics some stylized facts, particularly the HLM effect and the cyclical properties of consumption.

After describing the positive correlation between the terms of trade and the trade balance across industrialized countries econometrically, Backus, Kehoe and Kydland (1994) provide a dynamic general-equilibrium interpretations of these properties. Extending the earlier work on trade and price dynamics by Hodrick (1989) and Stockman and Svensson (1987), who develop simple general-equilibrium models in which both the trade balance and the terms of trade are endogenous, they find that the general-equilibrium perspective is essential, in the sense that the correlations between trade and relative prices depend critically on the source of

fluctuations and the theory mimics the cross correlation function for the trade balance and the terms of trade.

Senhadji (1998) extends Backus, Kehoe and Kydland (1994) analysis to less developed countries (LDC). He finds that there is a positive correlation between terms of trade and trade balance for the 30 LDC's in his sample and he shows that a similar correlation pattern can also be reproduced by a stochastic growth model of an LDC economy.

On the empirical side, the econometric studies on this subject are not extensive. Backus, Kehoe and Kydland (1994) describe the positive correlation between the terms of trade and the trade balance across industrialized countries. Mendoza (1995) analyzes the effects of terms of trade on real income and trade balance using impulse response functions. His evidence suggests that an improvement in terms of trade results in an increase in real income and an improvement in trade balance for G-7 countries. Using panel data, Kent (1997) argues that countries with the least persistent terms of trade shocks exhibit a positive relationship between these shocks and the current account, whereas countries with the most persistent terms of trade shocks exhibit a negative relationship. Finally, Cashin and McDermott (1998) support the HLM effect by using the substitution effect argument for the OECD countries. They find that movements in the terms of trade are an important cause of variation in the current account position for most of the developed countries in their sample. In addition, shocks to the terms of trade are very persistent for all countries except the United States. They decompose movement in the terms of trade into its permanent and temporary components, and find that the

temporary component of movements in the terms of trade is large for all countries, accounting for about half of the variance of quarter-to-quarter changes in the terms of trade. Cointegration and generalized method of moments estimation indicate that terms of trade shocks induce large and significant intratemporal and intertemporal substitution effects, which operate to offset any associated income effects on saving decisions and the current account position. Finally, Otto (2003) provides strong evidence for the existence of a conventional HLM effect from the SVAR models. For the vast majority of the 55 small open economies examined in the study, he finds that the immediate effect of a positive shock to the terms of trade is an improvement in the balance of trade. This finding is similar across both developing countries and small OECD countries.

To the best of our knowledge, there are no studies examining the effects of a change in the parity of major currencies on a developing country's economic performance, which is the aim of this paper. Therefore, this chapter contributes to the literature, by figuring out the macroeconomic implications of optimal currency denomination of trade, which is a microeconomics-based theory and combining it with the HLM literature. Moreover, by analyzing the effects of an external shock, USD/Euro parity, which fluctuates much in the last decade, we give insight to policy makers for keeping the external balances in equilibrium and for implementing the right exchange rate policies.

On the methodology side, in macroeconomics, performing policy analysis using the econometric methods constitutes importance. There are large structural models for these purposes. However, Sims (1980) questions the many identifying

assumptions made by traditional large-scale macroeconomic models and suggests the use of impulse responses from vector autoregressions (VARs) for policy analysis. Although structural VAR work has focused on contemporaneous relationships between variables or between residuals in a system of equations, identification, the ability to attribute to an economically interpretable shock, has remained a problem.

Blanchard and Quah (1989) were among the first to use long-run restrictions as a means of identification of VAR models. However, there is a literature suggesting that these long-run restrictions prevent the theory capturing what the data suggests, for models including real exchange rate and trade balances, where identifying nominal shocks by imposing the restriction of long-run PPP is a common practice. Under this restriction, nominal shocks do not have long run effects on real exchange rates. On the other hand, there is a consensus from the empirical evidence that the effects of nominal shocks on real exchange rates are long lasting and at the very least dampen out very slowly. Furthermore, in Lane's recent open economy sticky-price intertemporal model, nominal shocks can potentially have long run effects on both a country's real exchange rate and trade balance. In their paper, they estimate SVAR models of output, the real exchange rate and trade balance for G-7 countries. In view of Lane's theoretical contribution and the consensus view that nominal shocks have long-lasting impacts on real exchange rates, they do not use PPP as an identifying assumption. Rather a contemporaneous restriction is used to identify nominal shocks in the structural VAR's. Under their identification scheme, a positive nominal shock results in a depreciation of each country's real exchange rate in the short run and importantly in the long run as well. It is this long-run real depreciation that can explain their finding that a positive nominal shock improves trade balance of each

country at long horizons and accounts for around one-half and for some countries two thirds of the forecast error variance of the trade balance at long forecast horizons. In Fisher and Huh (2002), structural VAR models for the G-7 are identified in such a way that nominal shocks, at least potentially can have long-run effects on each country's trade balance.

Modeling an economy from the small open economy perspective is another problem. Cushman and Zha (1997) address the empirical puzzles on monetary policy framework for the relatively small open economy by applying a structural VAR approach, using Canada as a case study. They criticize the previous empirical work on their area, which uses VAR approach applying various identifying techniques beyond Choleski decomposition on the ground of a small open economy perspective. Cushman and Zha (1997) use Canada as a case study. Since, shocks from Canada probably have little effect on other countries, the US and foreign variables are treated as exogenous from Canada's point of view. The methodology they use is block exogeneity. Block exogeneity has been applied before in a small open economy analysis by Genberg et al. (1987) for Switzerland, and Racetta and Rayould (1992) for Canada (no error bands for impulse responses). The gist of their specification is to extend the general methodology by Bernanke (1986), Blanchard and Watson (1986), and Sims (1986) to their model of small open economy. The imposition of block exogeneity follows naturally from small open economy models and helps identifying the monetary reaction function from the viewpoint of the small open economy.

The generalized theory on block exogeneity is studied in Zha (1999), which states it as Bayesian methods that can be readily applied to economic problems that surface when over-identification in VAR relates to lag structure. The methods deal with situations wherein a structural model is composed of blocks that are recursive in the coefficient of contemporaneous variables and wherein lag structure, due to possible restrictions on lagged behaviors, may change from block to block. This paper sets out a generalized block Monte Carlo method to show that it is possible to obtain ML estimation and exact Bayesian inference with substantial computational gains. Zha (1999) states that there are instances, in which over-identification in VAR relates to lag structure as certain lags do not enter certain equations. In many empirical applications, such restrictions are not reasonable; on the contrary, restrictions on the lag structure are necessary on the ground of economic reasoning. These situations frequently stem from some block exogeneity restrictions such as the crucial small-open-economy feature in international economics or from some beliefs that certain lags do not appear in certain equations (e.g. Zellner and Palm, 1974; Zellner, 1985; Leeper and Gordon, 1992; Sims and Zha, 1995; Bernanke et al., 1997). Failing to impose these restrictions because they may complicate statistical inference not only is economically unappealing but also may result in misleading conclusions.

In order to explore the dynamic effects of the change in the USD-Euro parity on the Turkish economy, we used VAR methodology. Concerning the fact that Turkey is a small-open economy, the change in USD-Euro parity would affect the economic performance of Turkey. However the reverse that Turkish economic indicators would have an effect on world prices is not realistic. Therefore, following

Cushman and Zha (1997), we use an identified VAR model with block exogeneity, which allows identifying foreign shocks from the point of the view of the small open economy.

To sum up, on the methodology side, this chapter contributes the literature on applying the block exogeneity methodology, which is extensively used in monetary policy framework, to a new area; the effects of a change in parity to trade balance.

In conclusion, the purpose of this paper is to analyze the effects of a change in parity of world's major currencies on less developed economies, which currency denomination of trade is asymmetric. To be particular, in this paper we assess how the value of Euro in terms of USD affects the economic performance in less developed countries, which exports are mostly denominated in Euro and imports are mostly denominated in USD, empirically. The case study is Turkey. The empirical evidence provided in this chapter suggests that the appreciation in the Euro for USD increases output in the long run, appreciates the local currency and improves the trade balance. However, an adverse shock to the USD-Euro parity would result in real exchange rate depreciation of Turkish Lira and trade deficits. Therefore, policymakers should concern that fluctuations of USD-Euro parity would have adverse effects on the Turkish economy, so the necessary mechanisms that would prevent these adverse effects should be put into action.

5.2. Turkish Trade Balance and its Relation with the USD-Euro Parity

In the last two decades, Turkey experienced two detrimental crises in 1994 and 2001. All these crises are triggered by the changes in the trade deficit. In the pre-1994 period, there was not such a big problem in the balance of payments in Turkey. However, with the structural problems that started to influence the macroeconomic balances in 1993, Turkey became vulnerable to the magnitude of the trade imbalances. Until 1993, the trade balance to GNP ratio was fluctuating around -5 percent, however in 1993 trade deficit increased to above 10 percent, as seen in Figure 8. After 1995, Turkey financed its large public deficits with the private savings. On the other hand, whenever it is the case that private savings are not enough to finance the high fiscal deficits, Turkey financed this with the capital account that ultimately caused the trade deficit. In the 1995-1999 era, the trade balance-GDP ratio was around -10 percent; however just before the economic crisis 2001 this ratio increased to an unsustainable level, -20 percent, and crises occurred in February 22, 2001. Thus, low trade deficits are vital for the stability of the economy, and it is necessary to examine that the shocks that would affect the trade balance.

Before analyzing the effects of USD-Euro parity on trade balance, it is necessary to figure out the links between USD-Euro parity and trade balance for the Turkish economy. Turkey is a small open economy that is a member of the European Customs Union with no restrictions on the trade of most of goods. About half of the exports of the country is to European Union countries and 49.3 percent of exports is in Euros whereas 42.7 of exports is in USD. However, only 38.7 percent of the

imports are in Euros and 56 percent is in US dollars.¹⁶ To sum up denomination composition of exports and imports are not symmetric in Turkey, exports are mostly denominated in Euros whereas imports are mostly denominated in USD. Therefore, a change in USD-Euro parity may have asymmetric effects on imports and exports in Turkey, meaning an influential effect on trade balance, which makes it interesting to examine Turkey's case. As an example, in year 2003, USD-Euro parity significantly increased and Turkey experienced an unexpected increase in its exports. The calculations showed that the gain in exports arising from the increase in parity is 12 percentage points, which is a significant contribution.

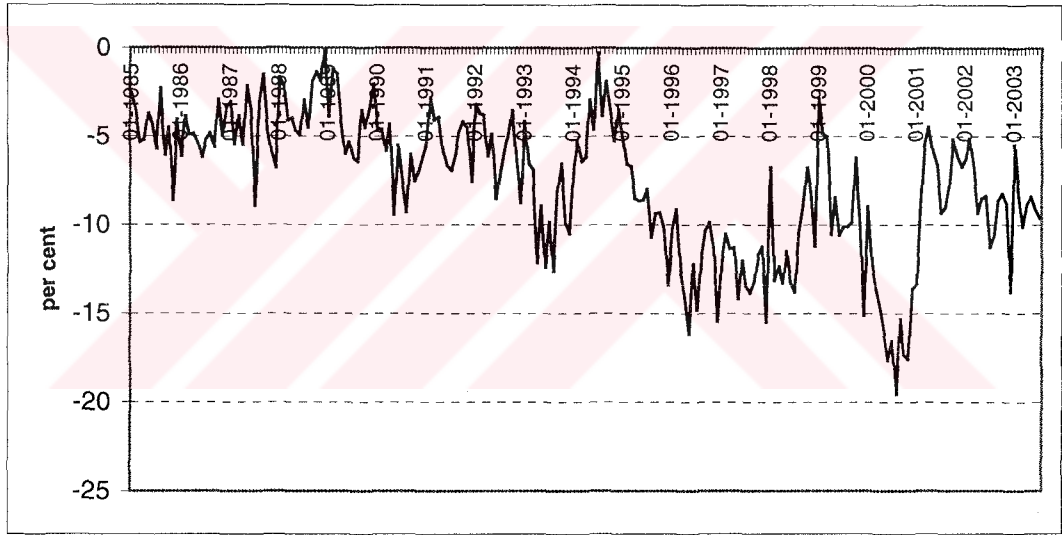


Figure 8. The Ratio of Trade Balance to GNP

Furthermore, Turkey's imported intermediate and raw materials, which constitutes around 73% of total imports, are mostly USD dominated. Thus, as the USD-Euro parity increases (appreciation of Euro against USD), lower input prices compared to export goods prices is the result. In other words, with a rise in USD-

¹⁶ The denomination composition figures for exports and imports are taken from Balance of Payments Report of Central Bank of Turkey and covers the period January-October 2003.

Euro parity export prices increases in real terms compared to imports prices: thus the terms of trade improve. Therefore, one may interpret a shock to parity as a shock to the terms of trade, also.

5.3. Developments in USD-Euro Parity

It is necessary to analyze the movements in the parity before exploring its effects on the economy. In the last decade USD-Euro parity followed a fluctuating pattern as seen in Figure 9. At the beginning of the sample, January 1985, USD was more valuable than Euro, where Euro was a representative currency named as Ecu. However, from 1986 onwards the trend changed and the USD-Euro parity increased. This trend continued until 2000. On the 1st of January 1999, the currencies of the member states of the Euro-Zone were locked together under the Euro. From that date until the 1st of January 2002, the Euro was the currency of the participating member states while the national currency units were sub-divisions of the Euro. Since, the 1st of January 1999 the Euro may be regarded as a currency in its own right, and governments, banks and many large companies have started to invoice and account in euros. In other words, between 2000 and 2002 the Euro-area was in a transition period, and during this transition period the USD-Euro parity was less than 1, implying a stronger USD. However, from November 2002 to July 2003, which is the end of the sample considered in this paper, the structure has changed and the USD-Euro parity exhibited an increasing trend.

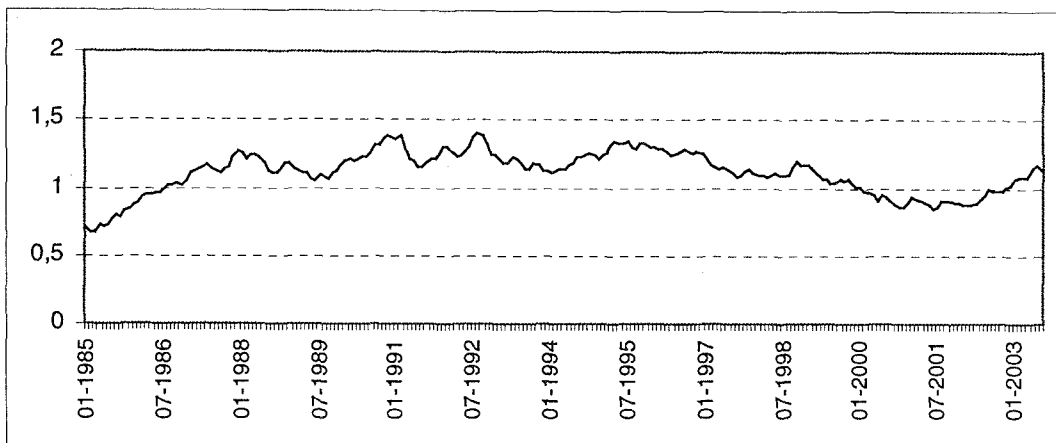


Figure 9. USD-Euro Parity

To sum up, Euro, which was only a representative currency till 1999, followed a volatile path against USD in the last decade and nowadays is on the way to be a vehicle currency in the world. It is the aim of the finance market to predict the future path of the parity; however it is not easy to decrease the error-bands in the parity forecasts. Therefore, it is important to distinguish the stochastic pattern of the trade balance that is affected from the change in the parity. Otherwise, it would not be possible to achieve the desired macroeconomic balances without considering the effects of a possible change in the parity.

5.4. Data and Descriptive Statistics

The data used in the paper is monthly and cover the period 1985:01 to 2003:07. Data in the model is as follows: USD-Euro parity, $parity_t$, the value of Euro against USD; however before December 1998 we took the value of ECU against USD as parity and the data is obtained from the European Central Bank web site

(www.ecb.int). For the *real exchange rate* we use two definitions. First, the real exchange rate is calculated as USD times the wholesale price index of Turkey divided by the US CPI, rer_t (an increase in the real exchange rate means an appreciation; this is the most widely taken real exchange rate definition by economists). Second, the definition of State Planning Organization-official definition of real exchange rate-, $rerspo_t$, is calculated with relative weights of 0.75 USD and 0.25 Euro and the corresponding countries' prices and taken from the Main Economic Indicators of State Planning Organization (SPO). The price index, and nominal exchange rate indicator; USD are obtained from the Central Bank of the Republic of Turkey data delivery system¹⁷ and US CPI is from the web site of St. Louis FED¹⁸. Relative output, $rely_t$, is the ratio of domestic *industrial production*, from the Central Bank's web site, to *industrial countries seasonally adjusted industrial production* that is obtained from the IMF-IFS tape. Finally, *trade balance*, trb_t , is the ratio of the difference between exports minus imports in TL to nominal industrial production (generated by the industrial production index and the wholesale price index), where export and import series are from the Main Economic Indicators of State Planning Organization; they are *fob* values in million dollars. All the series enter into the analysis in their logarithmic form except trade balance and relative income, they entered as ratio.

Table 14 summarizes the results obtained from testing parity, real exchange rate, relative income and trade deficit for a unit root with the Augmented Dickey-Fuller (ADF) test with constant, in the first column. In the second column, the ADF test is repeated for the first differences of the data. In the first column, we cannot

¹⁷ <http://tcmbf40.tcmb.gov.tr/cbt.html>

¹⁸ <http://research.stlouisfed.org/fred2>

reject the null hypothesis of no unit root in the level of each series. However, we can reject the null of unit root in the first difference of each series. Thus the ADF tests suggest that parity, real exchange rate, relative income and trade deficit are I(1).

Table 14. Unit Root Tests

Variables	Level	First Difference ⁺
Parity	-2.52	-3.69***
Real Exchange Rate	-2.15	-4.40***
Relative Income	-1.78	-4.60***
Trade Balance	-2.29	-4.61***

(-) The critical value is -2.88.
 *** indicate the level of significance at 1% level.

Table 15 gives the correlation matrix of the first differences of parity, real exchange rate, relative income and trade balance (their first differences are included as the levels are not stationary). The results suggest that parity is positively correlated with relative output, trade balance and the real exchange rate. So, an appreciation of USD-Euro parity increases the relative income, improves the trade balance and appreciates the real exchange rate.

Table 15. Correlation Matrix

	Parity	Relative Income	Real Exchange Rate	Trade Balance
Parity	1.00	0.04	0.29	0.10
Relative Income	0.04	1.00	0.03	-0.09
Real Exchange Rate	0.29	0.03	1.00	0.04
Trade Balance	0.10	-0.09	0.04	1.00

Table 16 reports the cross correlations of USD-Euro parity with the real exchange rate, relative income and trade balance at various leads. The lead number indicates the number of months by which the variables are led relative to parity. Table 16 suggests that USD-Euro parity is positively correlated with relative income for up to 7 months. The positive correlation of parity with the real exchange rate appreciation is valid for the whole period. On the other hand, the positive correlation of parity with trade balance continues for all the leads. Therefore, cross correlation results support the results of the correlation matrix. There is a positive static relationship between parity relative income, trade balance and real exchange rate appreciation.

Table 17 reports the Johansen co-integration test performed with relative income, real exchange rate and trade deficit, where parity is taken as exogenous considering that it is unaffected by the Turkish economy. Under the Johansen tests, λ_{trace} and λ_{max} tests suggest that *there is less than one or exactly one co-integration vector hypotheses* are rejected at 5% significance level. But there are two co-integration vectors but not more than two vectors hypothesis cannot be rejected. Therefore, there is a long run relationship between parity, relative income, real exchange rate and trade balance, in other words they are co-integrated as shown in Table 17. Thus, following Sims, Stock and Watson (1999), we enter these variables into the system in levels when the VAR analysis is performed.

Table 16. Cross Correlations of Parity with Other Variables

Lags	Relative Income	Real Exchange Rate	Trade Balance
0	0.22	0.65	0.06
1	0.20	0.63	0.07
2	0.18	0.61	0.09
3	0.15	0.59	0.12
4	0.11	0.57	0.13
5	0.07	0.55	0.15
6	0.04	0.54	0.18
7	0.02	0.52	0.21
8	-0.01	0.51	0.24
9	-0.03	0.49	0.26
10	-0.05	0.46	0.27
11	-0.06	0.44	0.29
12	-0.08	0.41	0.31

Table 17. Co-integration Test

Null Hypothesis	Alternative Hypothesis		95% Critical Value	99% Critical Value
λ_{trace} tests		λ_{trace} value		
$r=0$	$r>0$	46.81	35.07	40.20
$r\leq 1$	$r>1$	21.17	20.17	24.99
$r\leq 2$	$r>2$	4.61	9.10	12.74
λ_{max} tests		λ_{max} value		
$r=0$	$r=1$	25.64	21.89	26.41
$r=1$	$r=2$	16.56	15.75	19.83
$r=2$	$r=3$	4.61	9.10	12.74

Thus, this section reports the existence of static and dynamic correlation between USD-Euro parity and relative income, real exchange rate and trade balance, respectively. However, these correlations are pairwise and do not account for the interrelationships among themselves. Thus, in the next section, we estimate a VAR model that accounts for the inner relationships. Furthermore, VAR models capture dynamic relationships and controls for other variables. Last, the existence of a long-run relationship among the variables of interest encourages us to use these variables in their log levels.

5.5. Model Specification (VAR)

Our aim in this paper is to assess the dynamic effects of a change in USD-Euro parity on the Turkish economy. In order to capture the responses of domestic variables to a foreign shock, using impulse response functions using a VAR would be one method for assessing the dynamic effects. However, there is a serious drawback of this methodology when it is used in its standard form like in Sims (1972). That is, the foreign variables are affected by the domestic variables with lags, which is not the case for a small open economy, whereas we want to identify the shocks from the perspective of a small open economy, Turkey. Therefore, for our aim the impact of the foreign shock on domestic economy is important not the reverse.

The identified VAR model with block exogeneity, however, overcomes this problem and has another advantage. With this method, we may specify economically

meaningful simultaneous interactions among variables, instead of a complete set of equations. In other words, there is a restriction on lagged relationships; they are determined by the data.

To figure out the details of the identified VAR model with block exogeneity, we may start with a general specification as in Zha (1999).

$$A(L)y(t) = \varepsilon(t) \quad (\text{Eq. 5.1})$$

In Eq. (2.30) $y(t)$ is an $m \times 1$ vector of observations, $A(L)$ is an $m \times m$ matrix polynomial in the lag operator L with non-negative powers and $\varepsilon(t)$ is an $m \times 1$ vector of structural disturbances. The specification in matrix form is as follows:

$$y(t) = \begin{bmatrix} y_1(t) \\ y_2(t) \end{bmatrix}, A(L) = \begin{bmatrix} A_{11}(L) & 0 \\ A_{21}(L) & A_{22}(L) \end{bmatrix}, \varepsilon(t) = \begin{bmatrix} \varepsilon_1(t) \\ \varepsilon_2(t) \end{bmatrix}. \quad (\text{Eq. 5.2})$$

The assumptions of Eq (5.2) are that the coefficient matrix of $L^0 A_0$, is non-singular and $\varepsilon(t)$ is uncorrelated with past $y(t-s)$ for $s > 0$. In the $A(L)$ matrix, $A_{12}(L)$ is zero representing the block exogeneity and it means that the first block $y_1(t)$ is exogenous to the second block $y_2(t)$ both contemporaneously and for lagged values of the variables.

The maximum likelihood estimation of VAR models (Sims, 1986; Gordon and Leeper, 1994) is not applicable to the identified VAR model with block exogeneity. Therefore, the maximum likelihood estimation and inference for the second block are computed with the conventional Choleski normalization with the modified error bands of Sims and Zha (1998). The detailed methodology can be followed up from Zha (1999).

The lag order of the identified VAR model with block exogeneity is 1, as the Schwartz Criteria test suggests, and it is set up for Turkey is as $y_1 = [\text{USD-Euro parity}]$ and $y_2 = [\text{real exchange rate, relative output, trade balance}]'$. Therefore, the foreign shock that we are trying to find the impact of is changes in the USD-Euro parity in our analysis. With this specification, the parity is not subject to any feedback from the domestic economy, neither contemporaneously nor with lags, however the reverse is valid, i.e. domestic economy is affected from the foreign shock both contemporaneously and with lags. On y_2 , the ordering of variables is important. We assume that the relative income will contemporaneously affect the real exchange rate and trade balance, but the relative income will not be contemporaneously affected by these two. The real exchange rate will contemporaneously affect the trade balance but affected by relative income. Moreover, the trade balance will be contemporaneously affected by relative income and real exchange rate, but not contemporaneously affect other variables. Here, two things are important: (1) all these three variables affect each other with lags and (2) USD-Euro parity will affect these three variables both contemporaneously with lags but will not be affected by these three in any form. In the specification, we also add a constant term, and monthly dummies to account for seasonality.

5.6. Impulse Response Functions

The effects of a positive shock to USD-Euro parity (USD value of Euro) are assessed by using impulse response function analysis. Figure 10 and 11 report the impulse response functions of the relative income, real exchange rate and trade

balance when one standard deviation shock is given to the parity with two different real exchange rate definitions. Following, Sims and Zha (1998), the 90% confidence bands are calculated using the bootstrap method with 500 draws and the middle line represents the median of the draws.

Figure 10 reports impulse response functions of parity, $parity_t$, on parity, relative income, $rely_t$, real exchange rate calculated with dollar, rer_t , and trade balance, trb_t . In the first diagram, a positive shock to USD-Euro parity is presented. Parity is affected positively in a statistically significant fashion. The initial increase in parity is more than the shock for five months, then decreases and dies out after 23 months. This behavior of parity would be an explanation for J-curve. Second diagram shows that a positive shock to USD-Euro parity does not affect the relative income for fourteen months in a statistically significant fashion. Then, relative income increases for three months and after sixteen months the effect of a positive shock of parity on relative income disappears statistically significant fashion. The third diagram shows the response of the real exchange rate to a positive shock to parity. Real exchange rate appreciates for the whole period as a response to a shock to parity and this effect is statistically significant. In the fourth diagram the effect of a positive shock to USD-Euro parity on the trade balance is presented. Trade balance improves for six months as a response in a statistically significant fashion. The initial effect of the positive shock to parity on the trade balance is small, but the effect of the shock shows an increasing trend in the first four months. The peak point of the increase on the trade balance is at the fourth month. However, after the fourth month the effect starts to decrease and after the seventh month the effect is no longer

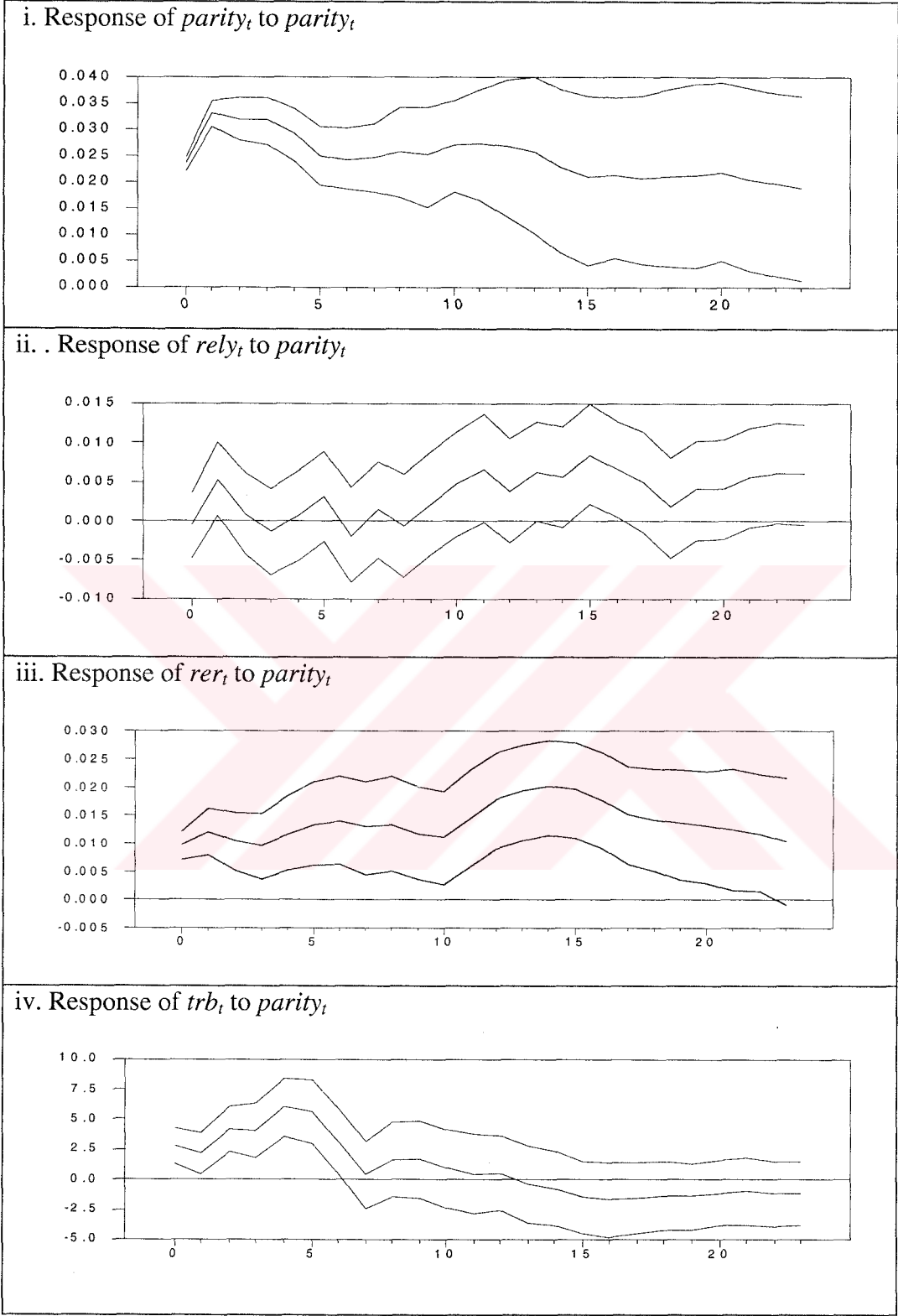


Figure 10. Impulse Response Functions with Commonly Used Definition

statistically significant. Therefore, Figure 10 indicates that the appreciation of USD-Euro parity results in an appreciation of real exchange rate of Turkey, increase in the relative income and improvement in the trade balance. Therefore, Turkish economy benefits from the appreciation of USD-Euro parity.

Figure 11 repeats the same analysis of Figure 10, but uses the official SPO definition of the real exchange rate rather than the most widely used one. The results are similar, but there are quantitative differences. The first diagram, as before, presents a positive shock to USD-Euro parity, and resembles J-curve as before. In the second diagram, it is seen that a positive shock to USD-Euro parity does not affect the relative income until the fourteenth month in a statistically significant fashion. Between fourteen and sixteen months relative income increases. Then the effect of the shock dies out. The third diagram shows the response of the real exchange rate to a positive shock to parity. The response of the real exchange rate with the SPO definition is also appreciation, but this effect is not significant between third and tenth months. Lastly, trade balance improves for 6 months in a statistically significant fashion. Comparing Figure 10 and Figure 11, i.e. comparing the effects of using different definitions of the real exchange rate, the attitude of the effect are similar but latter one has wider confidence bands.

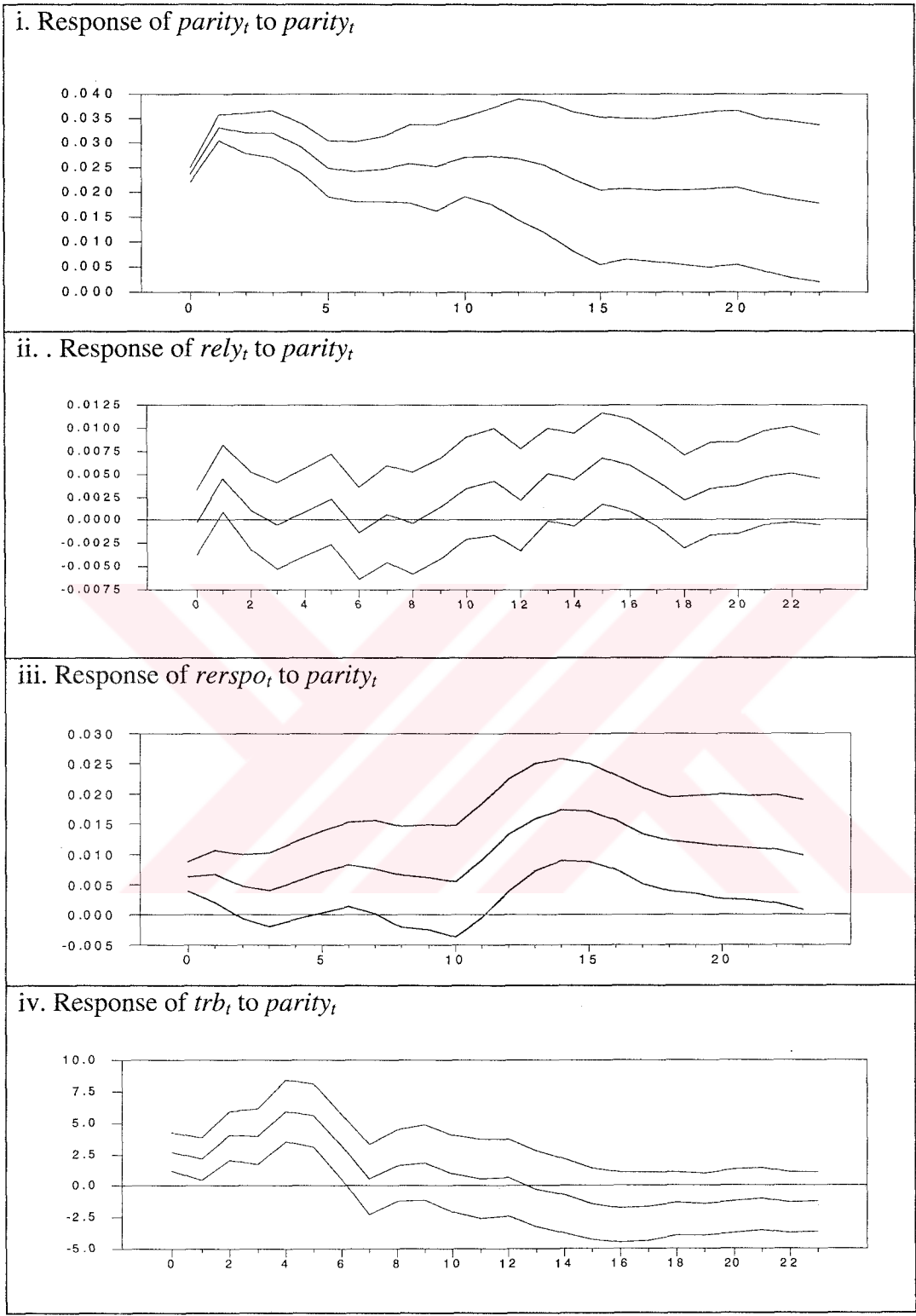


Figure 11. Impulse Response Functions
(SPO definition is used as real exchange rate)

To summarize, a positive shock to USD-Euro parity affects relative income in the long run, however, it results in an appreciation in real exchange rate and an increase in the trade balance. As a robustness test we change the order of variables in the second block so that the trade balance is placed before the real exchange rate and the analysis is repeated. The impulse response functions are reported in the Appendix D (Figures D.1 and D.2). The results are robust.

The estimates could be capturing the effects of terms of trade with the USD-Euro parity. To account for this, we tested for the effects of parity after including the terms of trade variable in our specification. Firstly, the terms of trade enters into the analysis as an exogenous variable, we included the lag of the terms of trade in Figure D.3 of Appendix D and secondly, both the current value and its first lag in Figure D.4 of Appendix D. The results do not change even when the terms of trade is controlled as an exogenous variable. Thirdly, in Figure D.5 of Appendix D, we included the terms of trade in our model as an endogenous variable. For testing if parity is a proxy for the terms of trade effect we put the terms of trade as the first variable in the second block. The analysis indicates that the terms of trade improve with a parity shock. On the other hand, the real exchange rate appreciates and trade balance improves as in without the terms of trade case. Lastly, in Figure D.6 of Appendix D, we put the terms of trade instead of parity and analyze the effects of a change in terms of trade on the other variables. The analysis suggest that an improvement in the terms of trade results in a depreciation in the real exchange rate, and does not affect the relative output nor the trade balance.

The oil prices would affect the trade balance. To account for this, oil prices are included to the estimates as an exogenous variable. The results remain robust as in Figure D.7 of Appendix D. Last, instead of a block exogeneity we estimated a standard VAR with the first difference of parity. Figure D.8 of Appendix D shows that the results do not change.

5.7. Conclusion

The purpose of this chapter is to analyze the effects of change in parity of world's major currencies on developing open economies, where denomination composition of trade is asymmetric.

In this chapter, we assess how the value of Euro in terms of USD affects the economic performance in Turkey. Turkey mostly imports goods in USD and exports in Euro. The empirical evidence provided suggests that the appreciation in the Euro for USD increases output in the long run, appreciates the local currency and improves the trade balance.

CHAPTER 6

DO FINANCIAL CAPITAL FLOWS IMPROVE MACROECONOMIC PERFORMANCE IN EMERGING MARKETS? : THE TURKISH EXPERIENCE

6.1. Introduction

There is an ongoing debate on the *pros* and *cons* of capital inflows. Neo-classical economists support the view that capital inflows are beneficial because they create new resources for capital accumulation and stimulate growth in developing economies with capital shortages. FitzGerald (1998) theoretically argues that higher capital inflows lower interest rates, which help increase investment and economic growth. On the empirical side, using data for 17 emerging markets, Bekaert and Harvey (1998) find a positive relationship between equity capital flows and key macroeconomic indicators, including growth and inflation. Evidence from Latin American and Far Eastern economies shows that capital inflows tend to appreciate real exchange rates, lower interest rates, and increase consumption, investment and economic growth (Corbo and Hernandez, 1994; Calvo, Leiderman and Reinhart,

1994; Fernandez-Arias and Montiel, 1995; Khan and Reinhart, 1995; Antzoulatus, 1996; and Kamin and Wood, 1997).

In contrast, the recent financial crises in Asia, Russia and Latin America have created doubts about the benefits of capital inflows and emphasized the necessity of capital controls. There are earlier studies supporting the premise that capital inflows are used to finance imports and domestic consumption (Frenkel, Fanelli and Rozenwurcel, 1993; Agosin, 1994; and French-Davis, Titelman and Uthoff, 1994). Rodrik (1998) argues that capital flows have no significant impact on economic performance once the impact of other variables such as the education level, the initial level of income, the quality of government institutions, and regional dummies, are controlled for. Durham (2000) examines the effects of capital flows on growth and saving by employing panel data regressions covering 26 countries and finds that capital flows have negative effects on growth only in the short run.

In this paper we draw attention to the Turkish experience. Turkey is an open economy and is not under heavy government regulations. However, it suffers from high and persistent inflation. Volatile capital inflows and inflation make it easier to capture the impact of capital inflows on the macroeconomic performance. There are scant empirical studies for the Turkish case. Cavusoglu, Gungor and Olgun (1997) argue that real exchange rates appreciate following a capital flow shock. Celasun, Denizer and He (1999) find that capital flows affect real variables, such as consumption and investment. Berksoy and Saltoglu (1998) report a positive long-run relationship between different types of capital flows and interest rates, while Kirmanoglu and Ozcicek (1999), using impulse response analysis, find that a short

term capital inflow causes real appreciation, decreases inflation, and brings about a temporary increase in real wages. Alper (2002) reports the procyclical behaviour of capital flows with real GDP. He argues that capital inflows lead the growth by one quarter. Moreover, Alper and Saglam (2001) examine the channels through which a sudden capital outflow affects the Turkish economy during the 1990's. In particular, they study the transmission of financial crises to the economy through changes in asset prices and credit channels, and their results indicate that asset and credit transmission channels are effective.¹⁷

The present study uses a VAR methodology to capture the effects of capital inflows on economic performance in Turkey. Previous studies examine only one specific effect of capital flows, while we study many variables. In order to avoid spurious regressions, this study includes a set of macroeconomic variables to better assess the simultaneous effects of capital flows on economic performance. Moreover, our study includes the 2000 and 2001 crises. Lastly, to the best of our knowledge, this study offers the most comprehensive robustness tests in the literature. Our empirical results suggest that an increase in capital inflows improves economic activity, leads to lower prices and interest rates, and causes real appreciation and higher money supply. On the other hand, we find that growing capital outflows could lead to a recession and a large real depreciation that might result in a financial crisis. This result supports the argument that high capital outflows should be prevented. However, whether capital controls would overcome such problems is subject to debate.

¹⁷ See Keyder (2001), Akcay and Zenginobuz (2001) and Yuksel (2002) for further discussion of capital inflows in Turkey.

The next section analyses the development of capital flows in Turkey. Section 6.3 presents the methodology, followed by a discussion of the expected macroeconomic effects of capital flows in section 6.4. In section 6.5, the VAR specification is explained, while section 6.6 presents the findings. In section 6.7, findings obtained under different specifications are presented. Finally, section 6.8 concludes the paper.

6.2. An Overview of Capital Flows in Turkey

The 1980's was a period of openness and economic liberalization for Turkey. Following the severe debt crisis during 1978-1980, the liberalization experience included lifting quantitative restrictions on trade and moving away from an inward-oriented import substitution to an export-oriented growth strategy. On the financial liberalization side, the first step was the removal of the interest rate ceilings on bank loans in 1981. By 1984, domestic residents were allowed to hold foreign exchange denominated assets and to engage in foreign exchange transactions. While fiscal balances deteriorated, reforms in the financial and external sectors continued. The Central Bank of the Republic of Turkey (CBRT) took important steps to alter the institutional setting of policy making and focused increasingly on using indirect monetary policy instruments. The interbank money and foreign exchange markets were opened in 1986 and 1988 respectively, while open market operations were introduced in 1987. Bank lending and borrowing rates were fully liberalized in 1988.

While the liberalization continued, especially on the macroeconomics policy side, a competitive real exchange rate policy -- where the central bank depreciates the domestic currency daily, based on a given expected inflation each month -- was maintained throughout the 1981-88 period. This policy was further supported by a repressed real wage regime. However, from 1987 onwards, the wage regime became politically unsustainable since real wages, which increased in the 1989-1990 period, had an adverse impact on public sector finances. The policy of maintaining a competitive real exchange rate, although helped export performance in the mid 1980's, implied capital losses on foreign debt, causing a deterioration in the terms of trade in the public sector *vis a vis* the private sector. As the government could not achieve the desired external balance, it abandoned the real exchange rate policy in 1989; and since then the exchange rate appreciated in real terms.

Following these developments, a complete financial liberalization package was adopted in 1989, which removed restrictions on capital controls, thus allowing foreign investors to invest freely. In 1990, Turkey accepted IMF's Article VIII, which allowed both residents and non-residents to conduct foreign exchange operations in Turkey and abroad and permitted commercial banks to engage freely in foreign exchange transactions. Finally, the interest rate ceiling on deposits was also removed in 1991. As a result, capital flows became a significant source of financing for the current account deficit, which reduced the relative importance of the official financing and worker's remittances. However, as discussed above, in 1989, when a set of liberalization policies was implemented, the government was following populist policies and therefore was not willing to make necessary spending adjustments for political reasons. This did not send the right signals to foreigners to

invest in Turkey. At the same time, the government had to finance the high debt payment obligations incurred in the past.

As a consequence of the liberalization of capital movements, the banking sector shifted to short-term borrowing from international markets. The sharp increase in portfolio investment in the Istanbul Stock Exchange contributed to the financing of the current account deficit. However, this increased the vulnerability of the financial system due to a higher probability of sudden capital reversals. According to Ekinci (1996), debt servicing after 1989 was characterized by a short-term external borrowing, which turned into a Ponzi game associated with external speculative finance. When the game came to an end, sudden reversals began as foreign creditors withdrew large-scale funds, which set the stage for the financial crisis in April 1994.

In the post-1994 crises, the same trends in the behaviour of capital flows continued. As Figure 12 shows foreign direct investment stayed at approximately the same levels until 2001. However, there was a substantial increase in 2001 due to the awarding of a third Global System for Mobile Communications (GSM) license. Regarding short-term capital flows, there were large outflows during the 1994 crisis period. Although there were no substantial inflows and outflows between 1995 and 1999, there were inflows in the first half of 2000 resulting from the Stand-by agreement signed with the IMF. Following the November 2000 crisis, there were still large short-term capital outflows.

In spite of the relatively low volatility of portfolio investment relative to short-term capital, the Russian crisis in 1998 affected returns on the Istanbul Stock

Exchange substantially. Although no sizable capital outflows were realized in the portfolio item of capital flows until 1998, including the 1994 crisis, the outflows were near 7 billion US dollars during the Russian crisis. Portfolio investments recovered in 1999; but then the November 2000 financial crisis struck, and there were still outflows observed at the end of October 2001.

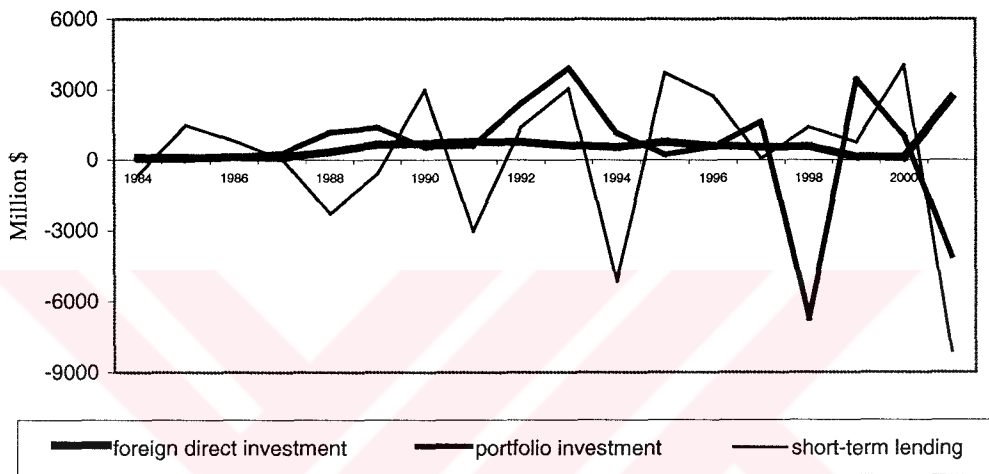


Figure 12. Development of Capital Flows¹⁸

6.3. Macroeconomic Effects of Capital Flows

Capital inflows provide resources for capital accumulation in developing countries with capital shortages and allow inter-temporal smoothing in consumption, which raises welfare. In competitive models with perfect foresight and complete markets, welfare benefits from capital flows may be regarded as being equivalent to

¹⁸ The source of the figure is the Central Bank of Republic of Turkey.

those from international trade in goods and services. Furthermore, economic growth may increase through technology and management skills transfer due to foreign direct investment (Helpman, 1985).

On the other hand, capital flows may result in a rapid monetary expansion, and excessive rise in domestic demand, which cause inflationary pressures and the appreciation of real exchange rate, widening current account deficits. As discussed in Akcoraoglu (2000), capital flows may also lead to an increase in domestic absorption. When some of the spending falls on non-traded goods, their relative prices increase and real exchange rate appreciates. This raises the demand for tradable goods, leading to current account deficits. However, if there is a pre-determined exchange rate target, that is, a fixed or crawling peg exchange rate regime, then the central bank may adopt either sterilized or non-sterilized intervention policies to deal with exchange rate pressures due to capital flows.

Sterilized intervention involves sales of government bonds by the central bank in exchange for foreign currencies and securities. For this intervention to be effective, domestic and foreign bonds should be imperfect substitutes. However, sterilized intervention causes an increase in the interest rate differential between home and foreign currency, which attracts more capital flows. In a non-sterilized intervention, the central bank purchases foreign currency in exchange for domestic currency. This action puts pressure on the central bank to appreciate the nominal exchange rate, which causes a decline in the interest rate differential; however, this policy also results in an increase in the monetary base, which intensifies inflationary pressures.

Under a floating exchange rate regime, there is no central bank intervention. Therefore, for a given level change in initial capital inflows, the appreciation of domestic currency and decline in domestic interest rates, the persistency of capital inflows are smaller compared to that under a fixed (or crawling peg) exchange rate regime.

6.4. Methodological Issues

To capture the macroeconomic effects of capital flows on the macroeconomy, a VAR analysis is performed. To do so, we consider the economy as being represented by the following model:

$$\begin{bmatrix} 1 & b_{12} \\ b_{21} & 1 \end{bmatrix} \begin{bmatrix} y_t \\ z_t \end{bmatrix} = \begin{bmatrix} b_{10} \\ b_{20} \end{bmatrix} + \begin{bmatrix} \gamma_{11} & \gamma_{12} \\ \gamma_{21} & \gamma_{22} \end{bmatrix} \begin{bmatrix} y_{t-1} \\ z_{t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{yt} \\ \varepsilon_{zt} \end{bmatrix} \quad (\text{Eq. 6.1})$$

where y_t represents the capital inflow variable, z_t is a vector of other key economic variables of interest, and ε_{yt} and ε_{zt} are orthogonalized disturbances. The system can be estimated by OLS, which yields consistent estimates of the parameters. However, this representation under-identifies the VAR. The model can also be written in matrix form as:

$$BX_t = \tilde{A}_0 + \tilde{A}_1 X_{t-1} + \varepsilon_t \quad (\text{Eq. 6.2})$$

Sims (1980) suggests using a recursive system to identify the model by forming B as a lower triangular, which implies that y_t has a contemporaneous effect on z_t , but not vice versa. Thus, we can write Equation 2 as

$$X_t = A_0 + A_1 X_{t-1} + e_t \quad (\text{Eq. 6.3})$$

where $A_0 = B^{-1} \tilde{A}_0$, $A_1 = B^{-1} \tilde{A}_1$ and $e_t = B^{-1} \varepsilon_t$.

Both types of structural shocks can now be identified from the residuals of the recursive VAR model. This restriction manifests itself such that both e_{yt} (the residual of y_t from equation 6.3) and e_{zt} (the residual vector of z_t from equation 6.3) affect z_t contemporaneously, but e_{yt} affects y_t contemporaneously only. Identifying the orthogonalized residuals of the VAR in this triangular fashion is known as the Choleski decomposition. This restriction brings to the system an asymmetry, which makes the order of the variables important.

Turkey is a small open economy with many structural problems and political instability. Foreign direct investment in Turkey is neither sizable nor varies a lot. In addition, foreign portfolio investment may be driven by political risk, not economic performance (see, Celasun, Denizler and He, 1999). Therefore, following Calvo (2002) that risk incentives of foreign investors are dominant, we assume capital inflows affect the economy contemporaneously, but not vice versa.

6.5. The VAR Specification

To observe the effects of capital flows, we specify a VAR model with capital flows, interest rates, real exchange rate, broad money, output, and prices by using monthly data covering the period from 1992:01 to 2001:06. All data are obtained from the Central Bank of the Republic of Turkey's data delivery system (<http://tcmbf40.tcmb.gov.tr/cbt.html>), except for the interbank interest rate, which is

obtained from the State Planning Organization. CAP_t refers to the logarithm of net international reserves of the Central Bank, y_t is the logarithm of the industrial production index, p_t is the logarithm of the consumer price index, r_t is the CBRT's overnight interbank interest rate and $M2_t$ is the logarithm of M2 money. The real exchange rate, rer_t , is calculated by deflating the basket (the TL value of 1 USD plus 1.5 DM) by the consumer price index. The CBRT openly announced the basket as its target variable. An increase in the exchange rate implies a depreciation. A constant term, 11 monthly dummies to account for seasonality, a (0,1) dummy to control for the 1994 crisis, a (0,1) dummy to control for the Russian crisis in 1998:8 and 1998:9, and three dummy variables to control for the November 2000 financial crisis and February 2001 crisis in 2000:11, 2001:02 and 2001:03 are also added to our model. Based on the Akaike information criterion the lag order of VAR was set to 1¹⁹.

In order to observe the effects of capital flows, CAP_t is put first in the ordering of variables. The central bank is expected to respond to capital inflow shocks, using a policy tool such as interbank interest rates. Therefore, r_t is placed second in the ordering. Exchange rates respond to capital inflows because capital inflows increase the amount of foreign exchange reserves and the money supply. Hence, in the ordering, rer_t and $M2_t$ follow r_t . Finally, because output and prices would react to changes in interest and real exchange rates, y_t and p_t are included at the end of the ordering.

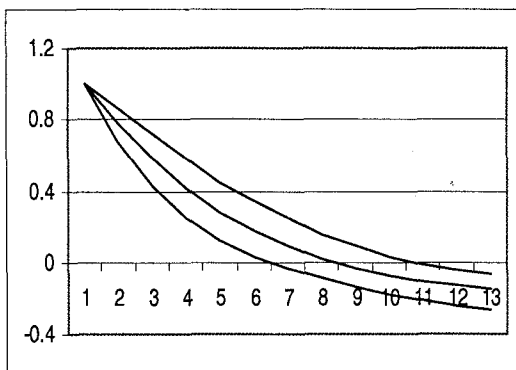
¹⁹ We have tried other lag structures such up to 4 lags. Our results were qualitatively similar to those with 1 lag.

6.6. Impulse Response Functions

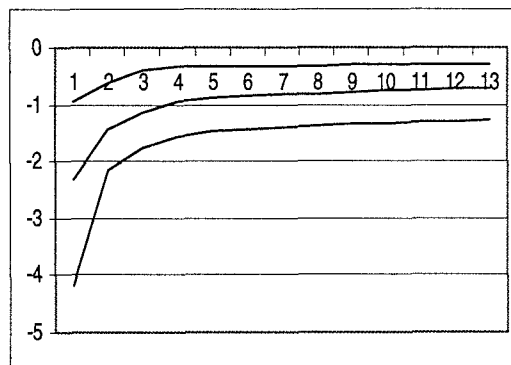
The effects of shocks of capital flows are assessed using impulse response functions. Figure 13 reports the impulse response functions for the rate interest rate, real exchange rate, money, output and prices when there is one standard deviation in capital flows. The 90 % confidence bands are calculated using the bootstrap method with 500 draws. The middle line in Figure 13 shows the median of the draws.

The results confirm our initial expectations. The first diagram of Figure 13 presents the response of capital flows to own shocks, which indicates that the impact of positive shocks persist about six months. The second diagram indicates that the interest rate responds negatively to a positive capital flow shock. The initial response, which continues for two months, is deeper. After the third month, the interest rate converge to a path below the pre-shock value, but above the initial response of the interest rate. The third diagram indicates that a positive innovation to short-term capital inflows causes a real appreciation of the domestic currency in the first month. During the next five months, the response of the real exchange rate to capital flow shock is statistically insignificant. Following the seventh month of the shock to capital flows, the real exchange rate follows a path below its pre-shock value, which indicates real appreciation. The fourth diagram displays a temporary increase in money supply for six months and the response of money to a shock to capital flows becomes statistically insignificant after that. The fifth diagram indicates that a positive innovation to capital flows leads to positive economic growth between the second and fifth months, after which the response of output becomes statistically insignificant. This result parallels those found in Alper (2002). He argues that capital

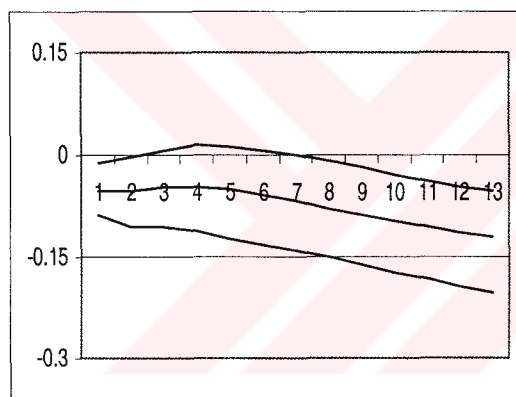
i. Response of CAP_t to own shocks



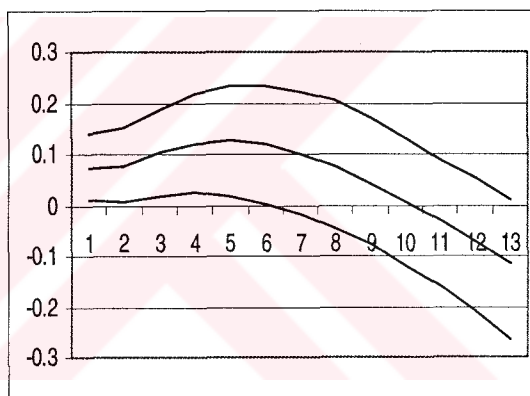
ii. Response of r_t to CAP_t



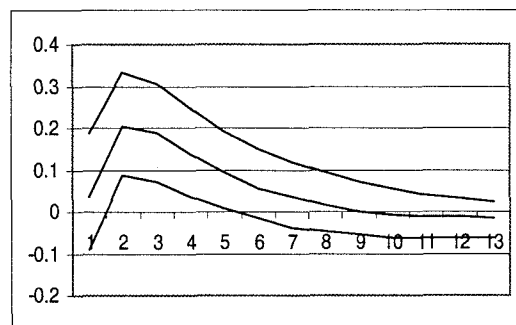
iii. Response of rer_t to CAP_t



iv. Response of $M2_t$ to CAP_t



v. Response of y_t to CAP_t



vi. Response of p_t to CAP_t

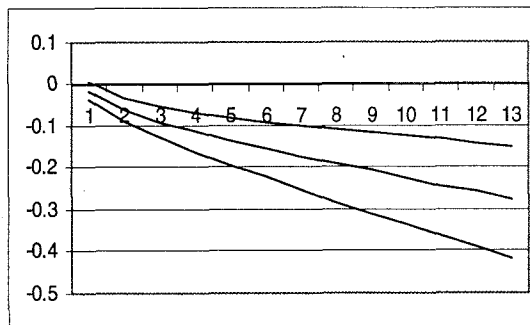


Figure 13. Responses to one Standard Deviation Innovation in Capital Inflows

flows lead the growth by one quarter, and we observe the effect of capital inflows within 2 months and lasts for 5 months. The negative response of the consumer price index continues for the entire horizon, indicating lower prices, as depicted in the last diagram. The results show that a shock to capital flows increases output and money supply, causes real appreciation, and decreases interest rates and prices.

6.7. Variance Decompositions

In addition to the assessment of the dynamic effects of capital flow shocks using impulse response functions, which indicate that capital inflows are beneficial for Turkey, the forecast error variance decomposition analysis was also performed to examine how capital flow shocks contribute to the variability of key economic aggregates.

Table 18 reports the forecast error variance decomposition of the macroeconomic variables due to capital flows. The first column shows the time horizons at which forecast errors are calculated are shown. The numbers in parentheses are standard errors. The results suggest that the shocks contribute significantly to macroeconomic fluctuations, except output. The proportional rate of capital flows shocks in explaining forecast error variance of prices is 29% when a 6-month period is used and it reaches 50% in period 24, making up the largest contribution. Although the contribution of capital flow shocks to interest rates, real exchange rates and money is small in period 6, it becomes significant in period 24. On the other hand, the contribution of capital flows shock to output fluctuations is

statistically insignificant, which suggests that, although capital flow shocks influence interest rates, real exchange rate, money and prices, they do not contribute to business cycles, given by output fluctuations²⁰.

Table 18. Forecast Error Variance Decompositions: Contribution of Capital Inflow Shocks to Changes in Key Macroeconomic Variables

Horizon	Own	r_t	rer_t	$M2_t$	y_t	p_t
6	97% (0.09)	16% (0.07)	8% (0.04)	7% (0.05)	7% (0.05)	29% (0.11)
12	89% (0.10)	21% (0.08)	17% (0.08)	6% (0.04)	7% (0.05)	40% (0.14)
18	80% (0.08)	26% (0.09)	29% (0.13)	16% (0.07)	7% (0.05)	46% (0.16)
24	73% (0.09)	29% (0.09)	38% (0.15)	32% (0.11)	8% (0.05)	50% (0.17)

Note: Numbers in parentheses report the standard errors.

6.8. Sensitivity Analysis

In order to examine the sensitivity of the results, we estimated our VAR model using different specifications.²¹ However, the results did not change significantly. First, the model is estimated using the wholesale price index, instead of

²⁰ The mixed evidence from impulse responses and variance decompositions on output can be explained by the finding that an increase in capital inflows does not have an economically significant effect on output or its effect is dominated by other variables.

²¹ All estimations in this section are reported in Appendix E.

consumer price index. The major difference in this case was that the interest rate responds negatively to a shock to capital flows only for two months. However, capital flows continue to contribute to price and money fluctuations.

Second, the analysis was performed using a different money definition, M1. The results indicated that M1 responds negatively to a capital flow shock after eight months, whereas M2 responds positively to a capital flow shock for three months. The effects of capital flows on the interest rate disappear where the wholesale price index is used along with M1. In this case, we also observed an appreciation of the local currency but only for one period. The analysis is repeated with M2Y (M2 plus foreign exchange deposits held in commercial banks). Although the results were similar to the base case, the only notable change was that the real appreciation of local currency lasted all periods. However, the results of forecast error variance decompositions indicated that capital flow shocks are not the major contributor to any macroeconomic fluctuations when different money measures were used.

Third, the analysis is repeated with 3-month nominal and real Treasury bond rates, replacing overnight interbank interest rates. Both Treasury bond rates responded negatively to a shock to capital flows after eight months, whereas our base case results showed that, interbank interest rates respond to a shock to capital flows only in the initial period. This result is expected since interbank interest rate is a policy variable and the central bank responds to a shock as soon as it is observed, while other market participants do not respond to shocks after they are observed. However, the responses of other variables in the model were the same as in the base

case. In addition, variance decompositions that are performed using the Treasury bond rates give parallel estimates to the base case results.

Fourth, the analysis is performed using nominal exchange rates, rather than real rates. A basket currency [denoted in terms of $TL/(1 \text{ USD} + 1.5\text{DM})$] is used. An increase in the rate represents a depreciation of the domestic currency. We found that the nominal exchange rate responds negatively to a shock to capital flows during the whole period, whereas in the base case the real exchange rate responds negatively for the first two months and then again after seven months. The other variables in the system respond similarly to those in the base case and forecast error variance decomposition results are similar in both cases.

Fifth, the definition of capital flows in the analysis was changed. The VARs were performed with the ratio of capital flows, as reported in the balance of payments, to M2Y. In this case, we found major differences in the results. The interest rate responds negatively to the shock to capital flows only in the first month and after the sixth month in a statistically significant fashion. Moreover, the response is smaller than the base case. Real exchange rate appreciates as a response to a shock to the capital flows after the second month, using this definition of capital flows. Although in the benchmark case money does not respond to a shock to capital flows for ten months, in this new case, money responds negatively after the eleventh month. However, output does not respond to capital flow shocks when we use the ratio of capital flows to M2Y, whereas the response of output is positive in the base case. When we perform variance decomposition analyses with this definition of

capital flows, we found that capital flow shocks are not the major contributor to any macro-economic fluctuations.

Finally, as discussed in section 3, the exchange rate regime could alter the effects of capital flows on economic performance. Thus, we performed the analysis by ending the sample period prior to the adaptation of (a) a crawling peg exchange rate regime (1999:11) and (b) a freely floating exchange rate regime (2001:01)²². The results suggested that the effects of capital flows on interest rate, real exchange rate, money supply and output vary slightly with the exchange rate regime. When we perform the analysis by ending the sample in 1999:11, even if the directional effects of capital flows on economic performance are the same, the real rate, money and output respond to capital flow slightly less persistently: however, the effect of capital inflows on prices does not change, compared to the results from the full sample. On the other hand, when the sample is ended in 2001:01; the estimates are close to those for the full sample. Thus, the empirical evidence suggests that the exchange rate regime does not matter much regarding the effects of capital inflow on economic performance. However, one must caution that this result is most likely due to the small sample size we used rather than a general conclusion. Future research might give different results. Our results can serve as a benchmark for future studies.

²² Due to data limitation we could not perform the analysis for the periods of crawling peg (1999:12 – 2001:01) and freely floating exchange rate regime (2001:02 – 2001:06).

6.9. Policy Implications and Conclusions

This paper examines the effects of capital flows on economic performance by estimating a VAR model for the period from 1992:01 to 2001:06. The results of the impulse response functions suggest that higher capital inflows raise output and money supply, but lower prices and interest rates, and also cause a real appreciation of the Lira. Policymakers may design policies to encourage capital inflows, and, at the same time, to ensure that capital inflows are stable. For the latter, authorities should encourage foreign *direct* investment relative to *portfolio* investment, since the foreign direct investment is less volatile than portfolio investment. Policies that promote the stability of portfolio investment could also be adopted through strengthening the existing prudential regulations and supervisory mechanisms while improving the effectiveness of financial disclosures.²³

²³ For a discussion of these issues, see Blöndal and Christiansen (1999).

CHAPTER 7

CONCLUSION

In this dissertation, we analyzed the application of monetary policy under uncertainty and shocks and the effect of uncertainty on the economy. The uncertainties we study are inflation uncertainty and exchange rate risk. These can be decreased and their costs minimised by the appropriate central bank policy. On the other hand the shocks that we analyze are the unexpected exchange rate shocks, parity and capital flights, which are mostly not under the control of government. The results suggest that policymakers should be aware of these shocks and they should try to minimize the costs of them with the appropriate policies.

Inflation and inflation uncertainty are closely related with each other. The empirical analyses on G-7 countries suggests that inflation increases inflation uncertainty whereas the reverse is not true for all countries. In other words inflation uncertainty decreases inflation for four countries in our sample. If we accept four countries as majority, the intuition behind this result is that when uncertainty is high, the central bank reduces those real costs at the margin by reducing inflation. Therefore, in developing countries the central bankers should follow this policy to minimize the cost of inflation uncertainty.

Policymakers should also prevent the exchange rate risk as it is detrimental to the economy. A deterministic model of a small open economy and the empirical analysis following this model for Turkey suggests that an increase in the exchange rate risk would result in an increase in prices, depreciation of the real exchange rate, and a decrease in the economic activity.

Another insight for a policy maker would be to minimize the unexpected shocks to the exchange rate, either unexpected appreciation or depreciation. That is because either in the face of currency depreciation or appreciation, the economic activity decreases as the empirical analysis on Turkey suggests. In other words, the effect of unexpected real exchange rate fluctuations in Turkey are asymmetric.

A small open economy, in which the denomination composition of trade is asymmetric, would be affected, when there is a change in two developing countries' relative currencies', in our case USD-Euro parity. In other words an improvement in the parity in favor of the developed country's currency where exports are mostly to, the small open economy's trade balance improves. Therefore, a policymaker should involve the possible fluctuations in the parity and its outcomes to the policy programmes in order to reach the targets.

Capital flows are important for the economic performance especially in the emerging markets. The special importance for the emerging markets is that capital outflows are very high with every negative news. Therefore, the consequences of capital outflows on the economy constitutes importance. Our empirical results suggest that capital outflows decreases growth, increases inflation and depreciates

the exchange rate. These are critical negative signals for an economy. So, the policy implication is that when designing policies, possible capital outflows should be taken into consideration for emerging markets for reaching the targets.

As a result, when designing a policy program, it is important to consider the possible deviations from the policies. Otherwise, it would not be possible to achieve the targets, moreover the costs would be too high for the economy.



SELECT BIBLIOGRAPHY

- Agenor, P.R. 1991. "Output, devaluation and the real exchange rate in developing countries," *Weltwirtschaftliches Archiv* 127: 18-41.
- Agénor, Pierre-Richard and Peter J. Montiel. 1999. *Development Macroeconomics, 2nd Edition*, Princeton University Press, Princeton, NJ.
- Agosin, R.M. 1994. "Saving and Investment in Latin America," *UNCTAD Discussion Paper*, no. 90.
- Aizenman J. and N.P. Marion. 1996. "Volatility and the investment response" *NBER Working Paper Series* 5841.
- Akcay, C., and U. Zenginobuz. 2001. "Vulnerability to Purely Contagious Balance-of-Payment Crises in Emerging Economies: An Application to the Cases of Russia, Turkey, and Brazil," *Russian and East European Finance and Trade* 37(5): 5-21.
- Akcoraoglu, A. 2000. "International Capital Movements, External Imbalances and Economic Growth: The Case of Turkey," *Yapı Kredi Economic Review* 11(2): 21-36.
- Alper, C.E. 2002. "Business Cycles, Excess Volatility and Capital Flows: Evidence from Mexico and Turkey," *Russian and East European Finance and Trade* 38(4): 22-54.
- Alper, C.E., and I. Saglam. 2001. "The Transmission of a Sudden Capital Outflow: Evidence From Turkey," *Eastern European Economics* 39(2): 29-48.
- Antzoulatus, A.A. 1996. "Capital Flows and Current Account Deficits in the 1990's: Why Did Latin American and East Asian Countries Respond Differently?" *Federal Reserve Bank of New York Research Paper*, 9610.
- Armington, P.S. 1969. "A theory of demand for products distinguished by place of production" *International Monetary Fund Staff Papers* 16(1): 159-178.

- Bachetta P. and E. Van Wincoop. 2001. "A theory of currency denomination of international trade" *studienzentrum gerzensee stiftung der schweizerischen nationalbank working paper* 01.07
- Backus, D.K. 1993. "Interpreting Comovements in the Trade Balance and the Terms of Trade", *Journal of International Economics* 34: 375-387.
- Backus, D.K., Kehoe, P.J., and F.K. Kydland. 1994. "Dynamics of the trade balance and the terms of trade: the J-curve" *American Economic Review* 84(1):89-103.
- Baillie, R., C. Chung and A. Tieslau. 1996. "Analysing inflation by the fractionally integrated ARFIMA-GARCH model," *Journal of Applied Econometrics* 11: 23-40.
- Baldwin, R. and P. Krugman. 1989. "Persistent trade effects of large exchange rate shocks," *Quarterly Journal of Economics*, 104:635-654.
- Ball, L. 1992. "Why does high inflation raise inflation uncertainty," *Journal of Monetary Economics*. 29: 371-388.
- Baron, D.P. 1976b. "Fluctuating Exchange rates and the pricing of exports" *Economic Inquiry* 14:425-438.
- Bean C. R. 1986. "The Terms of trade, labour supply, and the current account" *Economic Journal* 96: 38-46.
- Bekaert, G., and C. Harvey. 1998. "Market Integration and Investment Barriers in Emerging Market Equity Returns," *NBER Working Paper*, 6669.
- Bellman, R. 1957. *Dynamic Programming*. Princeton, N.J.: University Press.
- Agnès Bénassy-Quéré & Lionel Fontagné & Amina Lahrèche-Révil. 2001. "Foreign Direct Investment and Company Taxation in Europe," *Economics Working Papers European Network of Economic Policy Research Institutes* 004.
- Berksoy, T., and B. Saltoglu. 1998. "Türkiye Ekonomisinde Sermaye Hareketleri (Capital Flows in Turkey)," *Istanbul Chamber of Commerce Publication*, 58.
- Bernanke, B.S. 1986. "Alternative exploration of the money-income correlation" *Carnegie-Rochester Conference Series on Public Policy* 25:49-99.
- Bernanke, B.S., M. Gertler and M. Watson. 1987 "Systematic Monetary policy and the effects of oil price shocks" *Brooking Papers on Economic Activity* 1:91-142.
- Berument, H. 2003. "Measuring monetary policy for a small open economy: Turkey", *Journal of Macroeconomics*, forthcoming.

- Berument, H., and A. Gunay. 2003. "Exchange rate risk and interest rate: a case study of Turkey", *Open Economies Review* 14: 19-27.
- Berument, H. and M. Pasaogullari. 2003. "Effects of the real exchange rate on output and infation: evidence from Turkey", *Developing Economies*,.
- Bini-Smaghi, L. 1991. "Exchange rate variability and trade: why is it so difficult to find any empirical relationship?" *Applied Economics* 23: 927-935
- Black S. W. 1996. "Issues in Korean Exchange Rate Policy" *NBER Working Paper Series* 5747
- Blanchard, O and D. Quah. 1989. " The Dynamic effects of aggregate demand and supply disturbances" *American Economic Review* 79: 655-673.
- Blanchard O.J. and M. Watson. 1986. "Are business cycles all alike?" In: Gordon R. (Ed) *The American Business Cycle: Continuity and change*. University of Chicago Press, Chicago: 123-156.
- Bleaney, M., and D. Greenaway. 2001. "The impact of trade and real exchange rate volatility on investment and growth in Sub-Saharan Africa", *Journal of Development Economics* 65: 491-500.
- Blöndal, S., and H. Christiansen. "The Recent Experience with Capital Flows to Emerging Market Economies", *OECD Economics Department Working Papers*, no. 211 (1999).
- Bollerslev, T. 1986. "Generalized Autoregressive Conditional Heteroscedasticity", *Journal of Econometrics* (31):307-327.
- Bomberger, W. 1996. "Disagreement as a measure of uncertainty", *Journal of Money, Credit and Banking* 28, 381-392.
- Brooks, C. and S.P. Burke. 1998. "Forecasting exchange rate volatility using conditional variance models selected by information criteria" *Economics Letters* 61: 273-278.
- Bruno, M. 1979. "Stabilization and stagflation in a semi-industrialized economy," in *International Economic Policy*, R. Dornbusch and J. Frankel, eds. Baltimore, MD Johns Hopkins University Press.
- Calvo, G.A. 2003. "Explaining sudden stop, Growth Collapse, and BOP crises: The case of Distortionary Output taxes," *IMF Staff Papers* 50.
- Calvo, G.A.; L. Leiderman; and C.M. Reinhart. 1994. "The Capital Inflow Problem: Concept and Issues," *Contemporary Economic Policy* 12(3): 54-66.
- Campa, J. 1993. "Entry by foreign firms in the US under exchane rate uncertainty." *Review of Economics and Statistics* 75(4): 614-622.

- Cashin P. and C.J. McDermott. 1998. "Terms of trade and the current account" *IMF working paper* 177.
- Cavusoglu, T.; N.D. Gungor; and H. Olgun. 1997. "The Characteristics of Capital Inflows in Turkey: An Econometric Investigation," *METU Working Paper*, 97/18.
- Celasun, O.; C. Denizler; and D. He. 1999. "Capital Flows, Macroeconomic Management, and the Financial System: The Turkish Case, 1989-97," *World Bank Working Paper*.
- Chou, W.L. and C.C. Chao. 2001. "Are currency devaluations effective? A panel unit root test" *Economics Letters*, 72(1): 19-25.
- Christiano, L.J. 1988. "Why does inventory investment fluctuate so much?" *Journal of Monetary Economics* 21:247-280.
- Clark, P.B. 1973. "Uncertainty, Exchange risk and the level of international trade" *Western Economic Journal* 11:302-313.
- Copelman, M. and A.M. Werner. 1996. "The monetary transmission mechanism in Mexico," *Working paper, Federal Reserve Board*.
- Corbo, V. and L. Hernandez. 1994. "Macroeconomic Adjustment to Capital Flows," *World Bank Policy Research Paper*, 1337.
- Cote, A. 1994. "Exchange rate volatility and trade: a survey," *Bank of Canada Working Paper*, no. 5.
- Cover, J.P. 1992. "Asymmetric effects of positive and negative money supply shocks," *Quarterly Journal of Economics*, 107(4): 1261-82.
- Cukierman, A. and A. Meltzer. 1986. "A theory of ambiguity, credibility and inflation under discretion and asymmetric information," *Econometrica* 54: 1099-1128.
- Cukierman, A. 1992. *Central Bank Strategy, Credibility and Independence*, MIT Press, Cambridge.
- Cushman, D., and T. Zha. 1997. "Modifying Monetary Policy in a Small Open Economy Under Flexible Exchange Rates", *Journal of Monetary Economics* 393: 433-48.
- Cushman, D.O. 1988 "Exchange rate uncertainty and foreign direct investment in the United States" 124(2): 322-334.
- Daly, K. 1999. *Financial Volatility and Real Economic Activity*. Ashgate, UK.

- Das, S.K. 2003. "Effects of exchange rate volatility on international trade: an empirical analysis" *Mimeo*.
- Davis, G and B. Kanogo. 1996. "On measuring the effect of inflation uncertainty on real GNP growth", *Oxford Economic Papers*, 48: 163-175.
- Deardorff, A.V., and R.M. Stern. 1978. "The Terms of Trade Effect on Expenditure", *Journal of International Economics* 8: 409-414.
- De Grauwe, P. 1988. "Exchange rate variability and the slowdown in growth of international trade" *International Monetary Fund Staff Papers* 35: 63-84.
- De Grauwe, P. and G. Verfaillie. 1988. "Exchange rate variability, misalignment, and the European monetary system" In *Misalignment of Exchange rates: Effects on trade and industry*, edited by Richard C. Marston, 77-100. Chicago: University of Chicago Press.
- Devereux M. and C. Engel. 2001. "Endogenous Currency of Price Setting in a Dynamic Open Economy Model". *mimeo*
- Dixit, A. 1989. "Hysteresis, import penetration, and exchange rate pass-through," *Quarterly Journal of Economics*, 54: 205-227.
- Domac, İ. 1997. "Are devaluations contractionary?" *Journal of Economic Development*, 22: 145-163.
- Dornbusch, R. 1988. *Open Economy Macroeconomics*, 2nd edition, New York
- Dornbusch, R. 1983. "Real interest rates, home goods, and optimal external borrowing" *Journal of Political Economy* 91: 141-153
- Durham, J.B. 2000. "Econometrics of the Real Effects of Cross-Border Capital Flows in Emerging Markets," *QEH Working Paper*, 52.
- Edwards, S. 1985. "Are devaluations contractionary?" *NBER Working Paper* 1676.
- Edwards, S. 1989. *Real Exchange Rates, Devaluation and Adjustment*, MIT Press. Cambridge, MA
- Ekinci, N. 1996. "Financial Liberalization Under External Debt Constraints: The Case of Turkey" *Middle East Technical University Economic Research Center Working Paper*, 96/05.
- Engle, R. (1982) "Autoregressive conditional heteroscedasticity with estimates of the variance of UK inflation" *Econometrica* (50) 987-1007
- Engle, R., David Lilien and Russesll Robins (1987) "Estimating time varying risk-premia in the term structure: the ARCH-M model" *Econometrica* (55) 391-407

- Faini, R., F. Clavijo and A. Senhadji. 1992. "The Fallacy of composition argument: Does the export demand matter?" *European Economic Review* 36(4): 865-882.
- Felmingham, B. and P. Mansfield. 1997. "Rationality and the risk premium on the Australian dollar", *International Economic Journal* 11: 47-57.
- Fernandez-Arias, E., and P.J. Montiel. 1995. "The Surge in Capital Inflows to Developing Countries: Prospects and Policy Response," *World Bank Policy Research Working Paper*, 1473.
- Fisher L.A. and H-S. Huh. 2002. "Real exchange rates, trade balances and nominal shocks: evidence for the G-7" *Journal of International Money and Finance* 21: 497-518.
- FitzGerald, E.V.K. 1998. "Short-Term Capital Flows, The Real Economy and Income Distribution in Developing Countries," *QEH Working Paper*, 8.
- Fountas, S. M. Karanasos and M. Karanassou. 2000 "A GARCH model of inflation and inflation uncertainty with simultaneous feedback" *mimeo*.
- Franke, G. 1991. "Exchange rate volatility and international trading strategy" *Journal of International Money and Finance* 10: 292-307.
- French-Davis, R.; D. Titelman; and A. Uthoff. 1994. "International Competitiveness and the Macroeconomics of Capital Account Opening," *UNCTAD Review*: 107-121.
- Frenkel, R.; J.M. Fanelli; and G. Rozenwurcel. 1993. "Growth and Structural Reforms in Latin America: Where We Stand," *UNCTAD Discussion Papers*, 62.
- Frey, R. 2003. "Exchange rate volatility and International trade- Some GARCH estimations stress the importance of trade diversification" *mimeo*.
- Friedman, M. 1977. "Nobel lecture: inflation and unemployment," *Journal of Political Economy* 85: 451-472.
- Froot, K.A. and P.D. Klemperer. 1989. "Exchange rate pass-through when market share matters" *American Economic Review* 79:637-654.
- Gagnon, J. 1996. "Net foreign assets and equilibrium exchange rates: panel evidence" *Federal Reserve Board International Finance Discussion Paper* 574.
- Garcia, R. and H. Schaller. 1995. "Are the effects of monetary policy asymmetric" *Scientific Series* 95s-6, CIRANO.

- Genberg, H.S. and M.K. Swoboda. 1987. "The relative importance of foreign and domestic disturbances for aggregate fluctuations in the open economy" *Journal of Monetary Economics* 19:45-67
- Goldberg, P.K. 1995. "Product differentiation and oligopoly in international markets: The case of the U.S. automobile industry," *Econometrica*, 63:891-951.
- Goldberg, L. S., C.D. Kolstad. 1995. "Foreign direct investment, exchange rate variability and demand uncertainty," *mimeo*
- Gonzaga, G.M. and M.C. Terra. 1997. "Equilibrium real exchange rate, volatility and stabilization" *Journal of Development Economics* 54(1): 77-100.
- Gordon, D. B., and E.M. Leeper. 1994. "The Dynamic Impacts of Monetary Policy: An exercise in Tentative Identification", *Journal of Political Economy* 102.
- Grier, K. and M. J. Perry. 1996. "Inflation, inflation uncertainty and relative price dispersion: Evidence from bivariate GARCH-M models" *Journal of Monetary Economics* 38: 391-405.
- Grier, K. and M. J. Perry. 1998. "On inflation and inflation uncertainty in the G7 countries" *Journal of International Money and Finance* 17: 671-689.
- Grier, K. and M. J. Perry. 2000. "On inflation and inflation uncertainty in the G7 countries" *Journal of Applied Econometrics* 15: 45-58.
- Gros, D. 1987. "Exchange rate variability and foreign trade in the presence of adjustment costs". *Department des sciences economiques, University Catholique de louvain Working paper* 8704
- Hafer, R.W. 1986. "Inflation uncertainty and a test of the Friedman hypothesis", *Journal of Macroeconomics*: 365-372.
- Hamilton, J. 1989. "A new approach to the economic analysis of non-stationary time series and the business cycle" *Econometrica* 57(2): 357-384.
- Hamilton, J. 1991. "A Quasi-Bayesian approach to estimating parameters for mixtures of normal distributions" *Journal of Business and Economic Statistics* 9: 27-39.
- Hansen, G. 1985. "Invisible Labor and the business cycle" *Journal of Monetary Economics* 16: 309-27.
- Harberger, A. C. 1950. "Currency Appreciation, Income and the Balance of Trade", *Journal of Political Economy* 58: 47-60.
- Helpman, E. 1985. "An Exploration in the Theory of Exchange Rate Regimes," *Journal of Political Economy*, 89: 865-890.

- Hodrick R.J. 1989. "US. International Capital Flows: Perspectives from Rational Maximizing Models" *Carnegie-Rochester Conference Series on Public Policy, Spring* 30:231-288.
- Holland, A. S. 1995. "Inflation and uncertainty: Tests for temporal ordering," *Journal of Money Credit and Banking* 27: 827-837.
- Hooper, P. and S.W. Kohlhagen. 1978. "The effect of exchange rate uncertainty on the prices and volume of international trade" *Journal of International Economics* 8: 438-511.
- Jiang, F. 2004. "Dual Long Memory in Inflation Dynamics Across the Countries in Far East and the Relation Between the Inflation Uncertainty and Macroeconomic Performance" *mimeo*.
- Kakes, J. 1998. "Monetary transmission and business cycle asymmetry" *University of Groningen SOM research report* 98C36.
- Kamin, S.B. 1996. "Exchange rates and inflation in exchange-rate based stabilizations: an empirical examination", *International Finance Discussion Paper*, 554.
- Kamin, S.B. and J.H. Rogers. 2000. "Output and the real exchange rate in developing countries: an application to Mexico", *Journal of Development Economics*, 61: 85-109.
- Kamin, S., and P. Wood. 1997. "Capital Inflows, Financial Intermediation, and Aggregate Demand: Empirical Evidence From Mexico and Other Pacific Basin Countries." *Board of Governors of the Federal Reserve System International Finance Discussion Papers* 583.
- Kandil, M. 2000. "The asymmetric effects of exchange rate fluctuations: Theory and evidence from developing countries," *IMF Working Paper*, 00/184
- Kandil, M. 2001. "Asymmetric in the effects of US government spending shocks: Evidence and Implications" *Quarterly Review of Economics and Finance* 41:137-165.
- Kandil, M. 2002. "Asymmetry in the effects of monetary and government spending shocks: contrasting evidence and implications," *Economic Inquiry*, 40(2): 288-313.
- Kandil, M. 2002. "Asymmetry in economic fluctuations in the US economy: The pre-war and the 1946-1991 periods compared," *International Economic Journal*, 16(1): 21-42.
- Kandil, M, and A. Mirzaie. 2002. "Exchange rate fluctuations and disaggregated economic activity in the US: Theory and evidence," *Journal of International Money and Finance*, 21:1-31.

- Karras, G. 1996 "Are the output effects of monetary policy asymmetric? Evidence from a sample of European Countries" *Oxford Bulletin of Economics and Statistics* 58: 267-278.
- Kauffmann, S. 2001. "Is there an asymmetric effect of monetary policy over time? A Bayesian analysis using Austrian data" *Oesterreichische Nationalbank working papers* 45.
- Kent, C. 1997. "The Response of the Current Account to Terms of Trade Shocks: A panel Data Study", *Research Discussion Paper* 9705.
- Keyder, N. 2001. "The Aftermath of the Exchange Rate-Based Program and the November 2000 Financial Crisis in Turkey," *Russian and East European Finance and Trade* 37(5): 22-44.
- Khan, M., and C. Reinhart. 1995. "Capital Inflows in the APEC Region," *IMF Occasional Paper*, 122.
- King, R.G., C.I. Plosser and S.T. Rebelo. 1988. "Production, growth and business cycles" *Journal of Monetary Economics* 21: 195-232.
- Kirmanoglu, H.; and O. Ozcicek. 1999. "The Effect of Short-Term Capital Inflow on the Turkish Economy," *Yapi Kredi Economic Review* 10(1): 27-34.
- Knetter, M.M. 1989. "Price discrimination by U.S. and German exporters," *American Economic Review*, 79:198-210.
- Kontonikas, A. 2002. "Inflation and inflation uncertainty in the United Kingdom Evidence from GARCH modeling" *Brunel University Working Paper*.
- Koray, F. and P. Chan. 1991. "Government Spending and Exchange Rate" *Applied Economics*, 23: 1551-58.
- Koray, F. and W. Lastrapes. 1989. "Real exchange rate volatility and U.S. Bilateral Trade: A VAR Approach." *Review of economics and statistics*, 71: 708-712.
- Krugman, P. and J. Taylor. 1987. "Contractionary effects of devaluation," *Journal of International Economics*, 8: 445-456.
- Kydland, F.E. 1984. "Labor force heterogeneity and the business cycle" *Carnegie Rochester Conference Series on Public Policy* 21:173-208.
- Kydland, F.E and E.C. Prescott. 1982. "Time to build and aggregate fluctuations" *Econometrica* 50: 1345-1370.
- Lane, P. and G.M. Milesi-Ferretti. 2000. "The transfer problem revisited: net foreign assets and real exchange rates" *CEPR Discussion paper* 2511.

- Lane, P. and G.M. Milesi-Ferretti. 2001. "External Wealth and trade balance and the real exchange rate" *mimeo*.
- Laursen, S. and L.A. Metzler. 1959. "Flexible Exchange Rates and the Theory of Employment", *Review of Economics and Statistics* 32: 281-299.
- Leeper, E.M. and D.B. Gordon. 1992. "In search of the liquidity effect" *Journal of Monetary Economics* 29: 341-369.
- Lenz, C. 1997 "Asymmetric effects of monetary policy in Switzerland" *Swiss Journal of Economics and Statistics* 133: 441-454.
- Lizondo, S. and P. J. Montiel. 1989. "Contractionary Devaluation in developing countries: Analytical Overview" *IMF Staff Papers* 36:182-227.
- Marston, R.C. 1990. "Pricing to market in Japanese manufacturing," *Journal of International Economics*, 29:217-236.
- Matsuyama, K. 1987. "Current account dynamics in a finite horizon model" *Journal of International Economics* 23: 299-313.
- McMillin, W. D. and F. Koray. 1990. "Does Government Debt Affect the Exchange Rate? Empirical Analysis of the U.S.-Canadian Exchange Rate," *Journal of Economics and Business*, 42, 279-88.
- Meade, J. 1951. *The Theory of International Economic Policy, I: The Balance of Payment*, Oxford: Oxford University Press:.
- Mendoza, E.G. 1992. "The Effects of Macroeconomic Shocks in a Basic Equilibrium Framework", *IMF Staff Papers* 394: 855-889.
- Mendoza, E.G. 1995. "The terms of trade, the real exchange rate and economic fluctuations" *International Economic Review* 361: 101-137.
- Obsfeld M. 1982. "Aggregate Spending and the Terms of trade: Is there a Laursen Meltzler Effect" *Quarterly Journal of Economics* 97:251-270.
- Obsfeld M. and K. Rogoff. 1998. "Risk and Exchange Rates" *NBER Working paper series* 6694.
- Ostry, J.D. and C.M. Reinhart. 1992. "Private Savings and Terms of Trade", *IMF Staff Papers* 32: 541-573.
- Otto, G. 2003. "Terms of Trade Shocks and the Balance of Trade: There is a Harberger-Laursen-Meltzer Effect", *Journal of International Money and Finance* 22: 155-184.

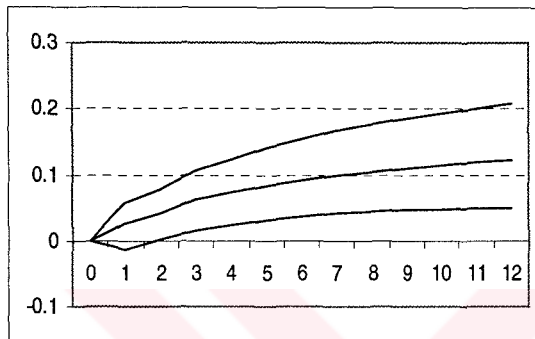
- Pagan, A. 1984. "Econometric issues in the analysis of regressions with generated regressors" *International Economic Review* 25: 221-247.
- Pagan, A. 1986. "Two Stage and Related Estimators and Their Applications", *Review of Economic Studies*, LIII : 517-538.
- Pagan, A. and A. Ullah. 1988. "The econometric analysis of models with risk terms" *Journal of Applied Econometrics* 3: 87-105.
- Peree, E. and A. Steinherr. 1989. "Exchange rate uncertainty and Foreign trade". *European Economic Review* 33: 1241-1264.
- Persson, T and L. E. O. Svensson. 1985. "Current Account Dynamics and the Terms of Trade: Harberger-Laursen-Metzler Two Generations Later" *Journal of Political Economy* 93: 43-65.
- Pozo, S. 1992. "Conditional exchange rate and the volume of the international trade: Evidence from the early 1900's" *Review of Economics and Statistics* 74: 325-329
- Prescott, E.C. 1986 "Theory ahead of business cycle measurement". *Federal Reserve Bank of Minneapolis Quarterly Review* (fall): 9-22.
- Rachetta, D. and J. Reynould. 1992. "Canadian monetary policy: Will the checklist approach ever get us to price stability" *Canadian Journal of Economics* 25: 819-838.
- Rodrik, D. 1998. "Who Needs Capital-Account Convertibility?" in *Should the IMF Pursue Capital-Account Convertibility?* Princeton Essays in International Finance 207.
- Russ, K.N. 2003. "Exchange rate regimes and foreign direct investment" *mimeo*.
- Savvides, A. 1992. "Unanticipated exchange rate variability and the growth of international trade" *Weltwirtschaftliches Archiv* 128: 446-463.
- Sen, P. and S.J. Turnovsky. 1989. "Deterioration of the terms of trade and the capital accumulation: A reexamination of the Laursen-Metzler effect" *Journal of International Economics* 26:227-250
- Senhadji, A.S. 1998. "Dynamics of the trade balance and the terms of trade in LDC's: The S-curve" *Journal of international economics* 46:105-131.
- Sims, C. A. 1972. "Money, Income and Causality," *American Economic Review*, 62: 540-552.
- Sims, C. 1980 "Comparison of Interwar and Postwar Business Cycles: Monetarism Reconsidered" *American Economic Review*, 702: 250-57

- Sims, C. A. 1986. "Are Forecasting Models Usable for Policy Analysis?" *Quarterly Review of the Federal Reserve Bank of Minneapolis*, Winter.
- Sims, C. A., J.H. Stock and M.W. Watson. 1990. "Inference in Linear Time Series Models with Some Unit Roots", *Econometrica* 58: 113-147.
- Sims, C. A., and T. Zha. 1995 "Does monetary policy generate recessions", *Manuscript, Yale University and Federal Reserve Bank of Atlanta*.
- Sims, C. A., and T. Zha. 1998. "Error Bands for Impulse Responses", *Econometrica* 675: 1113-1156.
- Siregar, R. and R.S. Rajan. 2002. "Impact of exchange rate volatility on Indonesia's trade performance in the 1990's." *Centre for International Economic Studies Discussion paper* 0205.
- Spatafora, N. 2003. "How concerned Should Developing Countries be About G-3 Exchange Rate Volatility", *World Economic Outlook, Chapter II*: 92-111.
- Stockman, A.C. and L.E.O. Svensson. 1987. "Capital flows, Investment, and Exchange rates" *Journal of Monetary Economics* 192: 171-202.
- Strongin, S. 1995). "The identification of monetary policy disturbances explaining the liquidity puzzle", *Journal of Monetary Economics*, 35(3): 463-497.
- Svensson, L. E. O. and A. Razin. 1983. "The terms of trade and the current account: The Harberger-Laursen-Metzler Effect" *Journal of Political Economy* 91: 97-125.
- Tai, C. 2000. "Time-varying market, interest rate, and exchange rate risk premia in the us commercial bank stock returns", *Journal of Multinational Financial Management* 10: 397-420.
- Tenreiro, S. 2003 "On the trade impact of nominal exchange rate volatility" *Federal reserve bank of Boston*.
- World Economic Outlook*. 1995. International Monetary Fund, Washington, DC.
- Yuksel, A. 2002. "The Performance of the Istanbul Stock Exchange During the Russian Crises" *Emerging Markets Finance and Trade* 38, (6): 78-99.
- Zellner, A. 1985. "Bayesian Econometrics" *Econometrica* 53: 253-269.
- Zellner, A. and F. Palm. 1974. "Time Series analysis and simultaneous equation econometric models." *Journal of Econometrics* 2:17-54
- Zha, T. 1999. "Block Recursion and Structural Vector Autoregressions", *Journal of Econometrics*, 90:291-316.

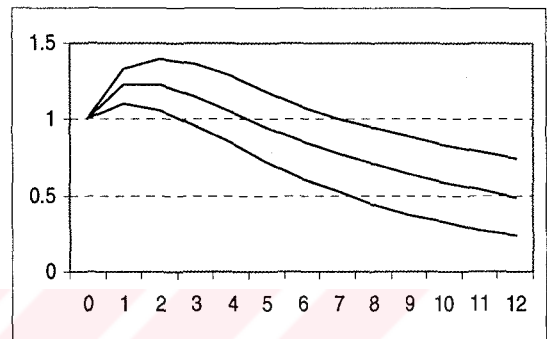
APPENDIX A

THE SENSITIVITY ANALYSES

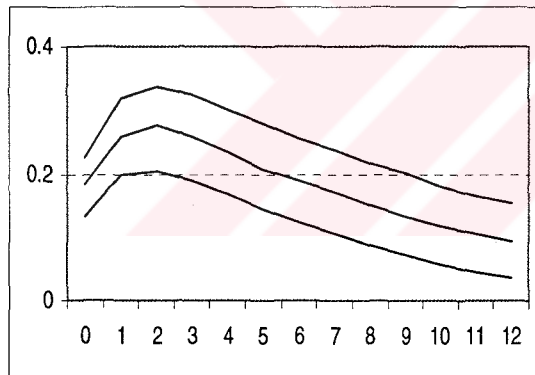
i. Response of RM_t to FXL_t/RES_{t-1}



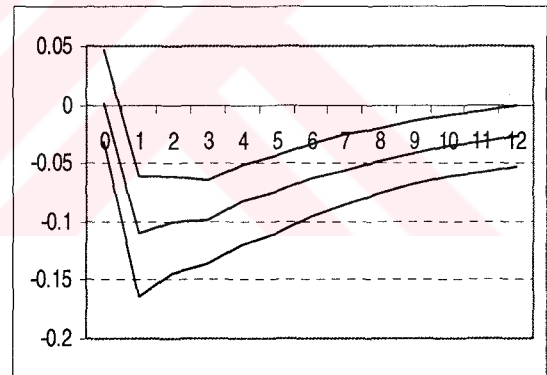
ii. Response of FXL_t/RES_{t-1} to FXL_t/RES_{t-1}



iii. Response of RER_t to FXL_t/RES_{t-1}



iv. Response of y_t to FXL_t/RES_{t-1}



v. Response of p_t to FXL_t/RES_{t-1}

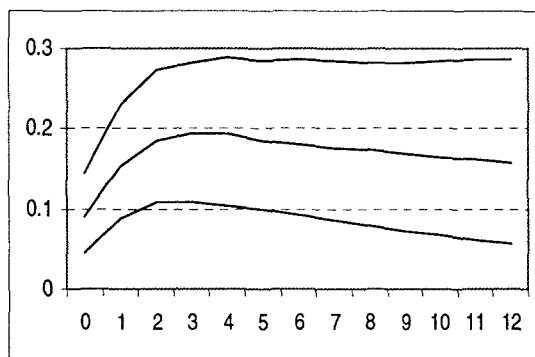
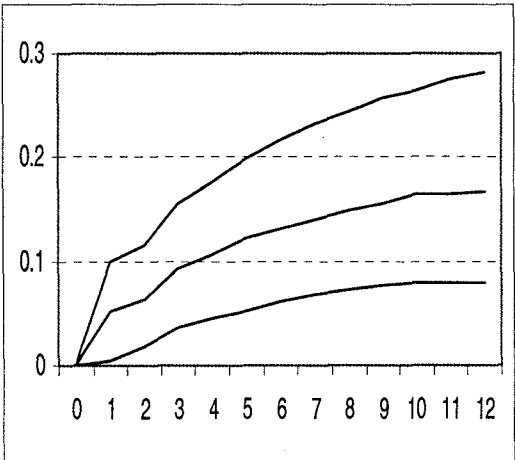
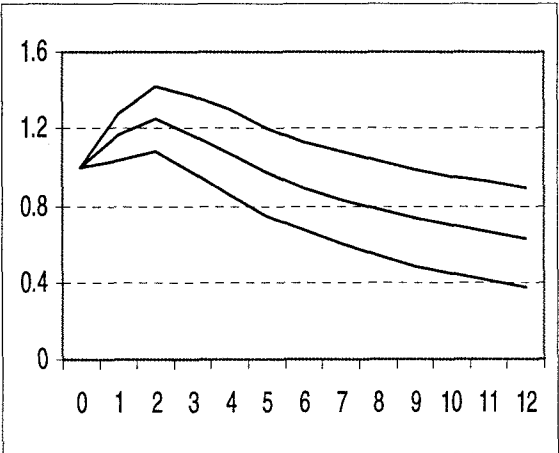


Figure A1. Impulse Response Functions

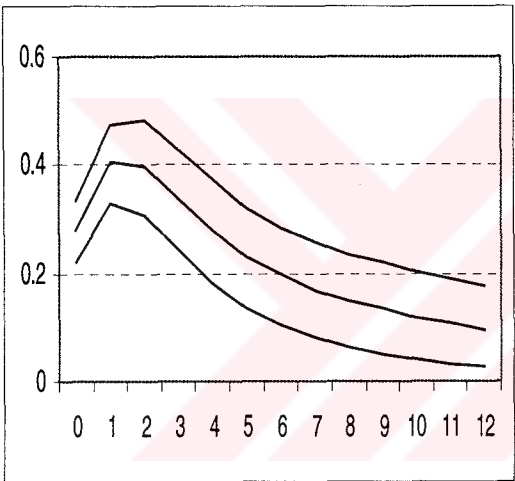
i. Response of RM_t to $FXL_t/TRES_{t-1}$



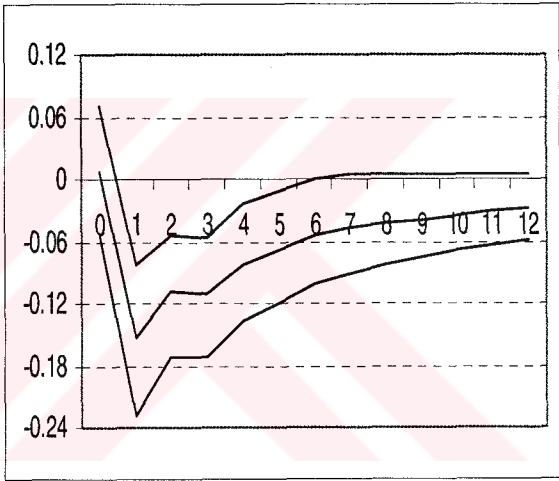
ii. Response of $FXL_t/TRES_{t-1}$ to $FXL_t/TRES_{t-1}$



iii. Response of RER_t to $FXL_t/TRES_{t-1}$



iv. Response of y_t to $FXL_t/TRES_{t-1}$



v. Response of p_t to $FXL_t/TRES_{t-1}$

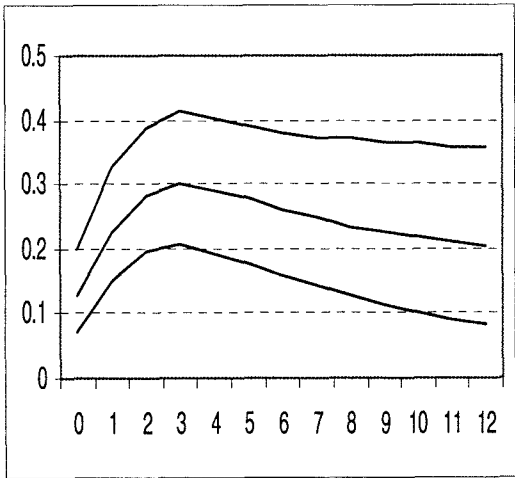
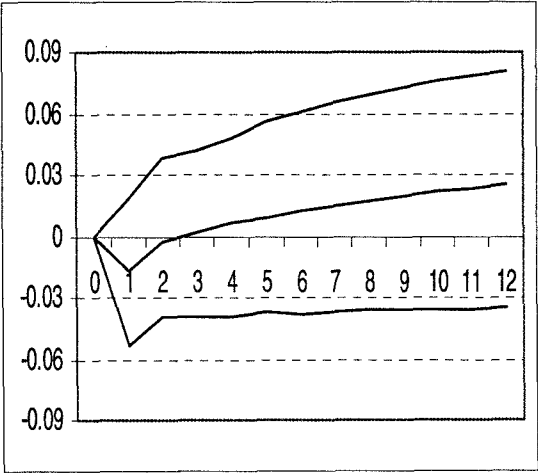
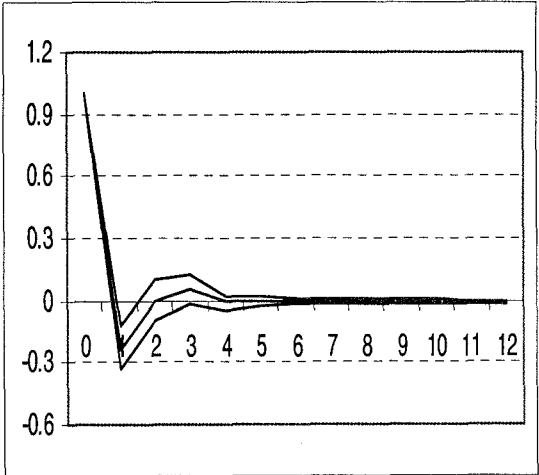


Figure A2. Impulse Response Functions

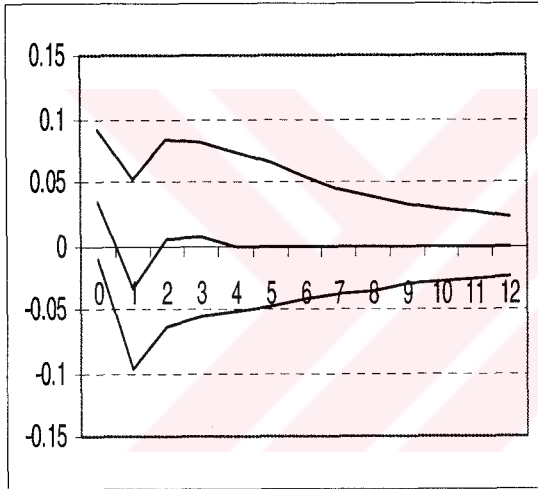
i. Response of RM_t to FXL_t/TLL_{t-1}



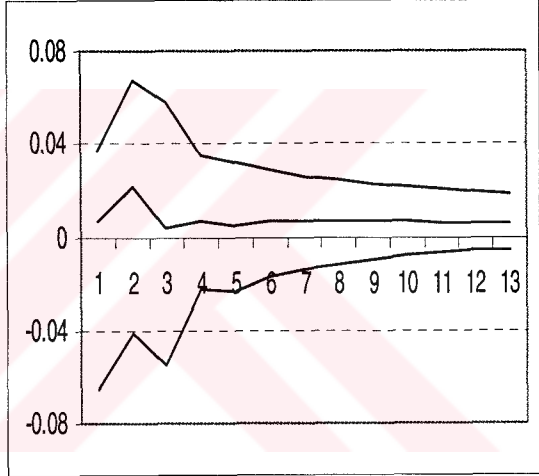
ii. Response of FXL_t/TLL_t to FXL/TLL_{t-1}



iii. Response of RER_t to FXL_t/TLL_{t-1}



iv. Response of y_t to FXL_t/TLL_{t-1}



v. Response of p_t to FXL_t/TLL_{t-1}

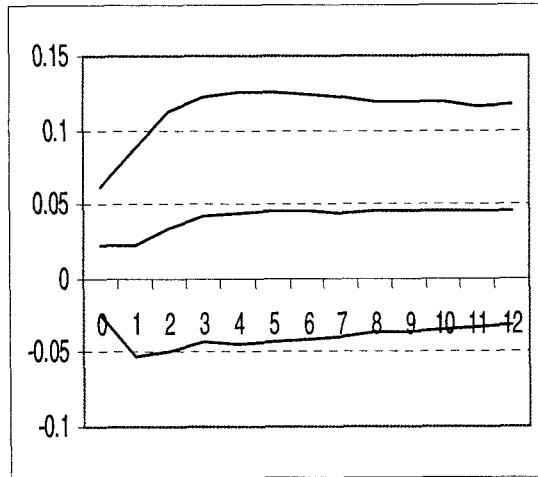


Figure A3. Impulse Response Functions

Table A1. Forecast Error Variance Decompositions: Contribution of FXL_t/RES_{t-1} to Changes in Key Macroeconomic Variables *

	RM_t	FXL_t/RES_{t-1}	rer_t	y_t	p_t
Period 6	6% (0.06)	85% (0.00)	49% (0.06)	14% (0.05)	28% (0.08)
Period 12	13% (0.09)	78% (0.00)	51% (0.04)	16% (0.05)	27% (0.09)
Period 18	16% (0.10)	72% (0.00)	49% (0.02)	16% (0.05)	25% (0.09)
Period 24	17% (0.10)	68% (0.01)	47% (0.02)	15% (0.05)	23% (0.10)

* Numbers in parentheses report the standard errors.

Table A2. Forecast Error Variance Decompositions: Contribution of $FXL_t/TRES_{t-1}$ to Changes in Key Macroeconomic Variables *

	RM_t	$FXL_t/TRES_{t-1}$	rer_t	y_t	p_t
Period 6	8% (0.07)	85% (0.01)	45% (0.05)	8% (0.04)	36% (0.07)
Period 12	16% (0.09)	80% (0.00)	45% (0.03)	9% (0.05)	32% (0.06)
Period 18	19% (0.09)	77% (0.00)	43% (0.02)	10% (0.04)	29% (0.07)
Period 24	20% (0.08)	75% (0.00)	42% (0.02)	10% (0.05)	26% (0.07)

* Numbers in parentheses report the standard errors.

Table A3. Forecast Error Variance Decompositions: Contribution of FXL_t/TLL_{t-1} to Changes in Key Macroeconomic Variables *

	RM_t	FXL_t/TLL_{t-1}	rer_t	y_t	p_t
Period 6	1% (0.02)	70% (0.06)	1% (0.02)	1% (0.02)	2% (0.06)
Period 12	1% (0.03)	69% (0.06)	1% (0.02)	1% (0.02)	2% (0.07)
Period 18	1% (0.04)	69% (0.06)	1% (0.02)	1% (0.02)	2% (0.07)
Period 24	2% (0.05)	69% (0.06)	1% (0.02)	1% (0.02)	3% (0.07)

* Numbers in parentheses report the standard errors.

APPENDIX B

THE MODEL

Description of the Models

The variables on the left hand side are the dependent variables under consideration and they are given in the order of the Tables in the paper. The explanations of the variables of the models are given just after the equations below. The models used are in line with the economic theory.

$$eend = f(y, p, r^*, dummies),$$

$$cpd = f(y, p, r, M1R/p, dummies),$$

$$cpn = f(y, r, M2Y/p, dummies),$$

$$ip = f(y, r, dummies),$$

$$cg = f(y, dummies),$$

$$ig = f(y, dummies),$$

$$x = f(y^*, px/p^*, ip, dummies),$$

$$m = f(y, pm, dummies),$$

$$p = f(gap, pm, cu, w, dummies),$$

$$M0 = f(y, p, r, dummies),$$

$$M1R = f(y, p, r, dummies),$$

$$r = f(p, debt/y, dummies),$$

$$rint = f(y, p, r, dummies),$$

Explanations of the Variables

eeend	:	Real exchange rate, it is defined as nominal exchange rate, TL/\$, times GNP deflator of USA divided by GNP deflator of Turkey, p
y	:	GNP in 1987 prices
p	:	GNP deflator
r*	:	LIBOR interest rate
dummies	:	Quarterly dummies to account for seasonality-s1, s2, s3; a dummy for controlling the high appreciation before 1994 crisis, which takes the value 1 in 1994:I zero otherwise, dum941; a dummy for controlling the high depreciation after 1994 crisis, which takes the value 1 in 1994:III zero otherwise, dum943; and a dummy variable for controlling the September 2001 terrorist attacks, which takes the value 1 in 2001:IV zero otherwise, dum20014.
cpd	:	Durable private consumption in 1987 prices
r	:	Real treasury-bond interest rate
M1R	:	M1 money + repo auctions,
Cpn	:	Non-durable private consumption in 1987 prices
M2Y	:	M2 money + foreign exchange denominated deposits held in commercial banks
Ip	:	Private investment in 1987 prices
Cg	:	Government consumption in 1987 prices
Ig	:	Government investment in 1987 prices
X	:	Total exports in 1987 prices
y*	:	OECD output in 1987 prices
p*	:	OECD prices
px	:	Export prices in 1987 prices
m	:	Total imports in 1987 prices
pm	:	Import prices in 1987 prices
gap	:	Difference between the realized output and potential output
cu	:	Capacity utilization
w	:	Wages
M0	:	M0 money
debt/y	:	Ratio of debt stock to nominal GNP
rint	:	Interbank interest rate

OECD output, OECD prices and USA GNP deflator are from OECD

Economic Outlook, treasury bond interest rate and wages are from Main Economic

Indicators of State Planning Organization (SPO), the potential output that is used in the gap variable is calculated in SPO and the remaining data are from the CBRT data delivery system (<http://tcmbf40.tcmb.gov.tr/cbt.html>). All the data are the first differences of the logarithms except for interest rates.



APPENDIX C

ESTIMATES

Table C.1. Estimates of the VAR Models

	cpd	cpn	ip	cg	ig	x	m	p	m0	m1r	r	rint
c	-0.59** (-2.62)	-0.22** (-2.45)	-0.83** (-3.69)	-0.15 (-0.71)	-1.16** (-2.15)	0.14** (2.85)	-0.23 (-0.53)	0.38** (2.51)	-0.33 (-1.40)	-0.53 (-1.10)	0.64* (1.90)	0.67** (2.34)
s1	0.31 (1.17)	0.14 (1.12)	0.60 (1.64)	-0.31 (-1.09)	0.45 (0.71)	-0.2** (-2.91)	0.28 (0.49)	-0.22* (-1.89)	0.44 (1.35)	1.09* (1.82)	-0.32 (-0.73)	-0.52 (-1.49)
s2	0.93** (2.17)	0.35** (2.22)	1.60** (3.85)	0.55 (1.71)	1.65* (1.87)	-0.15* (-1.97)	0.62 (0.78)	0.07 (0.60)	0.76 (1.62)	0.74 (0.80)	-1.04 (-1.60)	-1.16** (-2.17)
s3	1.01** (3.05)	0.51** (4.33)	1.38** (5.05)	0.41 (1.16)	1.87** (2.82)	0.06 (0.93)	-0.01 (-0.02)	-0.12 (-1.08)	0.75** (2.29)	0.01 (0.02)	-0.90* (-2.00)	-0.56 (-1.43)
pos(-1)	0.50 (0.53)	0.01 (0.04)	2.26** (2.68)	-0.02 (-0.03)	0.37 (0.2)	-0.14 (-0.21)	1.61 (1.25)	0.69 (0.54)	-0.50 (-0.55)	0.51 (0.25)	0.21 (0.16)	-0.79 (-0.76)
pos(-2)	0.23 (0.28)	-0.04 (-0.11)	-0.80 (-0.73)	0.00 (0.00)	2.91* (1.96)	-0.36 (-0.78)	0.61 (0.46)	-1.18 (-1.17)	-1.00 (-1.04)	-2.08 (-1.16)	-0.63 (-0.53)	0.07 (0.07)
pos(-3)	-1.10 (-1.33)	-0.99** (-2.72)	-3.00** (-2.52)	-0.03 (-0.05)	-0.38 (-0.24)	-0.17 (-0.24)	-1.85 (-1.32)	-1.22 (-1.18)	0.42 (0.41)	-1.24 (-0.65)	-2.00 (-1.68)	0.75 (0.76)
pos(-4)	-1.14 (-1.18)	-0.08 (-0.24)	-2.27 (-1.55)	-0.52 (-0.87)	1.27 (0.89)	-1.36* (-1.95)	-0.29 (-0.2)	-0.53 (-0.49)	-0.27 (-0.28)	-1.40 (-0.64)	-0.68 (-0.46)	1.38 (1.24)
neg(-1)	0.25 (0.28)	-0.18 (-0.41)	0.80 (0.99)	0.33 (0.53)	-1.02 (-0.46)	-1.10 (-1.34)	0.56 (0.38)	-0.45 (-0.17)	0.57 (0.67)	1.98 (1.05)	2.84 (1.66)	-0.67 (-0.67)
neg(-2)	0.84 (1.00)	-0.30 (-0.79)	0.16 (0.12)	0.07 (0.13)	5.10* (2.08)	-1.46** (-3.28)	0.90 (0.64)	-3.53* (-1.85)	0.81 (-0.99)	0.07 (-0.04)	-1.56 (-1.05)	-1.21 (-1.30)
neg(-3)	1.43 (1.67)	-0.09 (-0.26)	-2.33** (-2.40)	-0.03 (-0.04)	1.94 (1.47)	-0.13 (-0.20)	-0.48 (-0.31)	-2.81 (-1.74)	-0.23 (-0.26)	-1.80 (-0.98)	-4.51** (-2.72)	1.30 (1.32)
neg(-4)	-0.43 (-0.40)	0.21 (0.53)	-0.93 (-0.83)	0.34 (0.54)	0.09 (0.05)	-1.35** (-2.47)	1.06 (0.73)	0.11 (0.08)	-1.55 (-1.48)	-1.28 (-0.58)	-0.03 (-0.01)	1.08 (0.96)
y(-1)	1.32* (2.12)	0.7** (4.09)	1.49** (3.06)	0.43* (1.94)	2.56** (2.98)		0.70 (0.79)		0.75* (1.79)	0.46 (0.54)	-0.76 (-1.42)	-0.10 (-0.22)
y(-2)	1.10 (1.61)	0.83** (2.85)	1.29** (2.35)	0.77** (4.17)	1.18** (2.36)		0.15 (0.15)		0.27 (0.65)	-1.24 (-1.60)	-0.80 (-1.52)	0.00 (0.01)
y(-3)	0.66 (1.17)	0.36 (1.41)	0.67 (0.99)	-0.13 (-0.5)	1.61** (2.49)		-0.29 (-0.31)		-0.49 (-1.37)	-1.16 (-1.52)	0.12 (0.21)	1.09** (2.57)
y(-4)	-0.34 (-0.56)	-0.24 (-1.37)	-0.29 (-0.63)	-0.01 (-0.04)	-0.77 (-1.01)		0.16 (0.19)		0.06 (0.16)	-0.60 (-0.78)	0.74 (1.23)	0.91** (2.15)
cpd(-1)	-0.39 (-0.88)											
cpd(-2)	-0.40 (-1.33)											
cpd(-3)	-0.43 (-1.27)											
cpd(-4)	-0.44 (-1.37)											
cpn(-1)		-0.91** (-3.70)										
cpn(-2)		-1.01** (-3.09)										
cpn(-3)		-0.59* (-1.79)										
cpn(-4)		0.21 (0.84)										
ip(-1)			-0.35 (-1.31)			0.01 (0.14)						
ip(-2)			-0.04 (-0.15)			-0.12 (-1.43)						
ip(-3)			-0.12 (-0.66)			0.41** (2.70)						
ip(-4)			-0.31 (-1.41)			0.12 (1.17)						

Table C.1. Estimates of the VAR Models (cont'd.)

	cpd	cpn	ip	cg	ig	x	m	p	m0	m1r	r	rint
cg(-1)				-0.54** (-2.87)								
cg(-2)				-0.26 (-1.58)								
cg(-3)				-0.50** (-2.91)								
cg(-4)				-0.09 (-0.45)								
ig(-1)					-0.36 (-1.6)							
ig(-2)					-0.22 (-1.08)							
ig(-3)					-0.43** (-2.22)							
ig(-4)					0.24* (1.75)							
x(-1)						-0.36** (-2.2)						
x(-2)						-0.38** (-2.54)						
x(-3)						-0.14 (-1.04)						
x(-4)						0.11 (0.72)						
m(-1)							0.15 (0.44)					
m(-2)							-0.11 (-0.35)					
m(-3)							0.03 (0.1)					
m(-4)							-0.23 (-0.71)					
p(-1)	0.07 (0.21)							-0.16 (-0.48)	0.17 (0.49)	0.26 (0.37)	0.13 (0.26)	-0.57 (-1.60)
p(-2)	0.32 (1.26)							-0.39 (-1.15)	0.47 (1.49)	0.52 (0.86)	-0.77** (-2.18)	-0.27 (-0.82)
p(-3)	-0.08 (-0.26)							0.21 (0.66)	-0.32 (-0.86)	0.20 (0.34)	0.25 (0.72)	-0.68* (-1.87)
p(-4)	-0.18 (-0.62)							-0.23 (-0.63)	-0.22 (-0.68)	0.81 (1.29)	0.70 (1.61)	0.35 (0.99)
px/p*(-1)						0.29 (0.68)						
px/p*(-2)						-1.19** (-3.06)						
px/p*(-3)						-0.45 (-1.10)						
px/p*(-4)						-0.10 (-0.14)						
pm(-1)							0.39 (0.87)	0.46 (0.83)				
pm(-2)							0.23 (0.58)	-0.13 (-0.39)				
pm(-3)							0.65* (1.83)	-0.12 (-0.35)				
pm(-4)							-0.30 (-0.68)	-0.38 (-0.97)				

Table C.1. Estimates of the VAR Models (cont'd.)

	cpd	cpn	ip	cg	ig	x	m	p	m0	m1r	r	rint
cu(-1)								-1.45 (-0.70)				
cu(-2)								-2.59* (-2.02)				
cu(-3)								0.56 (0.28)				
cu(-4)								-1.96 (-1.66)				
w(-1)								0.00 (-0.01)				
w(-2)								0.37* (2.15)				
w(-3)								0.18 (0.99)				
w(-4)								-0.20 (-0.90)				
gap(-1)								-0.10 (-0.18)				
gap(-2)								-0.60 (-0.77)				
gap(-3)								0.69 (0.64)				
gap(-4)								-0.78 (-0.98)				
y*(-1)						4.02 (0.88)						
y*(-2)						6.39 (1.60)						
y*(-3)						-2.03 (-0.49)						
y*(-4)						-1.53 (-0.58)						
m0(-1)									-0.22 (-0.85)			
m0(-2)									-0.07 (-0.24)			
m0(-3)									0.33 (1.26)			
m0(-4)									-0.14 (-0.60)			
m1r(-1)										-0.16 (-0.78)		
m1r(-2)										-0.11 (-0.57)		
m1r(-3)										0.44** (2.45)		
m1r(-4)										0.15 (0.69)		
m1r/p(-1)	-0.18 (-1.75)											
m1r/p(-2)	-0.01 (-0.14)											
m1r/p(-3)	0.19* (2.04)											
m1r/p(-4)	0.16 (1.64)											
m2y/p(-1)		-0.09 (-0.78)										
m2y/p(-2)		-0.01 (-0.09)										

Table C.1. Estimates of the VAR Models (cont'd.)

	cpd	cpn	ip	cg	ig	x	m	p	m0	m1r	r	rint
m2y/p(-3)		0.09 (0.78)										
m2y/p(-4)		0.03 (0.26)										
r(-1)	0.00 0.03	0.03 (0.59)							0.03 (0.15)	0.16 (0.44)	-0.42 (-1.64)	-0.23 (-1.04)
r(-2)	0.08 0.59	0.01 (0.27)							0.19 (1.26)	0.14 (0.49)	-0.11 (-0.56)	0.51** (2.65)
r(-3)	0.14 1.08	0.06 (1.25)							-0.16 (-1.10)	-0.11 (-0.39)	0.02 (0.11)	-0.25 (-1.34)
r(-4)	0.05 0.35	0.02 (0.41)							0.02 (0.13)	0.18 (0.61)	-0.65** (-3.42)	-0.26 (-1.26)
rental(-1)			-0.28** (-2.66)									
rental(-2)			0.06 (0.44)									
rental(-3)			0.19 (1.46)									
rental(-4)			0.04 (0.24)									
rint(-1)												-0.02 (-0.15)
rint(-2)												-0.93** (-4.40)
rint(-3)												0.06 (0.40)
rint(-4)												-0.05 (-0.30)
debt/y(-1)											-0.98 (-0.89)	
debt/y(-2)											-2.22 (-1.19)	
debt/y(-3)											-0.27 (-0.15)	
debt/y(-4)											-1.49 (-0.77)	
dum941	-0.07 (-0.92)	-0.04 (-1.08)	-0.10 (-1.73)	-0.04 (-1.33)	-0.16* (-2.09)	-0.25** (-8.04)	-0.06 (-0.45)	-0.13 (-1.30)	-0.02 (-0.3)	0.40** (2.46)	0.12 (1.12)	0.60** (7.22)
dum943	0.04 (0.38)	0.11** (2.96)	0.17* (2.10)	0.09** (2.51)	0.46** (3.19)	0.01 (0.27)	0.17 (1.17)	-0.17 (-0.79)	0.13 (1.22)	0.26 (1.19)	-0.46** (-2.39)	0.05 (0.30)
dum20014	-0.29* (-2.13)	-0.01 (-0.15)	-0.21** (-2.12)	0.00 (-0.13)	0.29** (3.45)	0.03 (0.36)	-0.05 (-0.35)	0.24 (1.45)	0.07 (0.64)	-0.54** (-2.28)	0.41 (1.27)	-0.33** (-2.26)
dumrepo	0.00 (-0.01)									0.05 (0.85)		
R ²	0.86	1.00	0.88	0.99	0.97	0.95	0.60	0.81	0.71	0.76	0.87	0.93
asym	0.84	0.31	0.03	0.94	0.13	0.01	0.67	0.06	0.54	0.39	0.13	0.56
poss	0.33	0.18	0.04	0.60	0.26	0.24	0.98	0.26	0.40	0.24	0.19	0.45
negs	0.19	0.61	0.14	0.53	0.10	0.00	0.41	0.04	0.79	0.76	0.16	0.77

- '/' represents ratio of the first variable to the second.
- *t*-ratios are in parentheses. * and ** denote statistical significance at the 10% and 5% levels.
- Asym is the Wald test statistics for the null hypothesis that the sum of the coefficients for the positive shocks and the sum of the coefficients of the negative shocks are the same.
- poss is the Wald test statistics for the null hypothesis that the sum of the positive shock coefficients is zero.
- negs is the Wald test statistics for the null hypothesis that the sum of the negative shock coefficients is zero.

Table C.2. Estimates of the Reduced VAR Models

	cpd	cpn	ip	ig	x	m	p	m1r	r	rint
c	-0.34** (-2.59)	-0.20** (-3.44)	-0.64** (-3.08)	-0.91** (-2.20)	0.09** (2.64)	0.06 (1.35)	0.58** (4.36)	0.05 (0.24)	0.21 (1.25)	0.63** (2.58)
s1	0.50** (2.82)	0.22** (2.54)	0.50 (1.36)	-0.12 (-0.19)	-0.17** (-3.63)	-0.15** (-2.82)	-0.82** (-3.81)	0.55* (1.71)	-0.43 (-1.67)	-0.50 (-1.65)
s2	0.40 (1.64)	0.27** (2.78)	1.21** (3.07)	1.32* (1.84)	-0.09 (-1.61)	0.07 (1.06)	-0.58** (-3.10)	-0.14 (-0.37)	-0.28 (-1.14)	-1.02** (-2.27)
s3	0.43** (2.56)	0.37** (4.85)	1.04** (4.99)	1.67** (3.80)	0.06 (1.23)	-0.06 (-0.95)	0.30** (-4.25)	-0.34 (-1.57)	-0.07 (-0.82)	-0.45 (-1.32)
pos(-1)		-0.00 (-0.00)	1.78** (2.57)	0.65 (0.37)		0.93 (1.13)	0.95 (-1.45)	-0.75 (-0.73)		
pos(-2)		-0.08 (-0.31)	-1.04 (-1.39)	2.95 (1.68)		-0.17 (-0.21)	-0.24 (-0.37)	-2.71** (-2.64)		
pos(-3)		-0.40 (-1.57)	-1.42* (-2.03)			-1.73** (-2.12)	1.10** (2.08)			
pos(-4)			-1.27 (-1.63)							
neg(-1)	0.16 (0.32)			-0.93 (-0.47)	-1.19** (-2.77)		-1.02 (-1.14)		2.94** (3.19)	0.25 (0.43)
neg(-2)	0.44 (0.80)			4.70** (2.44)	-1.66** (-3.38)		-1.53* (-1.76)		-0.52 (-0.60)	-1.06 (-1.63)
neg(-3)	1.26** (2.42)			3.75** (2.61)					-3.16** (-3.48)	
neg(-4)										
y(-1)	0.65** (2.39)	0.66** (4.62)	0.91** (2.20)	2.28** (2.98)			-0.95** (-2.89)	0.55 (1.12)	-0.63 (-1.56)	-0.15 (-0.35)
y(-2)	-0.44 (-1.64)		0.72** (2.36)	2.05** (2.78)				-1.08** (-2.40)		0.12 (0.32)
y(-3)	-0.00 (-0.00)		0.27 (0.64)	1.89** (2.65)						1.01** (2.78)
y(-4)			-0.47* (-1.82)							0.80** (2.15)
cpd(-1)	0.00 (0.00)									
cpd(-2)										
cpd(-3)										
cpd(-4)										
cpn(-1)		-0.77** (-5.05)								
cpn(-2)		-0.45** (-3.01)								
cpn(-3)		-0.14 (-1.03)								
cpn(-4)		0.14 (0.95)								
ip(-1)			-0.10 (-0.65)		0.08 (0.85)					
ip(-2)					-0.07 (-0.81)					
ip(-3)					0.26** (2.82)					
ip(-4)										

Table C.2. Estimates of the Reduced VAR Models (cont'd.)

	cpd	cpn	ip	ig	x	m	p	m1r	r	rint
ig(-1)				-0.54** (-3.04)						
ig(-2)				-0.35** (-2.03)						
ig(-3)				-0.57** (-3.38)						
ig(-4)				0.05 (0.29)						
x(-1)					-0.38** (-3.49)					
x(-2)					-0.35** (-3.23)					
x(-3)					-0.11 (-1.03)					
x(-4)					0.10 (0.94)					
m(-1)						0.30* (1.84)				
m(-2)										
m(-3)										
m(-4)										
p(-1)							0.03 (0.15)		0.60** (2.17)	-0.69** (-2.43)
p(-2)									-0.30 (-1.34)	-0.25 (-0.94)
p(-3)										-0.59* (-1.94)
p(-4)										0.41 (1.51)
px/p*(-1)					-0.22 (-0.61)					
px/p*(-2)					-1.15** (-3.28)					
px/p*(-3)										
px/p*(-4)										
pm(-1)						0.33 (1.11)				
pm(-2)						0.26 (0.90)				
pm(-3)						0.60** (2.05)				
pm(-4)										
w(-1)							0.02 (0.15)			
w(-2)							0.35** (3.34)			
w(-3)										
w(-4)										

Table C.2. Estimates of the Reduced VAR Models (cont'd.)

	cpd	cpn	ip	ig	x	m	p	m1r	r	rint
y*(-1)					4.19*					
					(1.88)					
y*(-2)										
y*(-3)										
y*(-4)										
m0(-1)							-0.33			
							(-1.68)			
m0(-2)										
m0(-3)										
m0(-4)										
m1r(-1)								0.05		
								(0.42)		
m1r(-2)								0.05		
								(0.34)		
m1r(-3)								0.58		
								(4.56)		
m1r(-4)										
m1r/p(-1)	-0.08									
	(-1.31)									
m1r/p(-2)	0.03									
	(0.47)									
m1r/p(-3)	0.18**									
	(3.03)									
m1r/p(-4)										
r(-1)									-0.31**	-0.39**
									(-2.34)	(-2.67)
r(-2)									0.15	0.48**
									(1.16)	(3.02)
r(-3)									-0.02	-0.25
									(-0.17)	(-1.59)
r(-4)									-0.73**	-0.23
									(-5.69)	(-1.33)
rental(-1)			-0.21*							
			(-1.99)							
rental(-2)										
rental(-3)										
rental(-4)										
rint(-1)										0.01
										(0.09)
rint(-2)										-0.81**
										(-4.61)
rint(-3)										0.06
										(0.43)
rint(-4)										-0.06
										(-0.34)

Table C.2. Estimates of the Reduced VAR Models (cont'd.)

	cpd	cpn	ip	ig	x	m	p	m1r	r	rint
debt/y(-1)									-0.97 (-1.38)	
debt/y(-2)									-3.99** (-2.91)	
debt/y(-3)									1.51 (1.11)	
debt/y(-4)										
dum941	-0.03 (-0.58)	0.01 (0.46)	-0.13** (-3.06)	-0.19 (-1.11)	-0.20** (-3.80)	-0.09 (-0.78)	-0.03 (-0.41)	0.42** (3.26)	0.19** (2.27)	0.56** (7.57)
dum943	0.03 (0.49)	0.07** (2.05)	0.14** (2.61)	0.36* (1.69)	0.04 (0.74)	0.17 (1.41)	-0.06 (-0.73)	0.30* (2.01)	-0.59** (-5.09)	-0.00 (-0.01)
dum20014	-0.18 (-2.24)	-0.05 (-1.35)	-0.16** (-4.01)	0.28 (1.53)	-0.03 (-0.51)	-0.00 (-0.03)	-0.01 (-0.21)	-0.50 (-3.74)	0.55** (2.37)	-0.26* (-1.98)
dumrepo	-0.01 (-0.61)							0.03 (0.73)		
R ²	0.72	0.99	0.83	0.96	0.93	0.50	0.66	0.64	0.80	0.92
asym	0.05	0.31	0.15	0.06	0.00	0.53	0.27	0.03	0.59	0.39
poss	-	0.31	0.15	0.22	-	0.53	0.94	0.03	-	-
negs	0.05	-	-	0.03	0.00	-	0.06	-	0.59	0.39

- '/' represents ratio of the first variable to the second.
- *t*-ratios are in parentheses. * and ** denote statistical significance at the 10% and 5% levels.
- Asym is the Wald test statistics for the null hypothesis that the sum of the coefficients for the positive shocks and the sum of the coefficients of the negative shocks are the same.
- poss is the Wald test statistics for the null hypothesis that the sum of the positive shock coefficients is zero.
- negs is the Wald test statistics for the null hypothesis that the sum of the negative shock coefficients is zero.

Table C.3. Estimates of the VAR Models with 3SLS

	cpd	cpn	ip	cg	ig	x	m	p	m0	m1r	r	rint
c	-0.40** (-2.82)	-0.20** (-3.74)	-0.82** (-5.29)	-0.19 (-1.52)	-1.55** (-5.09)	0.13** (3.85)	-0.34 (-1.08)	0.57** (8.39)	-0.27 (-1.51)	-0.42 (-1.44)	0.83** (3.61)	0.74** (3.93)
s1	0.20 (1.32)	0.13 (1.71)	0.70** (3.39)	-0.28 (-1.47)	0.84* (2.01)	-0.19** (-5.16)	0.40 (0.96)	-0.41** (-6.81)	0.25 (0.99)	0.87 (2.37)	-0.40 (-1.56)	-0.59** (-2.60)
s2	0.68** (2.74)	0.33** (3.54)	1.51** (5.47)	0.60** (2.90)	2.08** (4.02)	-0.17** (-2.94)	0.80 (1.43)	0.04 (0.74)	0.68* (2.16)	0.54 (1.00)	-1.39** (-3.25)	-1.22** (-3.52)
s3	0.76** (3.72)	0.45** (6.40)	1.18** (5.63)	0.44** (2.27)	2.33** (5.40)	0.05 (1.11)	0.09 (0.19)	-0.17** (-3.34)	0.83** (3.74)	-0.10 (-0.26)	-1.06** (-3.57)	-0.61** (-2.40)
pos(-1)	2.30** (2.82)	-0.10 (-0.39)	1.20* (1.77)	-0.16 (-0.36)	0.99 (0.83)	0.49 (1.25)	0.08 (0.07)	0.48 (0.85)	0.18 (0.20)	2.95* (1.82)	0.01 (0.02)	-0.06 (-0.08)
pos(-2)	0.40 (0.84)	-0.19 (-0.92)	-1.66** (-2.64)	-0.14 (-0.32)	4.46** (3.72)	-0.52 (-1.34)	-0.13 (-0.11)	-1.96** (-4.16)	-1.65** (-2.45)	-3.23** (-2.88)	-1.00 (-1.23)	-0.05 (-0.08)
pos(-3)	-1.04* (-2.23)	-0.96** (-4.42)	-1.99** (-2.76)	0.09 (0.21)	-0.47 (-0.31)	-0.87* (-1.89)	-1.13 (-1.03)	-1.68** (-3.96)	0.35 (0.52)	-0.97 (-0.82)	-2.80** (-3.18)	0.41 (0.64)
pos(-4)	-2.40** (-3.51)	0.04 (0.17)	-1.17 (-1.57)	-0.19 (-0.41)	0.94 (0.73)	-1.81** (-3.87)	0.91 (0.78)	-0.94* (-1.99)	-0.85 (-0.99)	-2.99* (-1.83)	-1.33 (-1.26)	0.77 (0.95)
neg(-1)	2.58** (2.74)	-0.46 (-1.37)	-1.28 (-1.35)	0.50 (0.76)	1.63 (0.99)	0.13 (0.27)	-1.93 (-1.16)	-1.86 (-1.67)	1.57 (1.40)	5.18** (2.69)	2.64** (2.52)	0.63 (0.61)
neg(-2)	1.59 (1.82)	-0.72** (-2.50)	-1.26 (-1.35)	0.23 (0.37)	8.76** (4.91)	-2.20** (-4.14)	0.90 (0.61)	-4.67** (-5.12)	-0.13 (-0.17)	-3.02* (-1.86)	-1.78* (-1.99)	-1.82 (-2.07)
neg(-3)	-0.33 (-0.37)	0.14 (0.51)	0.34 (0.36)	0.56 (0.89)	1.57 (0.68)	-0.98 (-1.65)	1.61 (1.02)	-2.95** (-4.49)	-1.07 (-1.13)	-3.32* (-1.89)	-4.54** (-4.44)	0.04 (0.04)
neg(-4)	-2.53** (-2.40)	0.38 (1.22)	0.04 (0.04)	0.94 (1.56)	-0.32 (-0.19)	-0.28 (-0.50)	1.78 (1.20)	-0.46 (-0.66)	-1.49 (-1.39)	-0.54 (-0.27)	0.13 (0.11)	1.05 (0.96)
γ(-1)	1.02** (2.78)	0.67** (6.41)	1.67** (5.41)	0.57** (3.04)	3.00** (5.55)		0.76 (1.20)		0.46 (1.30)	0.06 (0.11)	-0.59 (-1.80)	-0.27 (-0.86)
γ(-2)	0.89** (2.36)	0.61** (4.69)	1.23** (3.10)	0.87** (4.74)	1.26** (2.26)		0.16 (0.22)		0.42 (1.50)	-1.11** (-2.42)	-0.70* (-2.12)	0.03 (0.09)
γ(-3)	0.53 (1.74)	0.37** (2.30)	0.62 (1.52)	-0.05 (-0.26)	1.69** (3.44)		-0.48 (-0.71)		-0.57** (-2.40)	-0.45 (-0.98)	0.67 (1.50)	1.07** (3.68)
γ(-4)	-0.09 (-0.25)	-0.21* (-2.01)	-0.11 (-0.36)	0.03 (0.15)	-1.01* (-1.74)		-0.14 (-0.22)		0.08 (0.34)	-1.14** (-2.49)	1.14** (2.4)	0.98** (3.59)
cpd(-1)	-0.34 (-1.31)											
cpd(-2)	-0.16 (-0.82)											
cpd(-3)	-0.50** (-2.42)											
cpd(-4)	-0.64** (-2.99)											
cpn(-1)		-0.86** (-5.83)										
cpn(-2)		-0.91** (-4.53)										
cpn(-3)		-0.6** (-2.85)										
cpn(-4)		0.31* (1.95)										
ip(-1)			-0.25 (-1.52)			0.00 (-0.05)						
ip(-2)			-0.11 (-0.71)			-0.17** (-2.94)						
ip(-3)			-0.07 (-0.59)			0.44** (6.56)						
ip(-4)			-0.28** (-2.39)			0.15* (1.89)						

Table C.3. Estimates of the VAR Models with 3SLS (cont'd.)

	cpd	cpn	ip	cg	ig	x	m	p	m0	m1r	r	rint
cg(-1)				-0.69** (-4.62)								
cg(-2)				-0.40** (-2.67)								
cg(-3)				-0.64** (-4.38)								
cg(-4)				-0.24 (-1.67)								
ig(-1)					-0.44** (-2.61)							
ig(-2)					-0.24 (-1.54)							
ig(-3)					-0.53** (-3.55)							
ig(-4)					0.22 (1.46)							
x(-1)						-0.36** (-3.50)						
x(-2)						-0.22* (-2.10)						
x(-3)						-0.08 (-0.91)						
x(-4)						0.20** (2.49)						
m(-1)							0.13 (0.51)					
m(-2)							-0.11 (-0.44)					
m(-3)							0.20 (0.79)					
m(-4)							-0.03 (-0.13)					
p(-1)	-0.14 (-0.68)							0.00 (-0.02)	0.09 (0.37)	0.27 (0.64)	-0.14 (-0.37)	-0.61** (-2.57)
p(-2)	0.33* (2.21)							-0.60** (-4.13)	0.68** (2.87)	0.76* (2.08)	-0.87** (-4.06)	-0.26 (-1.28)
p(-3)	-0.02 (-0.13)							0.10 (0.70)	-0.42 (-1.73)	0.18 (0.51)	0.31 (1.44)	-0.77** (-3.11)
p(-4)	-0.25 (-1.41)							-0.29* (-1.93)	-0.25 (-1.19)	1.01** (2.68)	0.87** (2.75)	0.36 (1.57)
px/p*(-1)					0.54 (1.56)							
px/p*(-2)					-1.15** (-3.94)							
px/p*(-3)					-0.8** (-3.09)							
px/p*(-4)					0.21 (0.74)							
pm(-1)							0.40 (1.27)	1.05** (3.95)				
pm(-2)							0.06 (0.20)	-0.07 (-0.47)				
pm(-3)							0.81** (2.97)	0.33* (2.15)				
pm(-4)							-0.08 (-0.23)	-0.89** (-4.85)				

Table C.3. Estimates of the VAR Models with 3SLS (cont'd.)

	cpd	cpn	ip	cg	ig	x	m	p	m0	m1r	r	rint
cu(-1)								-3.70** (-4.04)				
cu(-2)								-1.91** (-3.32)				
cu(-3)								1.00 (1.17)				
cu(-4)								-2.51** (-4.75)				
w(-1)								0.09 (0.79)				
w(-2)								0.47** (5.48)				
w(-3)								0.17* (2.09)				
w(-4)								-0.27** (-2.97)				
gap(-1)								-0.71** (-2.69)				
gap(-2)								0.48 (1.29)				
gap(-3)								-0.19 (-0.37)				
gap(-4)								-1.13** (-3.08)				
y*(-1)						5.40** (2.83)						
y*(-2)						6.06** (2.92)						
y*(-3)						-3.26 (-1.52)						
y*(-4)						-0.82 (-0.41)						
m0(-1)									-0.33 (-1.54)			
m0(-2)									-0.05 (-0.27)			
m0(-3)									0.47** (2.51)			
m0(-4)									-0.23 (-1.37)			
m1r(-1)										0.00 (0.03)		
m1r(-2)										-0.25** (-2.08)		
m1r(-3)										0.39** (3.47)		
m1r(-4)										0.04 (0.30)		
m1r/p(-1)	-0.13* (-2.21)											
m1r/p(-2)	-0.04 (-0.74)											
m1r/p(-3)	0.18* (3.37)											
m1r/p(-4)	0.07 (1.06)											
m2y/p(-1)		-0.04 (-0.47)										
m2y/p(-2)		0.00 (0.00)										

Table C.3. Estimates of the VAR Models with 3SLS (cont'd.)

	cpd	cpn	ip	cg	ig	x	m	p	m0	m1r	r	rint
m2y/p(-3)		0.13*										
		(1.88)										
m2y/p(-4)		0.01										
		(0.16)										
r(-1)			-0.14									
			(-1.61)									
r(-2)			0.07									
			(0.91)									
r(-3)			0.19**									
			(2.50)									
r(-4)			0.06									
			(0.75)									
rental(-1)	-0.25*	0.04							-0.10	-0.05	-0.51**	-0.23
	(-1.85)	(1.17)							(-0.56)	(-0.21)	(-2.77)	(-1.65)
rental(-2)	0.15*	0.02							0.29**	0.31*	-0.24	0.53**
	(1.92)	(0.72)							(2.72)	(1.85)	(-1.8)	(4.22)
rental(-3)	0.13	0.04							-0.17*	-0.19	-0.02	-0.29**
	(1.78)	(1.43)							(-1.86)	(-1.18)	(-0.18)	(-2.45)
rental(-4)	0.01	0.04							-0.04	0.16	-0.53**	-0.32**
	(0.12)	(1.25)							(-0.42)	(0.93)	(-3.61)	(-2.38)
rint(-1)												-0.09
												(-0.92)
rint(-2)												-0.94**
												(-6.64)
rint(-3)												0.08
												(0.76)
rint(-4)												0.00
												(-0.03)
debt/y(-1)											-0.46	
											(-0.63)	
debt/y(-2)											-2.09*	
											(-1.84)	
debt/y(-3)											-1.27	
											(-1.08)	
debt/y(-4)											-2.70*	
											(-1.9)	
dum941	-0.06	-0.04*	-0.08	-0.03	-0.11	-0.29**	-0.08	-0.15**	-0.05	0.30**	0.07	0.56**
	(-1.33)	(-2.06)	(-1.35)	(-0.76)	(-0.88)	(-7.58)	(-0.73)	(-3.72)	(-1.12)	(2.91)	(1.02)	(9.86)
dum943	-0.01	0.12**	0.18**	0.11**	0.50**	0.05	0.23**	-0.48**	0.09	0.15	-0.31*	0.03
	(-0.10)	(5.13)	(2.67)	(2.33)	(3.71)	(1.30)	(2.15)	(-4.73)	(1.28)	(1.10)	(-2.17)	(0.32)
dum20014	-0.28**	0.00	-0.26**	-0.02	0.35**	0.06	-0.04	0.36**	0.05	-0.56**	0.52**	-0.35**
	(-3.69)	(0.12)	(-3.82)	(-0.44)	(3.03)	(1.34)	(-0.38)	(4.90)	(0.79)	(-4.12)	(2.45)	(-3.60)
dumrepo	0.00									0.06		
	(-0.08)									(1.58)		
R ²	0.87	1.00	0.91	0.99	0.98	0.97	0.61	0.90	0.69	0.81	0.88	0.93
asym	0.74	0.03	0.02	0.25	0.00	0.00	0.61	0.00	0.13	0.13	0.00	0.67
poss	0.42	0.01	0.01	0.64	0.04	0.00	0.90	0.00	0.06	0.04	0.01	0.37
negs	0.24	0.15	0.11	0.02	0.00	0.00	0.29	0.00	0.33	0.47	0.01	0.94

- '/' represents ratio of the first variable to the second.
- t-ratios are in parentheses. * and ** denote statistical significance at the 10% and 5% levels.
- Asym is the Wald test statistics for the null hypothesis that the sum of the coefficients for the positive shocks and the sum of the coefficients of the negative shocks are the same.
- poss is the Wald test statistics for the null hypothesis that the sum of the positive shock coefficients is zero.
- negs is the Wald test statistics for the null hypothesis that the sum of the negative shock coefficients is zero.

Table C.4. Estimates of the Reduced Models with 3SLS

	cpd	cpn	ip	ig	x	m	p	m1r	r	rint
c	-0.35** (-3.29)	-0.26** (-5.77)	-0.95** (-6.65)	-0.98** (-3.18)	0.10* (-1.95)	0.06 (1.50)	0.54** (4.78)	0.02 (0.11)	0.20 (1.58)	0.47** (2.37)
s1	0.51** (3.61)	0.27** (4.15)	0.96** (4.81)	0.44 (0.92)	-0.20** (-2.25)	-0.15** (-3.27)	-0.77** (-4.31)	0.54* (1.73)	-0.43** (-2.14)	-0.11 (-0.43)
s2	0.41** (2.11)	0.38** (5.07)	1.78** (6.70)	1.37** (2.50)	-0.12* (-1.76)	0.07 (1.35)	-0.54** (-3.41)	-0.10 (-0.27)	-0.27 (-1.41)	-0.63 (-1.69)
s3	0.43** (3.19)	0.44** (7.74)	1.22** (5.52)	1.49** (4.35)	0.02 (0.32)	-0.06 (-1.19)	-0.28** (-4.91)	-0.31 (-1.51)	-0.07 (-1.09)	-0.49* (-1.82)
pos(-1)		0.04 (0.26)	1.61** (3.19)	0.31 (0.23)		0.96 (1.37)	-0.84 (-1.52)	-0.70 (-0.77)		
pos(-2)		-0.02 (-0.10)	-1.25** (-2.48)	2.52* (1.94)		-0.19 (-0.28)	-0.30 (-0.57)	-2.59** (-2.90)		
pos(-3)		-0.54** (-3.11)	-1.95** (-3.44)			-1.74* (-2.52)	1.12** (2.57)			
pos(-4)			-0.91* (-1.75)							
neg(-1)	0.17 (0.42)			-0.92 (-0.59)	-1.16** (-2.67)		-0.77 (-1.02)		2.97** (4.19)	0.87 (1.59)
neg(-2)	0.45 (1.03)			4.57** (3.11)	-1.45** (-2.17)		-1.63** (-2.29)		-0.52 (-0.78)	-0.94* (-1.94)
neg(-3)	1.24** (3.00)			2.40** (2.05)					-3.12** (-4.46)	
neg(-4)										
y(-1)	0.67** (3.07)	0.61** (5.97)	1.52** (5.35)	2.54** (4.35)			-0.88** (-3.23)	0.54 (1.14)	-0.62* (-1.99)	0.27 (0.81)
y(-2)	-0.43* (-2.02)		0.80** (2.60)	1.09* (1.79)			-0.99** (-2.33)			0.06 (0.19)
y(-3)	-0.01 (-0.04)		-0.01 (-0.03)	1.68** (3.06)						0.66** (2.25)
y(-4)	-0.59** (-3.40)		-0.57** (-2.51)							0.98** (3.37)
cpd(-1)	-0.01 (-0.05)									
cpd(-2)										
cpd(-3)										
cpd(-4)										
cpn(-1)		-0.65** (-5.99)								
cpn(-2)		-0.35** (-3.32)								
cpn(-3)		-0.17* (-1.82)								
cpn(-4)		0.07 (0.66)								
ip(-1)			-0.11 (-0.79)		0.08 (0.74)					
ip(-2)					-0.07 (-0.85)					
ip(-3)					0.26 (1.44)					
ip(-4)										

Table C.4. Estimates of the Reduced Models with 3SLS (cont'd)

	cpd	cpn	ip	ig	x	m	p	m1r	r	rint
ig(-1)				-0.38** (-2.43)						
ig(-2)				-0.20 (-1.36)						
ig(-3)				-0.54** (-4.19)						
ig(-4)				0.15 (1.12)						
x(-1)					-0.38** (-2.17)					
x(-2)					-0.41** (-3.07)					
x(-3)					-0.07 (-0.68)					
x(-4)					0.12 (0.46)					
m(-1)						0.34** (2.29)				
m(-2)										
m(-3)										
m(-4)										
p(-1)							0.00 (0.02)		0.62** (2.87)	0.45* (-1.92)
p(-2)									-0.31* (-1.81)	-0.40* (-1.91)
p(-3)										-0.95** (-3.81)
p(-4)										0.48** (2.11)
px/p*(-1)					-0.22 (-0.52)					
px/p*(-2)					-1.28** (-2.19)					
px/p*(-3)										
px/p*(-4)										
pm(-1)						0.33 (1.31)				
pm(-2)						0.24 (0.96)				
pm(-3)						0.60** (2.38)				
pm(-4)										
w(-1)							-0.04 (-0.40)			
w(-2)							0.40** (4.26)			
w(-3)										
w(-4)										

Table C.4. Estimates of the Reduced Models with 3SLS (cont'd)

	cpd	cpn	ip	ig	x	m	p	m1r	r	rint
y*(-1)					6.92 (1.50)					
y*(-2)										
y*(-3)										
y*(-4)										
m0(-1)							-0.19 (-1.08)			
m0(-2)										
m0(-3)										
m0(-4)										
m1r(-1)								0.02 (0.18)		
m1r(-2)								0.10 (0.69)		
m1r(-3)								0.61** (4.65)		
m1r(-4)										
m1r/p(-1)	-0.07 (-1.57)									
m1r/p(-2)	0.03 (0.58)									
m1r/p(-3)	0.18** (3.67)									
m1r/p(-4)										
r(-1)									-0.30** (-2.95)	-0.26** (-2.23)
r(-2)									0.15 (1.44)	0.50** (4.15)
r(-3)									-0.02 (-0.22)	-0.34** (-2.94)
r(-4)									-0.73** (-7.45)	-0.21 (-1.60)
rental(-1)			-0.12 (-1.52)							
rental(-2)										
rental(-3)										
rental(-4)										
rint(-1)										-0.01 (-0.16)
rint(-2)										-0.95** (-7.02)
rint(-3)										0.13 (1.26)
rint(-4)										-0.07 (-0.57)

Table C.4. Estimates of the Reduced Models with 3SLS (cont'd)

	cpd	cpn	ip	ig	x	m	p	m1r	r	rint
debt/y(-1)									-0.99*	
									(-1.85)	
debt/y(-2)									-3.93**	
									(-3.73)	
debt/y(-3)									1.48	
									(1.42)	
debt/y(-4)										
dum941	-0.03	-0.00	-0.10	-0.14	-0.20**	-0.09	-0.04	0.42**	0.19**	0.58**
	(-0.72)	(-0.06)	(-1.67)	(-1.08)	(-4.03)	(-0.92)	(-0.68)	(3.75)	(2.97)	(10.64)
dum943	0.04	0.08**	0.21**	0.44**	0.03	0.18*	-0.05	0.30**	-0.59**	0.08
	(0.62)	(3.31)	(3.19)	(2.76)	(0.43)	(1.79)	(-0.73)	(2.24)	(-6.67)	(0.67)
dum20014	-0.18**	-0.05*	-0.16**	0.23	-0.01	0.00	-0.01	-0.49**	0.55	-0.33**
	(-2.79)	(-1.87)	(-2.55)	(1.68)	(-0.18)	(0.00)	(-0.25)	(-4.18)	(3.06)	(-3.40)
dumrepo	-0.01							0.03		
	(-0.76)							(0.77)		
R ²	0.72	0.99	0.88	0.97	0.91	0.49	0.65	0.64	0.80	0.91
asym	0.01	0.10	0.02	0.05	0.00	0.46	0.23	0.02	0.53	0.93
poss	-	0.10	0.02	0.20	-	0.46	0.98	0.02	-	0.93
negs	0.01	-	-	0.02	0.00	-	0.04	-	0.53	-

- '/' represents ratio of the first variable to the second.
- *t*-ratios are in parentheses. * and ** denote statistical significance at the 10% and 5% levels.
- **Asym** is the Wald test statistics for the null hypothesis that the sum of the coefficients for the positive shocks and the sum of the coefficients of the negative shocks are the same.
- **poss** is the Wald test statistics for the null hypothesis that the sum of the positive shock coefficients is zero.
- **negs** is the Wald test statistics for the null hypothesis that the sum of the negative shock coefficients is zero.

APPENDIX D

SENSITIVITY ANALYSIS

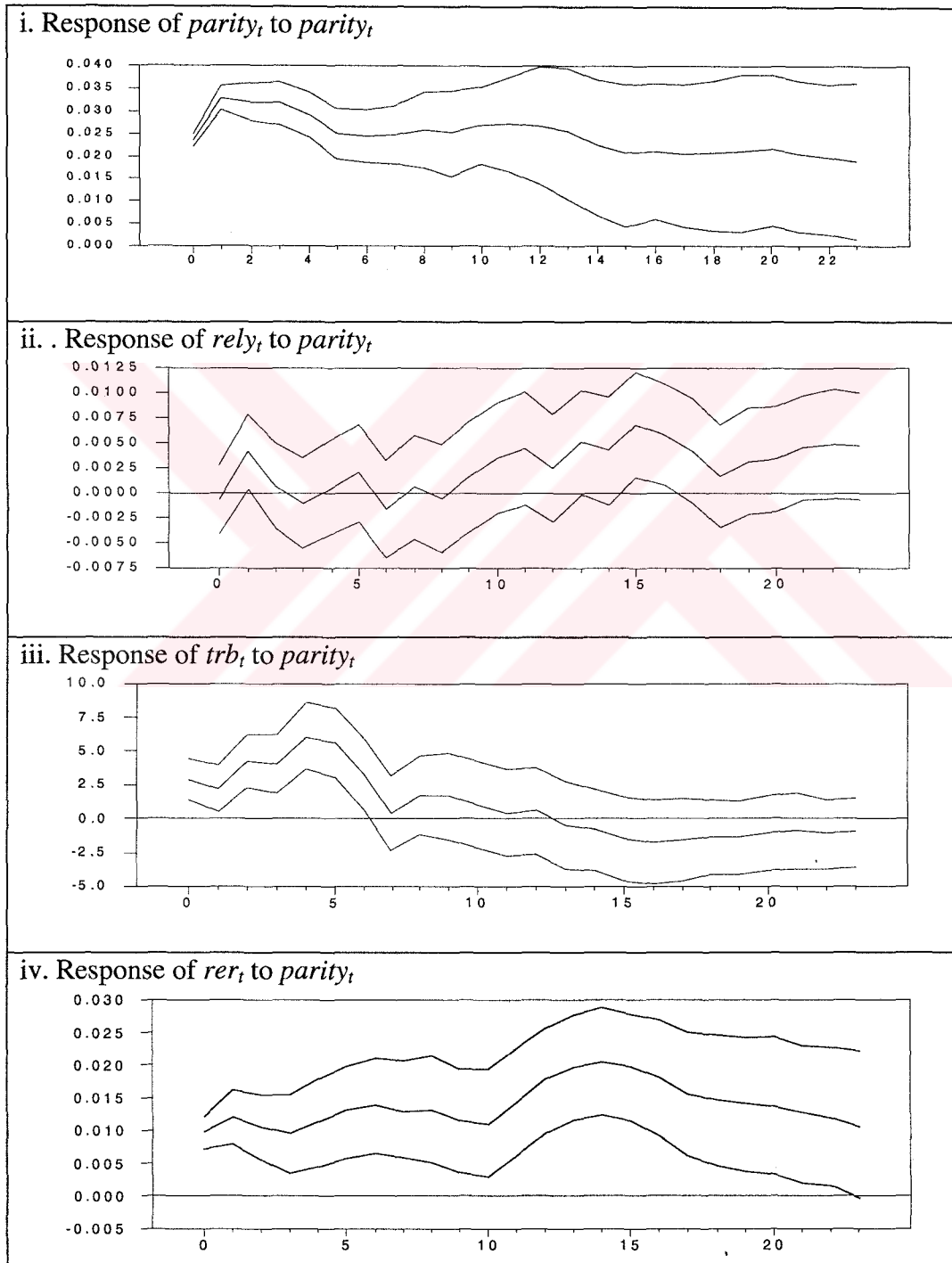


Figure D.1. Impulse Response Functions in different ordering

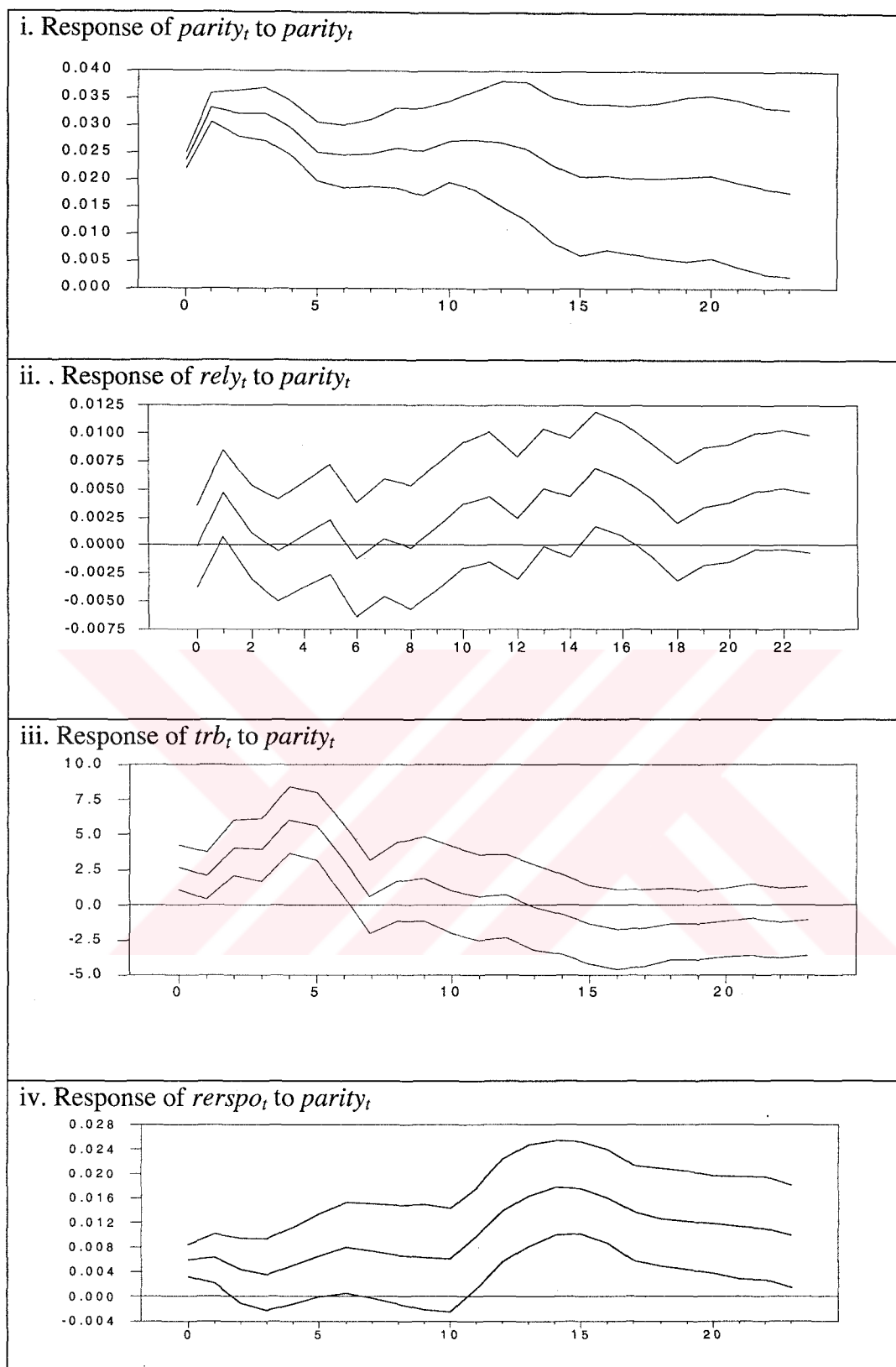


Figure D.2. Impulse Response Functions (SPO definition is used as real exchange rate) with different ordering

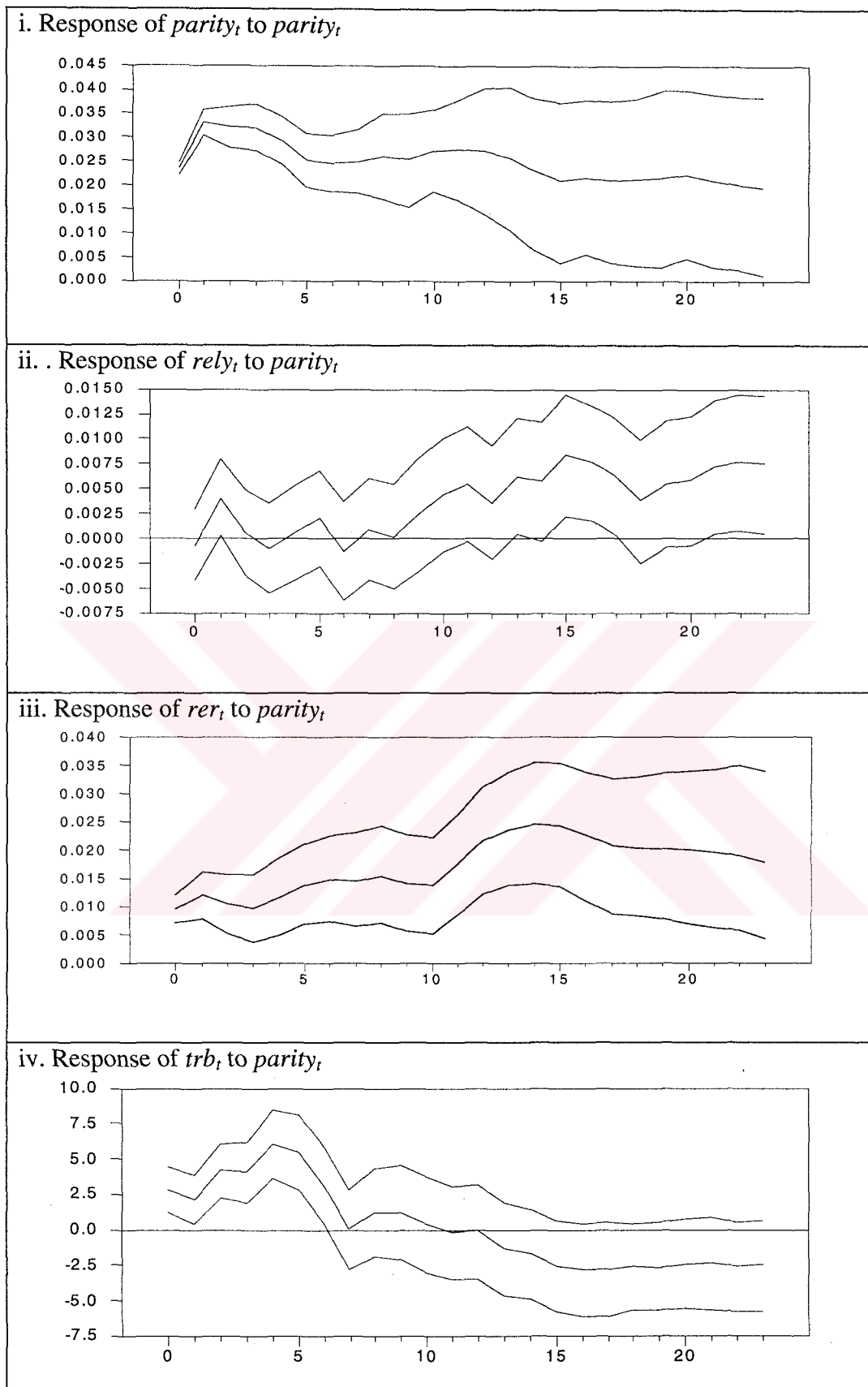


Figure D.3 Impulse Response Functions when terms of trade (1. lag) is included as an exogenous variable

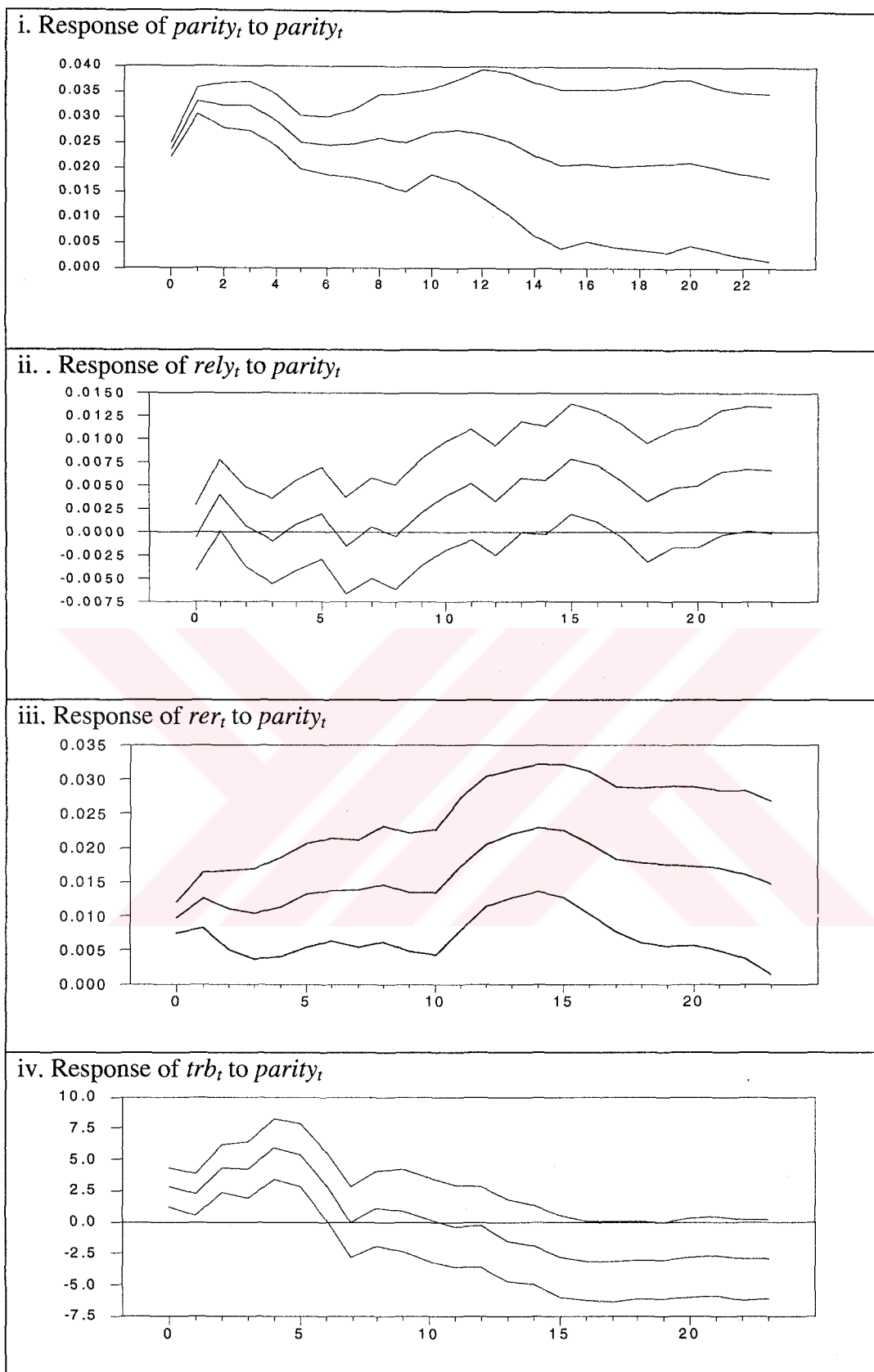


Figure D.4. Impulse Response Functions when terms of trade (current and 1. lag) is included as an exogenous variable

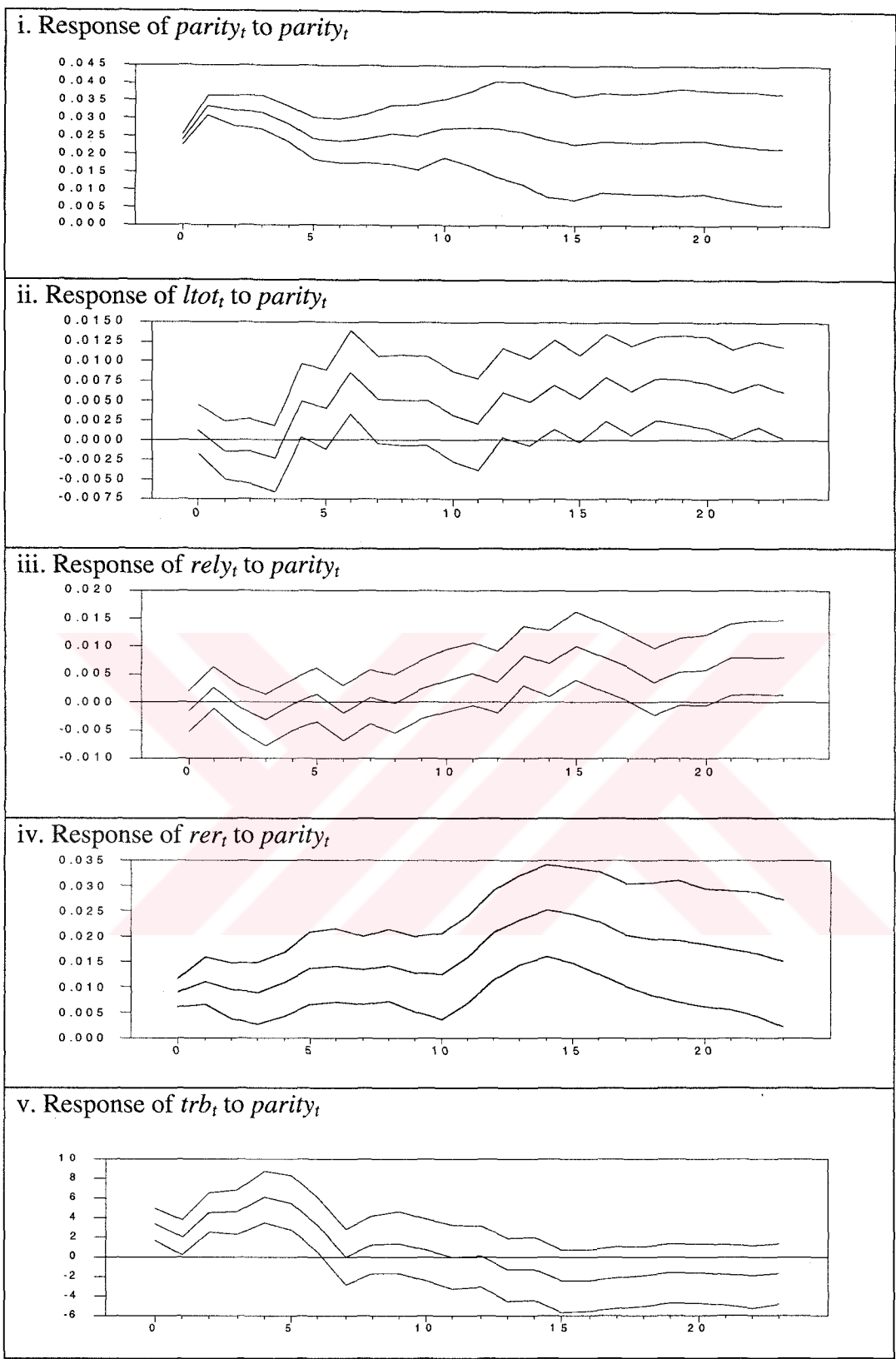


Figure D.5. Impulse Response Functions including terms of trade

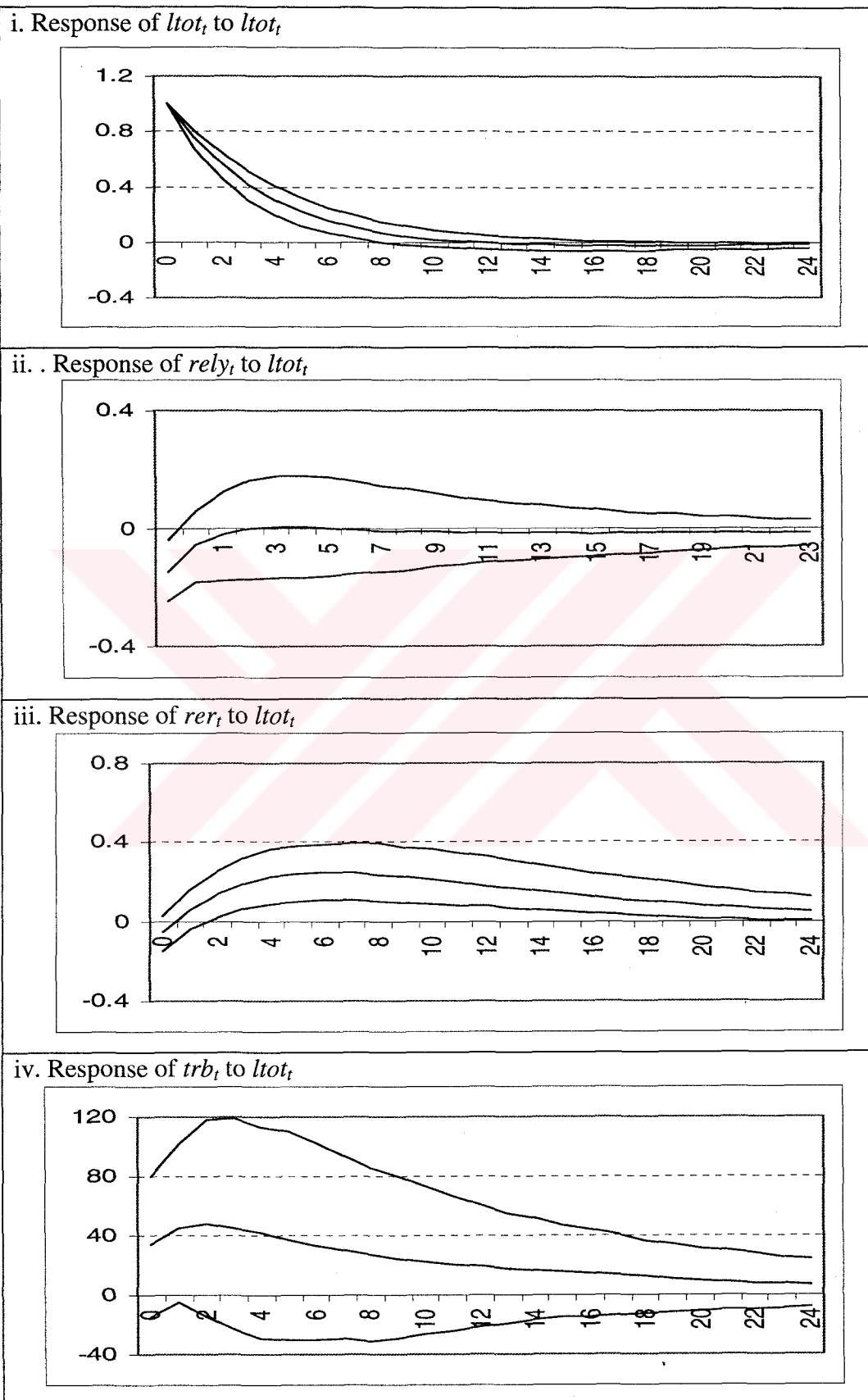


Figure D.6. Impulse Response Functions for Robustness (parity is excluded)

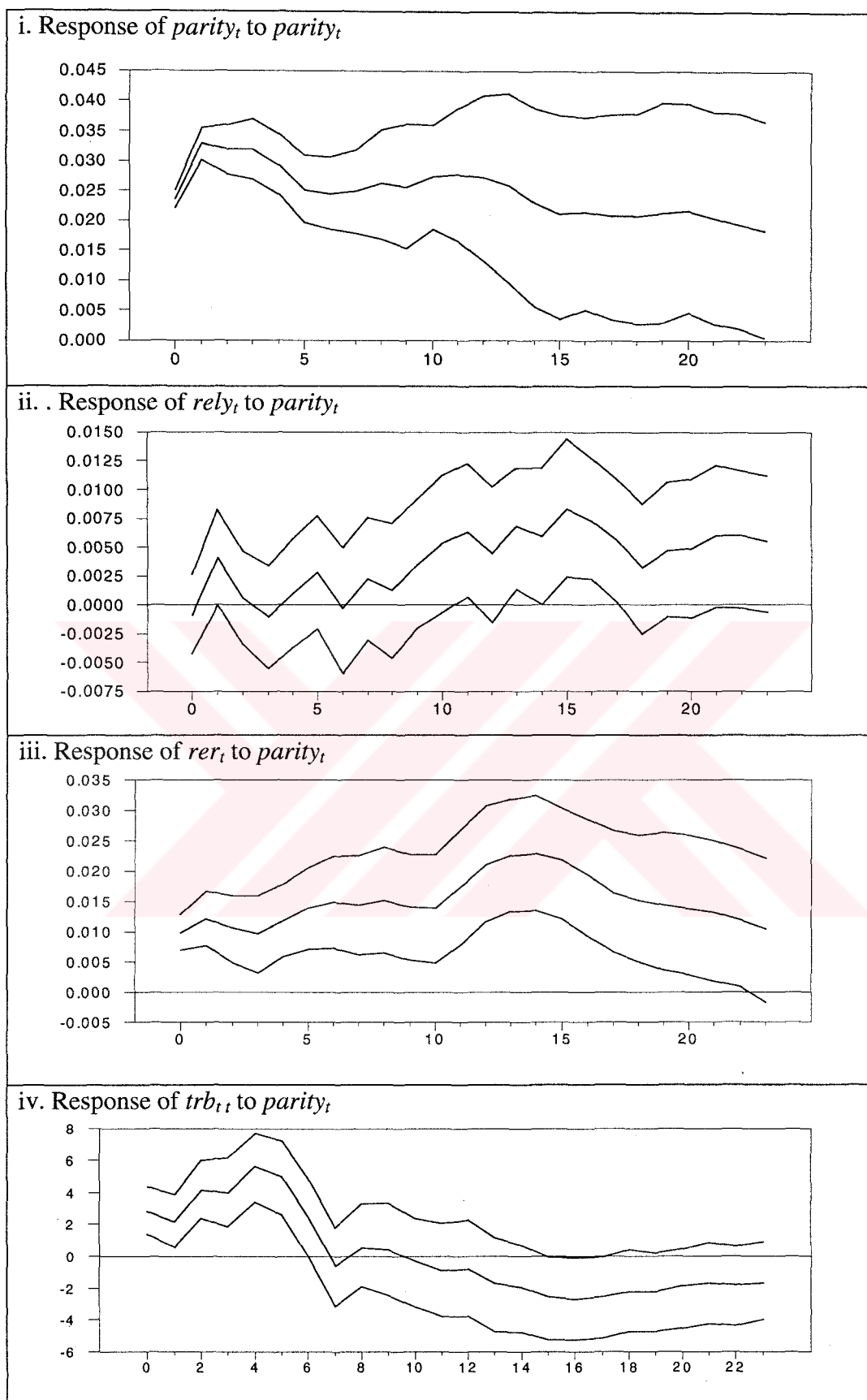
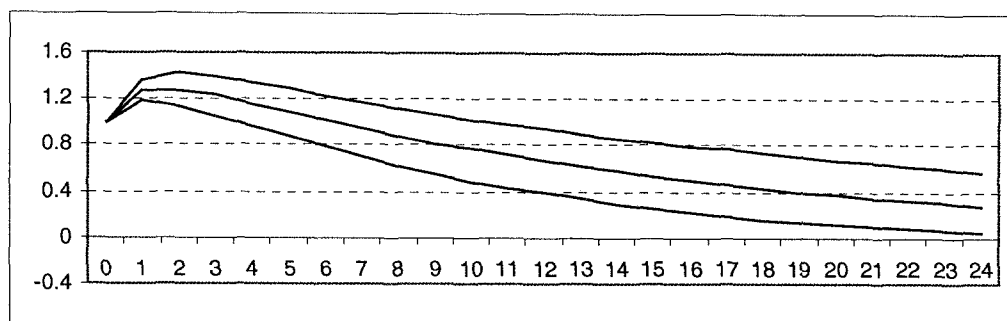
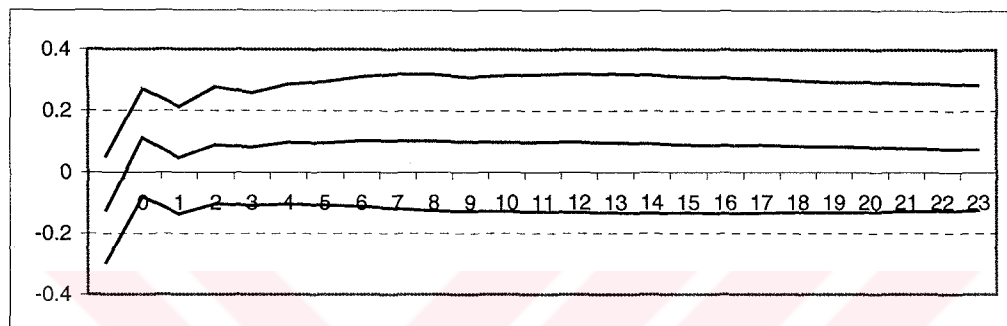


Figure D.7. Impulse Response Functions when oil prices is included as an exogenous variable

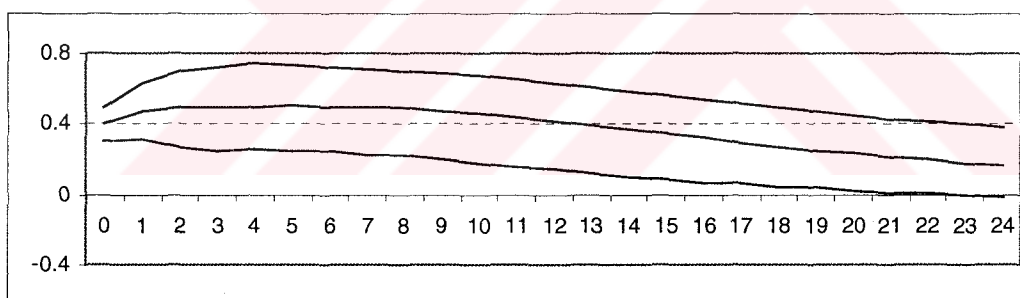
i. Response of $parity_t$ to $parity_t$



ii. Response of $rely_t$ to $parity_t$



iii. Response of rer_t to $parity_t$



iv. Response of trb_{it} to $parity_t$

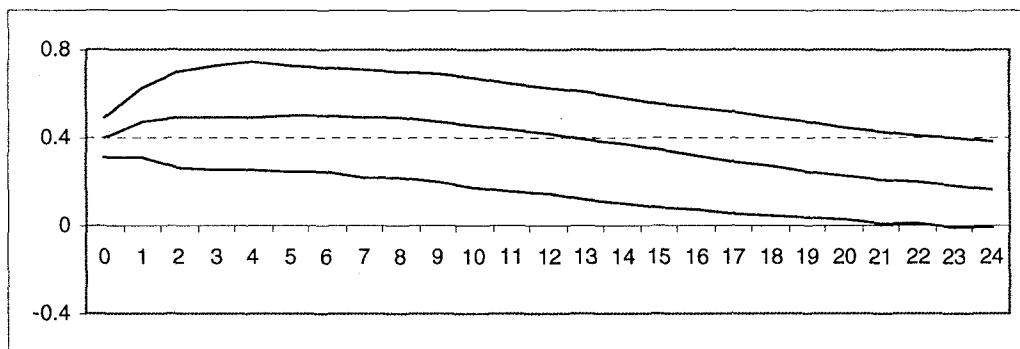
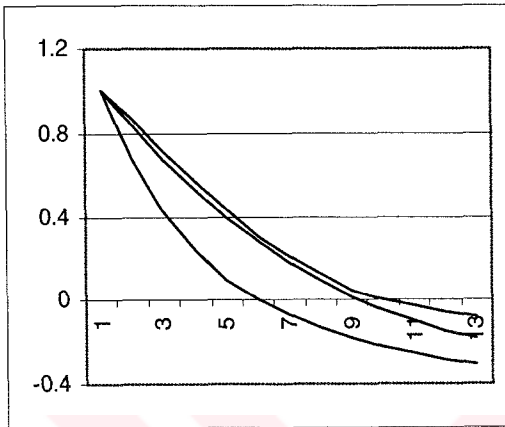


Figure D.8. Impulse Response Functions when first difference of parity is used

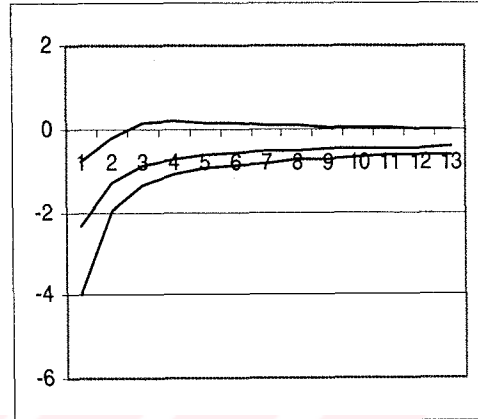
APPENDIX E

SENSITIVITY ANALYSIS

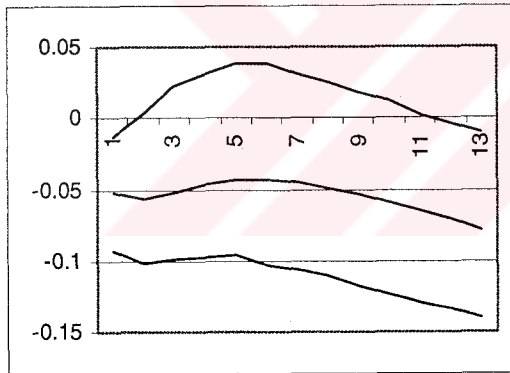
i. Response of CAP_t to CAP_t



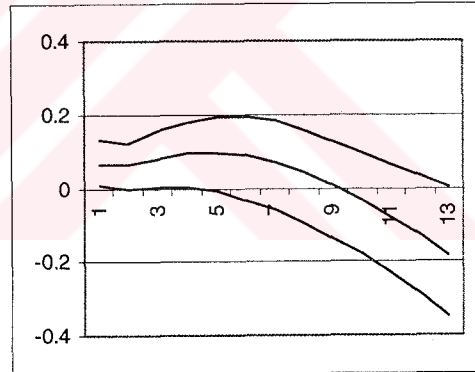
ii. Response of r_t to CAP_t



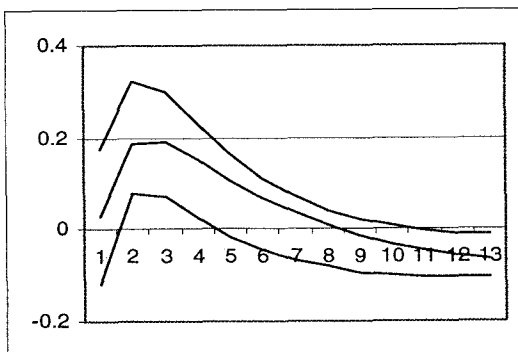
iii. Response of rer_t to CAP_t



iv. Response of $M2_t$ to CAP_t



v. Response of y_t to CAP_t



vi. Response of wpi_t to CAP_t

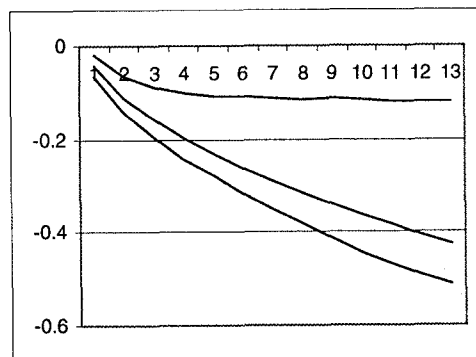
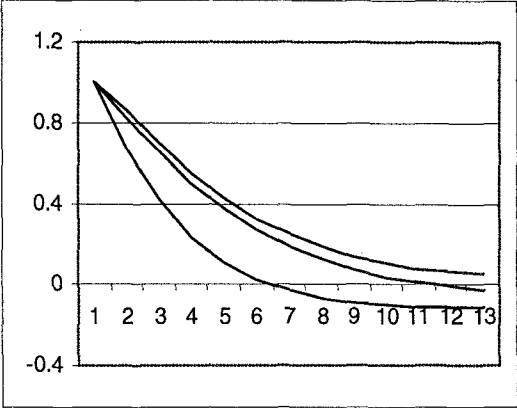
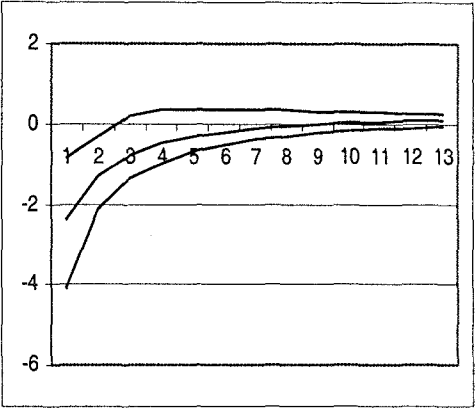


Figure.E.1. Impulse Response Functions with Different Variable Definitions

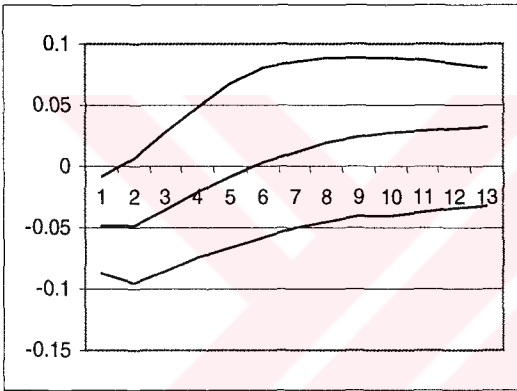
i. Response of CAP_t to CAP_t



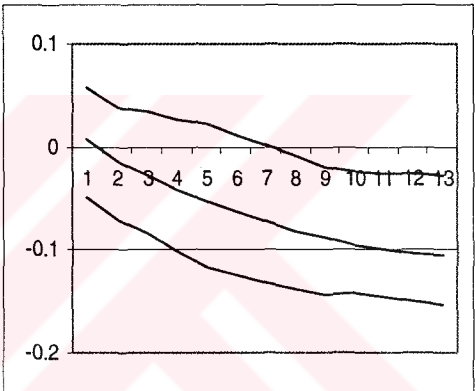
ii. Response of r_t to CAP_t



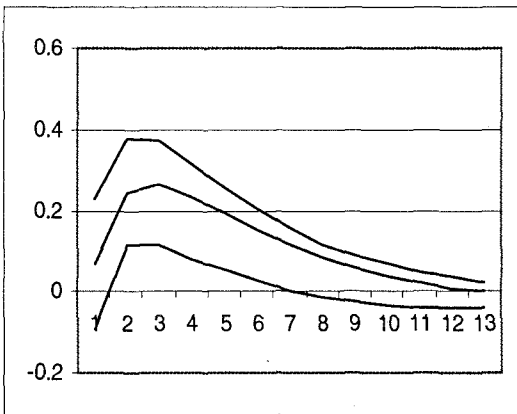
iii. Response of rer_t to CAP_t



iv. Response of MI_t to CAP_t



v. Response of y_t to CAP_t



vi. Response of p_t to CAP_t

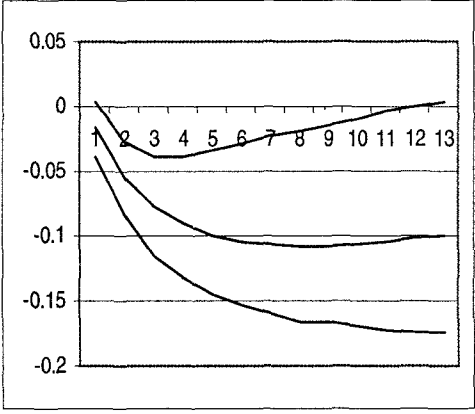
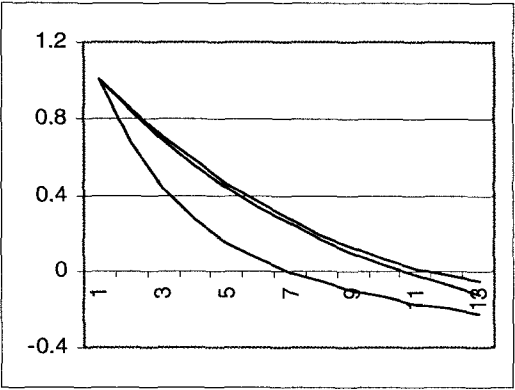
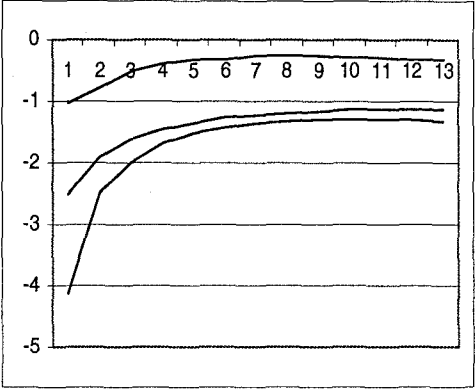


Figure E.2. Impulse Response Functions with Different Variable Definitions

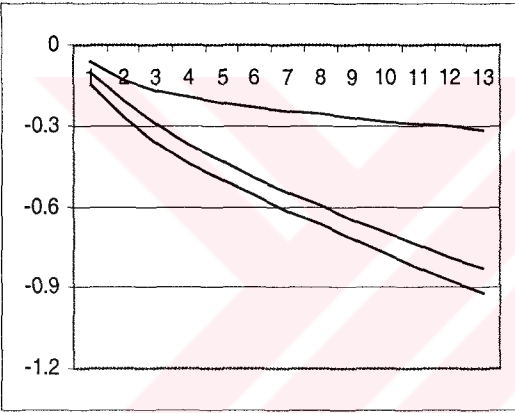
i. Response of CAP_t to CAP_t



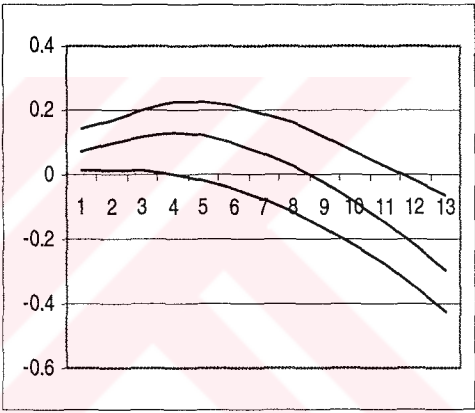
ii. Response of r_t to CAP_t



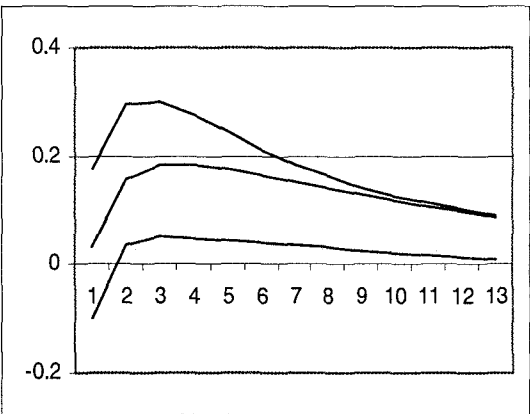
iii. Response of rer_t to CAP_t



iv. Response of $M2Y_t$ to CAP_t



v. Response of y_t to CAP_t



vi. Response of p_t to CAP_t

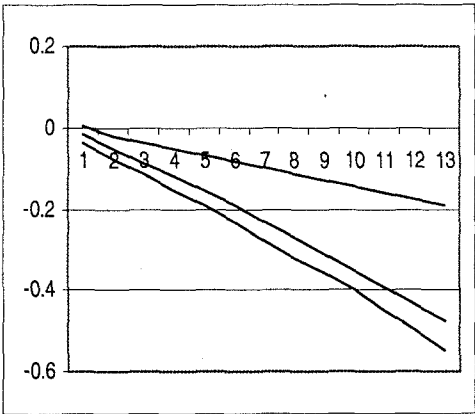
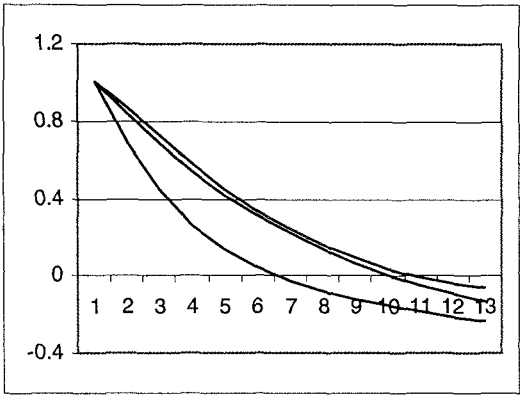
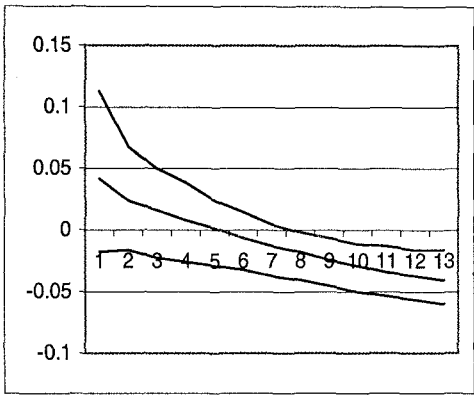


Figure E.3. Impulse Response Functions with Different Variable Definitions

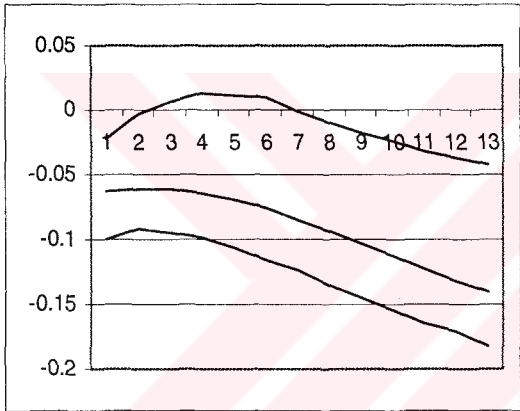
i. Response of CAP_t to CAP_t



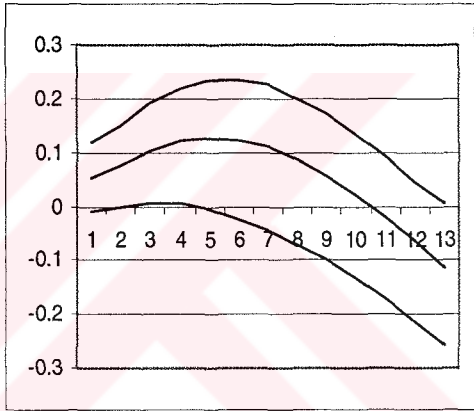
ii. Response of R_t to CAP_t



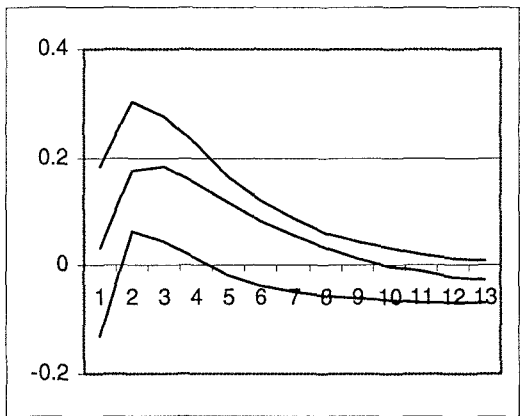
iii. Response of rer_t to CAP_t



iv. Response of $M2_t$ to CAP_t



v. Response of y_t to CAP_t



vi. Response of p_t to CAP_t

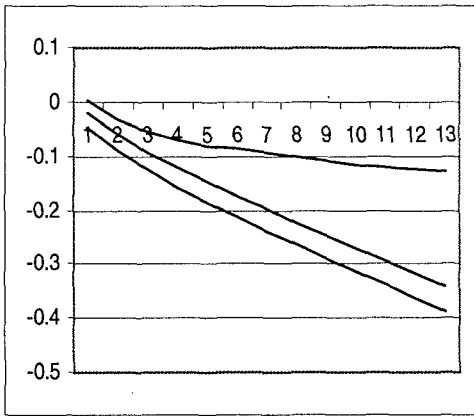
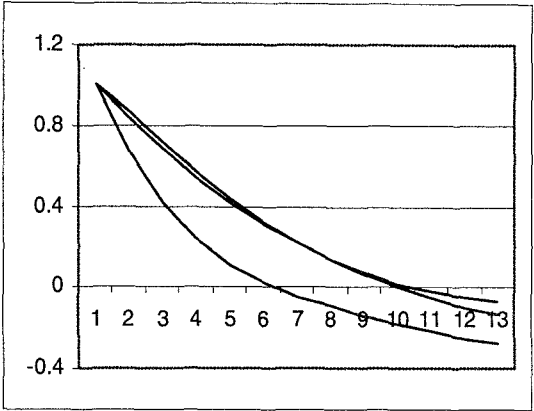
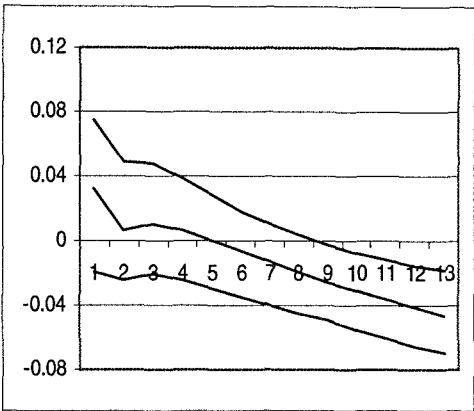


Figure E.4. Impulse Response Functions with Different Variable Definitions

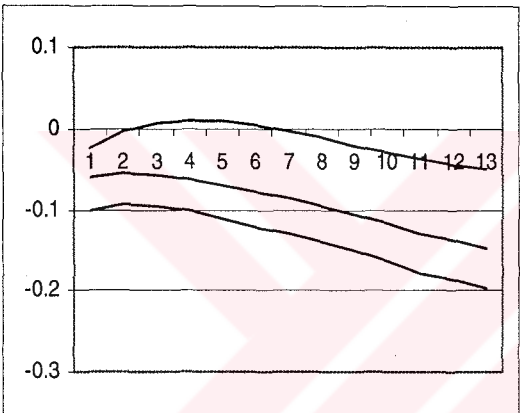
i. Response of CAP_t to CAP_t



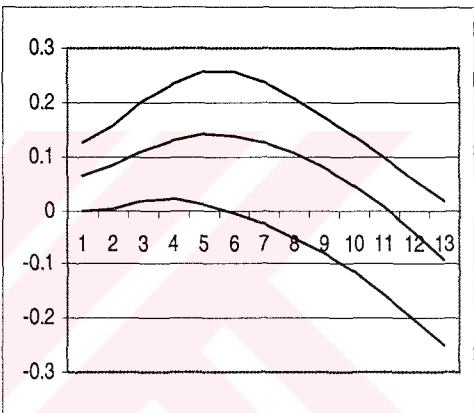
ii. Response of Rr_t to CAP_t



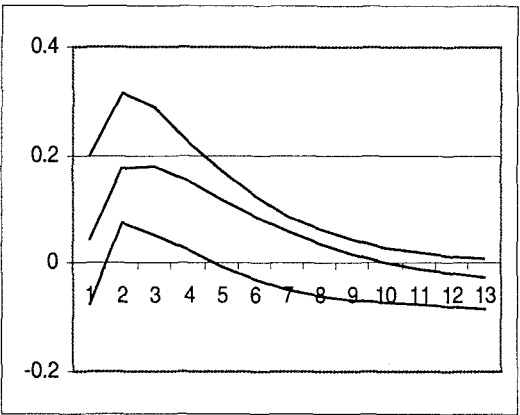
iii. Response of rer_t to CAP_t



iv. Response of $M2_t$ to CAP_t



v. Response of y_t to CAP_t



vi. Response of p_t to CAP_t

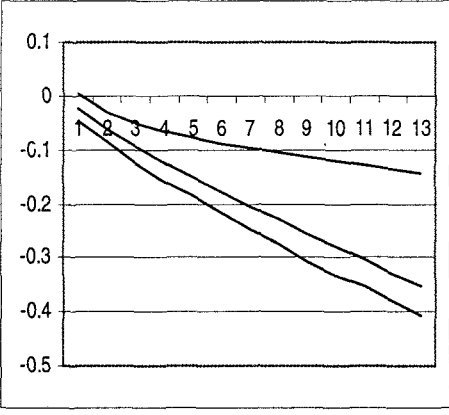
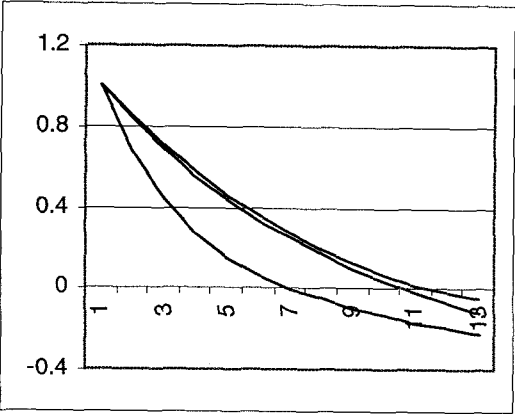
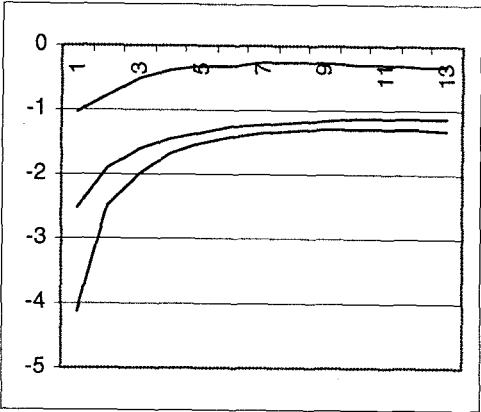


Figure E.5. Impulse Response Functions with Different Variable Definitions

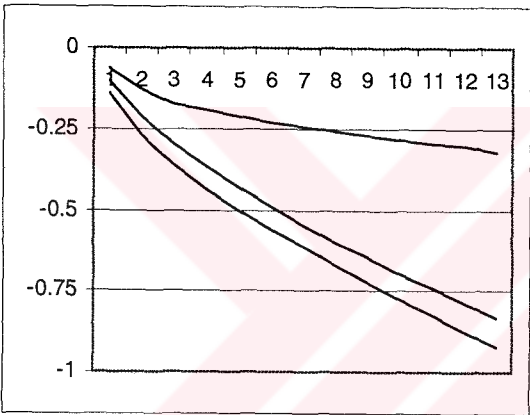
i. Response of CAP_t to CAP_t



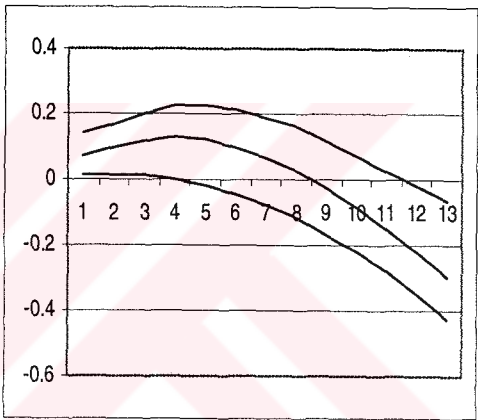
ii. Response of r_t to CAP_t



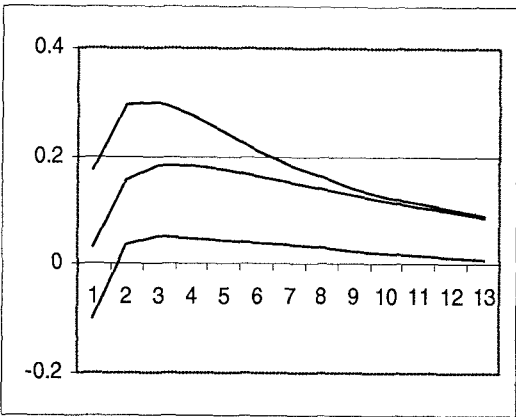
iii. Response of ER_t to CAP_t



iv. Response of $M2_t$ to CAP_t



v. Response of y_t to CAP_t



vi. Response of p_t to CAP_t

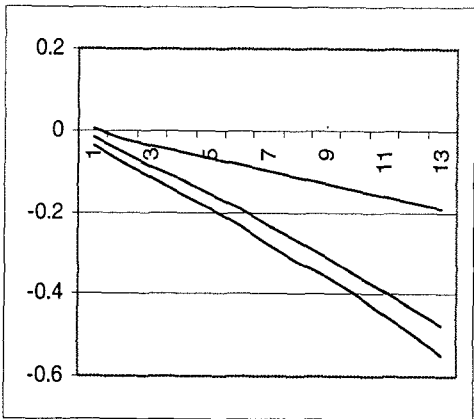
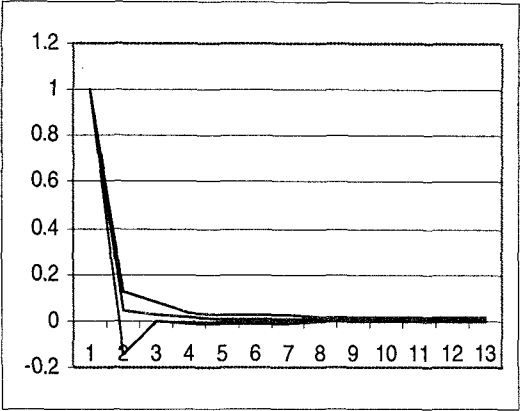
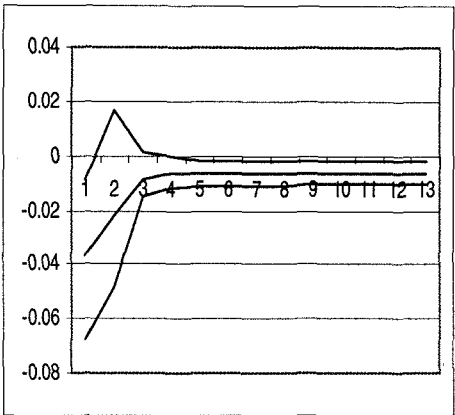


Figure E.6. Impulse Response Functions with Different Variable Definitions

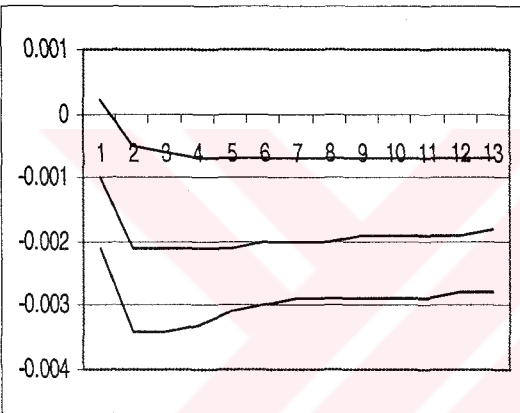
i. Response of $CAPM2Y_t$ to $CAPM2Y_t$



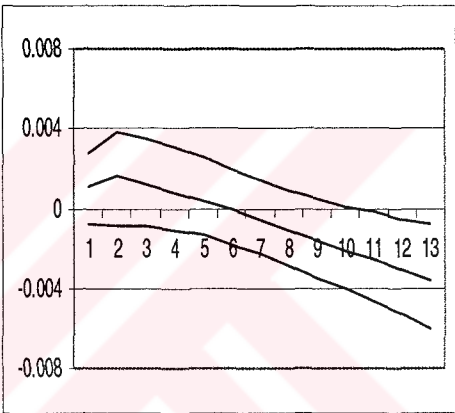
ii. Response of r_t to $CAPM2Y_t$



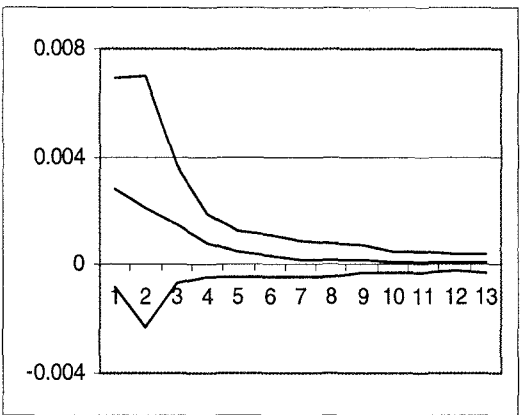
iii. Response of RER_t to $CAPM2Y_t$



iv. Response of $M2_t$ to $CAPM2Y_t$



v. Response of y_t to $CAPM2Y_t$



vi. Response of p_t to $CAPM2Y_t$

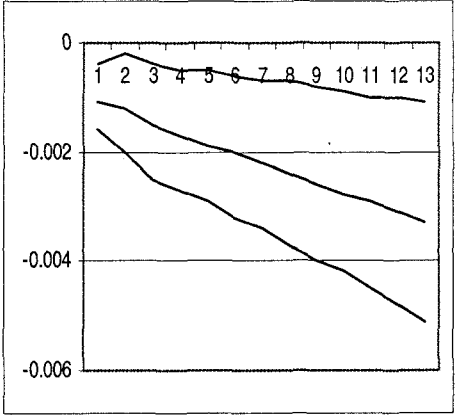


Figure E.7. Impulse Response Functions with Different Variable Definitions

Table E.1. Forecast Error Variance Decompositions of Capital Flows with Different Variable Definitions

	CAP_t	r_t	Rer_t	$M2_t$	y_t	wpi_t
Period 6	0.95 (0.09)	0.09 (0.05)	0.04 (0.02)	0.04 (0.03)	0.06 (0.04)	0.31 (0.12)
Period 12	0.84 (0.09)	0.10 (0.05)	0.07 (0.04)	0.04 (0.04)	0.06 (0.04)	0.39 (0.15)
Period 18	0.75 (0.09)	0.11 (0.05)	0.12 (0.06)	0.16 (0.08)	0.08 (0.04)	0.42 (0.16)
Period 24	0.68 (0.10)	0.12 (0.05)	0.18 (0.09)	0.27 (0.11)	0.10 (0.05)	0.43 (0.16)

Table E.2. Forecast Error Variance Decompositions of Capital Flows with Different Variable Definitions

	CAP_t	r_t	Rer_t	MI_t	y_t	wpi_t
Period 6	0.88 (0.11)	0.08 (0.04)	0.01 (0.02)	0.03 (0.02)	0.13 (0.06)	0.14 (0.08)
Period 12	0.77 (0.12)	0.08 (0.04)	0.02 (0.03)	0.10 (0.04)	0.13 (0.06)	0.14 (0.07)
Period 18	0.70 (0.12)	0.08 (0.04)	0.02 (0.03)	0.14 (0.06)	0.13 (0.06)	0.11 (0.06)
Period 24	0.64 (0.12)	0.08 (0.04)	0.02 (0.03)	0.14 (0.06)	0.13 (0.06)	0.09 (0.05)

Table E.3. Forecast Error Variance Decompositions of Capital Flows with Different Variable Definitions

	CAP_t	r_t	Rer_t	$M2Y_t$	y_t	wpi_t
Period 6	0.86 (0.11)	0.07 (0.04)	0.06 (0.03)	0.09 (0.04)	0.07 (0.05)	0.13 (0.07)
Period 12	0.77 (0.12)	0.07 (0.04)	0.06 (0.03)	0.09 (0.04)	0.07 (0.05)	0.13 (0.06)
Period 18	0.71 (0.12)	0.07 (0.04)	0.06 (0.03)	0.09 (0.04)	0.07 (0.05)	0.13 (0.06)
Period 24	0.66 (0.11)	0.07 (0.04)	0.07 (0.04)	0.10 (0.04)	0.07 (0.05)	0.12 (0.06)

Table E.4. Forecast Error Variance Decompositions of Capital Flows with Different Variable Definitions

	CAP	R_t	Rer_t	$M2_t$	y_t	wpi_t
Period 6	0.96 (0.08)	0.01 (0.02)	0.10 (0.05)	0.06 (0.04)	0.06 (0.04)	0.28 (0.12)
Period 12	0.88 (0.09)	0.04 (0.03)	0.20 (0.09)	0.05 (0.04)	0.06 (0.04)	0.40 (0.14)
Period 18	0.79 (0.08)	0.10 (0.05)	0.30 (0.13)	0.17 (0.08)	0.07 (0.04)	0.46 (0.16)
Period 24	0.73 (0.09)	0.16 (0.06)	0.37 (0.14)	0.33 (0.12)	0.07 (0.04)	0.49 (0.16)

Table E.5. Forecast Error Variance Decompositions of Capital Flows with Different Variable Definitions

	CAP_t	Rr_t	Rer_t	$M2_t$	y_t	wpi_t
Period 6	0.96 (0.09)	0.01 (0.01)	0.09 (0.04)	0.07 (0.04)	0.06 (0.04)	0.31 (0.13)
Period 12	0.88 (0.09)	0.04 (0.03)	0.20 (0.09)	0.05 (0.04)	0.06 (0.04)	0.40 (0.14)
Period 18	0.82 (0.09)	0.11 (0.05)	0.32 (0.12)	0.17 (0.09)	0.07 (0.04)	0.51 (0.17)
Period 24	0.76 (0.09)	0.20 (0.07)	0.41 (0.14)	0.34 (0.13)	0.07 (0.04)	0.54 (0.18)

Table E.6. Forecast Error Variance Decompositions of Capital Flows with Different Variable Definitions

	CAP_t	r_t	ER_t	$M2_t$	y_t	wpi_t
Period 6	0.98 (0.06)	0.18 (0.06)	0.37 (0.12)	0.05 (0.04)	0.09 (0.06)	0.25 (0.09)
Period 12	0.90 (0.07)	0.23 (0.07)	0.48 (0.16)	0.08 (0.04)	0.13 (0.07)	0.39 (0.14)
Period 18	0.79 (0.09)	0.27 (0.08)	0.53 (0.18)	0.26 (0.09)	0.14 (0.07)	0.47 (0.16)
Period 24	0.70 (0.10)	0.30 (0.09)	0.56 (0.19)	0.40 (0.14)	0.14 (0.07)	0.52 (0.18)

Table E.7. Forecast Error Variance Decompositions of Capital Flows with Different Variable Definitions

	$CAPM2Y_t$	r_t	rer_t	$M2_t$	y_t	wpi_t
Period 6	0.91 (0.07)	0.03 (0.03)	0.09 (0.06)	0.01 (0.01)	0.01 (0.01)	0.08 (0.05)
Period 12	0.90 (0.07)	0.03 (0.03)	0.10 (0.06)	0.03 (0.02)	0.01 (0.01)	0.09 (0.05)
Period 18	0.90 (0.07)	0.03 (0.03)	0.11 (0.06)	0.06 (0.04)	0.01 (0.01)	0.10 (0.06)
Period 24	0.90 (0.08)	0.03 (0.03)	0.11 (0.06)	0.09 (0.05)	0.01 (0.01)	0.10 (0.06)

