

TWO ESSAYS ON THE TURKISH ECONOMY

Master's Thesis

by
ALİ İNAMLİK

**Department of
Economics
Bilkent University
Ankara
November 2005**

.to my family.

“TWO ESSAYS ON THE TURKISH ECONOMY”

**The Institute of Economics and Social Sciences
of
Bilkent University**

by

ALİ İNAMLİK

**In Partial Fulfilment of the Requirements for the Degree of
MASTER OF ARTS**

in

**THE DEPARTMENT OF
ECONOMICS
BİLKENT UNIVERSITY
ANKARA**

November 2005

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 Master of Arts in Economics.

Assist. Prof Dr. Ümit ÖZLALE
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 Master of Arts in Economics.

Assoc. Prof. Dr. Hakan BERUMENT
Examining Comitte 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 Master of Arts in Economics.

Assoc. Prof. Dr. Yılmaz AKDİ
Examining Committee Member

Approval of the Institute of Economics and Social Sciences

Prof. Dr. Erdal EREL
Director

ABSTRACT

TWO ESSAYS ON THE TURKISH ECONOMY

İnamlık, Ali

Master of Economics

Supervisor: Asst. Prof. Ümit Özlale

November, 2005

This thesis comprise of two essays on Turkish Economy. Chapter 1 investigates the relationship between inflation and growth in Turkey. Historical data and statistical analysis suggest a negative relationship rather than a positive relationship. This outcome is completely the reverse of what Philips Curve oriented theories tell. The underlying reason behind this relationship is analyzed and a third variable is suspected to be the reason. Vector Autoregressive (VAR) analysis suggest that this variable could be real exchange rate. Generalized Impulse Response analysis is used with various exogenous variables, which makes the analysis robust. Chapter 2 investigates the day of the week effect on return and volatility for Istanbul Stock Exchange (ISE) through the period 1986 and 2003. Using generalized autoregressive conditional heteroskedasticity (GARCH) model, we find statistically significant evidence to report that there is the day of the week effect. Friday has the highest effect on return with 0,015 while Monday has the lowest return with -0,003 compared

to return on Wednesday. When volatility of return is concerned, Monday has the highest volatility with 0,933 and Tuesday has the lowest volatility with -0,716

compared to return on Wednesday.

Key Words: Phillips Curve, inflation, growth, and real exchange rate, Day of the week effect, volatility, Emerging Market

ÖZET

TÜRKİYE EKONOMİSİ ÜZERİNE İKİ MAKALE

İnamlık, Ali

Yüksek Lisans, İktisat Bölümü

Tez Danışmanı: Yrd. Doç. Dr. Ümit Özlale

Kasım, 2005

Bu tez iki bölümden oluşmaktadır. Birinci bölümde 1990:2004:1 zaman aralığı içinde büyüme ve enflasyon arasındaki dinamikleri incelenmiştir. Tarihsel veriler ve istatistiki analizler pozitif ilişkiden ziyade negative ilişkiyi işaret etmektedir. Bu sonuç Philips Eğrisi bazlı teorilerin idda ettiğinin tam aksidir. Bu negatif ilişkinin nedeni ve üçüncü bir değişkenin bu ilişkinin sebebi olup olamayacağı araştırılmıştır. Vekör Autoregresif analizi bu değişkenin reel döviz kuru olabileceğini göstermiş ve Genelleştirilmiş Etki Tepki analizleri de bu sonucu farklı dışsal değişkenler bahis konusu olduğunda da geçerli olduğunu göstermiştir. İkinci bölümde Haftanın Gün Etkisi'ni 1986 ve 2003 zaman aralığı içinde hem getiri için hem de dalgalanmalar için araştırmaktadır. Ampirik sonuçlar ışığında, Haftanın Gün Etkisi'nin İMKB'de istatiksel olarak varolduğunu söylenebilir. Çarşamba gününe kıyasla sonuçlara baktığımızda Cuma gününün 0,15 ile en fazla getiriye sahip olan gün olduğunu, Pazartesi gününün de -0,003 ile en düşük getiriye sahip gün olduğu görülmektedir. Getirinin dalgalanmalarına baktığımızda ise Pazartesi günü 0,933 ile en fazla dalgalanma gösteren gün olurken, Salı günü -0,716 ile en düşük dalgalanma gösteren gündür.

Anahtar Kelimeler: Philips Eğrisi, enflasyon, büyüme ve reel döviz kuru, Haftanın Gün Etkisi, dalgalanmalar, Gelişmekte Olan Ekonomiler

ACKNOWLEDGEMENTS

I would like to thank Assist. Prof. Ümit Özlale for his help in this paper. Assoc. Prof. Hakan Berument's encouraging supervision and advise brought this paper up to this point. I also appreciate his help and support at my desperate times.

TABLE OF CONTENTS

ABSTRACT	iii
ÖZET	v
ACKNOWLEDGEMENTS	vi
TABLE OF CONTENTS	vii
LIST OF TABLES	viii
LIST OF FIGURES	ix
CHAPTER 1: INFLATION AND GROWTH: POSITIVE OR NEGATIVE RELATIONSHIP	1
1.1 Introduction	1
1.2 The Data and an Historical Overview	7
1.3 Preliminary Data Analysis	9
1.4 VAR Modeling	12
1.5 Impulse-Response Analysis	14
1.6 Extended Experiments	15
1.6.1 Oil Price as an Exogenous Variable	16
1.6.2 Money as an Exogenous Variable	17
1.6.3 Government Spending as an Exogenous Variable	18
1.6.4 Tax Revenue as an Exogenous Variable	20
1.7 Conclusion	21
CHAPTER 2: THE DAY OF THE WEEK EFFECT ON STOCK MARKET VOLATILITY:ISTANBUL STOCK EXCHANGE	33
2.1 Introduction	33
2.2 Literature Review	34
2.3 Data and Methodology	37
2.4 Empirical Results	39
2.5 Conclusion	42
BIBLIOGRAPHY	48
APPENDIX	53

LIST OF TABLES

Table 1.1: Cross Correlations of Inflation and GDP	10
Table 1.2: Effects of Output on Inflation with Different Trend Definitions.....	11
Table 2.1: Descriptive Statistics on ISE Returns	43
Table 2.2: Return Statistics with GARCH Specification	44
Table 2.3: Return and Volatility Statistics with GARCH Specification	46
Table 2A: Return and Volatility Statistics with GARCH Specification with 4 Lags	53

LIST OF FIGURES

Figure 1.1: Historical Movements of Inflation and GDP Growth in Turkish Economy	7
Figure 1.2: Historical Movements of GDP Growth and Real Exchange Rate in Turkish Economy	8
Figure 1.3: Historical Movements of Inflation and Real Exchange Rate in Turkish Economy	8
Figure 1.4: Benchmark Model	14
Figure 1.5: Benchmark Model with Real Exchange Rate (Extended Benchmark Model)	15
Figure 1.6: Oil Price as an Exogenous Variable in the Benchmark Model	16
Figure 1.7: Oil Price as an Exogenous Variable in the Extended Benchmark Model	16
Figure 1.8: Money as an Exogenous Variable in the Benchmark Model	17
Figure 1.9: Money as an Exogenous Variable in the Extended Benchmark Model ..	18
Figure 1.10: Government Spending as an Exogenous Variable in the Benchmark Model	19
Figure 1.11: Government Spending as an Exogenous Variable in the Extended Benchmark Model	19
Figure 1.12: Tax Revenues as an Exogenous Variable in the Benchmark Model	20
Figure 1.13: Tax Revenues as an Exogenous Variable in the Extended Benchmark Model	20

CHAPTER 1

INFLATION AND GROWTH: POSITIVE OR NEGATIVE RELATIONSHIP?

1.1 Introduction

Dynamics between inflation and growth has always been an interesting research area in modern macroeconomics. Several economic theories suggest a positive relationship between these two variables; inflation is experienced after economic growth. However, The Real Business Cycle approach suggests that inflation and growth are negatively related.

Those theories, which claim a positive relation, attribute this assertion to Philips Curve and positive output gap, defined as the difference between actual output and potential output. The underlying reasoning is that if actual output rises above potential output, this will create an upward pressure on wages in the labor market. Higher wages, in turn, will lead to higher production costs and hence higher prices. This conclusion has been supported by empirical findings. Gerlach and Smets (1999), for instance, show that 1% increase over potential output raises inflation by 0,2% in the subsequent quarter for the EMU-5 countries. Moreover, since inflation is

serially correlated future inflation rate will also rise. Another interesting study has been undertaken by Paul, Kearney and Chowdhury (1997) who work with data pertaining to 70 countries and the 1960-1989 period. They report that the relation between inflation and growth is positive only in some countries. Mallik and Chowdhury (2001) analyze inflation-growth dynamics in four South Asian countries (Bangladesh, India, Pakistan and Sri Lanka) and find statistically significant evidence of a positive relation between these two variables.

Real Business Cycles allow for negative relationship between inflation and growth. One of the main studies investing the inverse relationship between inflation and growth is Kydland and Prescott (1990). They argue that supply shocks, not demand shocks, are responsible for the inverse relationship. Supply shocks make the prices countercyclical while demand shocks cause procyclical moves of prices to output. There is a condition to be taken into account, price flexibility. In an environment with sticky prices, a demand shock will increase the output while prices move very little. As output is on the way to its trends, prices may be rising. Negative correlation between these variables can also be observed although demand shock is responsible for the movements. Hence, Ball and Mankiw (1994) and Judd and Trehan (1995) study these effects. Den Haan (2000) uses VAR methods and derives the conclusion that negative correlation between output and growth is analyzed for long forecast horizons.

But for Turkey however, what the data show is just the opposite of what the Philips curve oriented theories tell. The periods with high inflation match the periods with low growth rates of output. Nas and Perry (2001) for instance, state that from 1960's to 1980, low growth rates of output have been associated with high inflation rates. Especially after the 1973-1974 oil crises inflation rose rapidly and output

growth declined seriously and this divergence continued. When inflation made its first peak in 1979, went over 80 percent, growth declined by 11%. In 1994, when Turkey experienced a financial crisis industrial production dropped to one of its lowest levels while inflation rose sharply. Macroeconomic data show that since 1990's Turkey has been experiencing a negative correlation between output gap and inflation. Obviously this contradicts the conclusion of the Philips Curve oriented theories tell and support the Real Business Cycles model. Hence in this paper we will analyze the reason behind this correlation. One early explanation comes from Ozbek and Ozlale (2004) who estimate the output gap for Turkey with Extended Kalman Filter and then analyze the correlation between output gap and inflation. They find a negative correlation between these variables and moreover a negative correlation between lagged output gap and inflation.

Yet another study showing the divergence of output growth and inflation is Agenor and Hoffmaister (1997) who employ generalized VAR analysis to search for the short run dynamics between inflation, output, nominal wages, and exchange rate. They find that a fall in the depreciation of the exchange rate reduces inflation and stimulates output. But the expansion in output is short lived. Kirmanoglu (2001), by employing VAR models shows that high inflation rates in Turkey cause lower economic growth. Mendoza (2003) finds evidence of inflation-output trade off in Turkish economy using VAR and GARCH models. Beside VAR models, panel data studies also support this negative relationship, especially for countries who suffer higher inflation rates. Barro (1996), for instance, shows that a negative relation exists for inflation rates above 15%. Judson and Orphanides (1996) use 10% threshold. Bruno and Easterly (1998) argue in favor of a 40% inflation as the relevant

threshold inflation rate. Ghosh and Philips (1998) find a positive effect for low inflation rates, but for those above 5% they find a non-linear negative effect.

We believe that there is a third variable effect that affects two variables, real exchange rate. By the channels and mechanisms, fluctuations in output and inflation can be explained by real exchange rate. The real increase (depreciation) in exchange rate mimic supply side shocks and we claim that depreciations in real exchange rate accelerate inflation while decelerating economic growth. On the other hand, appreciations increase the growth rate of output and reduce inflation. The reasons for real exchange rate being a good candidate for this third variable is discussed below.

In the literature there are many studies which examine the effects of exchange rate on output. These effects can be classified as follows:

- Rigidities in the economy: if prices are inflexible, devaluation will decrease real wages and hence weaken demand. This will result in a decrease in output.
- Debt Dynamics: after a real devaluation, foreign debt liabilities, measured in domestic currency increase dramatically. This especially occurs in economies where dollarization is high and agents have high foreign currency liabilities. The consequent increase in liabilities will force agents to make adjustments in their budgets and balance sheets and most probably to reduce their expenditures. Banks for example will cut their credits to firms who suffer losses and this may result in a decrease in output.
- Consumer Confidence: a devaluation will influence the adjustments of prices in the long-run. A devaluation will increase costs of production as well as expected inflation rate. These are events that decrease consumer confidence leading to a cut in expenditures and hence in production.

- Capital Outflows: a devaluation, even a signal of a devaluation will cause foreign capital outflow. A prime facie example is the experience of the Turkish economy in 2000 and 2001 when expected devaluations caused substantial capital outflows which in turn led to severe economic crisis.
- Income Distribution: effects of a devaluation on income distribution are ambiguous. But if a devaluation adversely affects groups with high marginal propensity to consume, this may decrease output.
- Economic Policies: after a devaluation, policy makers may use contractionary policies to curtail inflation. Such policies will lead to a decline in output.
- Supply-side Problems: if imported inputs are used in production, a devaluation will increase production costs causing a leftward shift in the aggregate supply curve and hence a reduction in output.

There are several studies on the relationship between output and real exchange rate in the Turkish economy. Berument and Pasaogullari (2003) show that these two variables are negatively related in Turkey. They report that the response of output to a real devaluation is negative and permanent. An overvalued currency may increase output but because it entails a risk of a depreciation it may eventually result in dramatic output losses.

With regard to the relation between inflation and real exchange rate in the Turkish economy. Berument and Pasaogullari (2003) also find that one-standard deviation shock to real exchange rate increases inflation and likewise one-standard deviation shock to inflation appreciates the currency. One strong relation between exchange rate and inflation is provided by the exchange rate pass-through. Evidence for the importance of this mechanism in the Turkish economy has been provided by Leigh and Rossi (2002) who employ a recursive vector auto regression model to

investigate the impact of exchange rate movements on prices. They report that the impact of exchange rate movements on inflation is over after a year and is mostly felt in the first four months. The effect is more pronounced on the wholesale price index than the consumer price index. Their third important finding is that the impact is over in Turkey in a shorter time and stronger than in other key emerging markets. Another study on Turkey is Mendoza (2003). He investigates inflation and output trade-off within the dynamics of nominal exchange rate. He finds significant evidence that lags of nominal exchange rate depreciation explain a big part of the inflation rate and volatility. His results reconfirms the existence of causality from exchange rate to inflation and shows that nominal depreciations raise inflation

In this paper we do not argue that increases in output do not lead to higher inflation, but we say that the evidence we examine shows a negative (not a positive) relationship between growth and inflation. Hence we analyze this relationship and assert that this negative association is due to a third variable effect, that of real exchange rate.

Turkey is a small-open developing economy without heavy government regulations. Therefore, it is possible to observe the effects of financial market developments to economic performance. Turkey has also suffered from high and volatile inflation without running into hyperinflation, along with high variability in real exchange rate and output growth for almost three decades. This provides a unique environment to observe the interactions among certain macroeconomic variables. Thus high volatility in output, inflation and real exchange rate for long periods play a magnifying role and allow us to avoid *type II error*- not rejecting the null hypothesis even if the null is false. The organization of the paper is as follows. Section 2 examines the characteristics of the data and historical movements therein.

Section 3 provides a preliminary analysis of the data while section 4 is VAR modeling. Section 5 reports the results of impulse response analysis and section 6 gives the results of the extended experiments. Section 7 concludes.

1.2 The Data and an Historical Overview

For the purpose of this paper real exchange rate is computed from the nominal exchange rate basket of the Central Bank of Turkey and the price data are gathered from IMF-IFS tape. Until the adaptation of euro, the exchange rate basket consists of 1.5 Deutsche mark and 1 US dollar. After the acceptance of the euro by European countries the basket is calculated with 0.77 euro and 1 dollar. The inflation rate is calculated as the first logarithmic difference of the GDP deflator. The analyses pertain to the 1987:1 to 2004:1 and all data are quarterly. All these are available on the website of the Central Bank of Turkey.¹

(Insert Figure 1.1 here)

Figure 1 presents quarterly data on real GDP growth and inflation. GDP data used here is seasonally adjusted. We observe that these two variables move in opposite directions. Inflation reaches its peak in 1994:4 when Turkey suffered one of the biggest financial crises of its history. In this crisis period GDP fell dramatically. Subsequently fluctuations are less in both variables. A noticeable drop in inflation has occurred after the 2000 stabilization program. However, this program has ended with two big financial crises. Inflation rose sharply while declines in output have reoccurred. After the November 2000 and February 2001 crises, inflation began to

¹ <http://tcmbf40.tcmb.gov.tr/cbt.html>

decrease while output growth began to increase. This observation that after the reform program of Transition to Strong Economy in year 2002. Turkey has been simultaneously experiencing steady increases in output with steady declines in inflation constitutes the rationale of this paper.

(Insert Figure 1.2 here)

(Insert Figure 1.3 here)

Figure 1.2 plots output growth against real exchange rate using quarterly data pertaining to the 1987:1-2004:1 period while Figure 1.3 plots inflation against real exchange rate in the same period. As observed from Figure 1.2, large devaluations are coupled with large declines in output and appreciations are coupled with growth in output. This suggests a negative relationship between these variables. On the other hand from Figure 1.3 we observe that increases in inflation are coupled with real devaluations while disinflation periods are coupled with real appreciations. These two figures provide a hint that the underlying reason of the opposite movements in inflation and GDP growth may be the behavior of the real exchange rate.

1.3 Preliminary Data Analysis

Apart from figures which primarily appeal to the eye but not to the mind some statistically verified evidence is needed to be sure of the negative correlation between inflation and output. For this purpose, we first calculate the cross correlations between inflation and output. The data used here is seasonally adjusted and covers the period from 1990:1 to 2004:1.

Table 1.1 reports the results for various lags and leads. Lag number indicates the number of quarters by which real GDP growth is lagged relative to inflation. Negative correlation between inflation and GDP is found in most of the cases, except the correlation between lag values of growth and current inflation. But an interesting finding is HP filter suggests negative correlation between these variables in all periods, using filters doesn't seem to change the results; negative relationship is still valid between inflation and GDP. And mostly, inflation and GDP is negatively correlated at the initial period.

Table 1.1: Cross Correlations of Inflation and GDP

Lag	Log	First Difference	Deviation from linear trend	Deviation from quadratic trend	Deviation from cubic trend	HP- filtered
-4	-0.076	-0.182	0.071	0.040	0.041	-0.157
-3	-0.217	-0.070	-0.081	-0.110	-0.110	-0.196
-2	-0.217	-0.012	-0.079	-0.110	-0.111	-0.195
-1	0.100	0.289	0.314	0.277	0.277	-0.164
0	-0.191	-0.282	-0.076	-0.119	-0.121	-0.150
1	-0.206	-0.021	-0.143	-0.180	-0.181	-0.103
2	-0.131	0.050	-0.054	-0.091	-0.092	-0.091
3	0.169	0.284	0.312	0.281	0.279	-0.064
4	-0.075	-0.238	-0.039	-0.068	-0.069	-0.032

Note that simple correlation does account for the dynamics of inflation and growth.

For further investigation of the negative correlation the following equation is

estimated:

$$\pi_t = \alpha + \beta_1 \pi_{t-1} + \beta_2 \pi_{t-2} + \beta_3 \pi_{t-3} + \beta_4 \pi_{t-4} + \beta_5 \pi_{t-5} + \beta_6 \pi_{t-6} + \gamma_1 Y_t + \gamma_2 Y_{t-1} + \gamma_3 Y_{t-2} + \gamma_4 Y_{t-3} + \gamma_5 Y_{t-4} + \gamma_6 Y_{t-5} + \gamma_7 Y_{t-6} + \epsilon_t \quad (1)$$

π is used for inflation and Y for output growth and both series are seasonally adjusted. This equation allows for the dynamic behavior of both inflation and output by including their lagged values. The above equation is estimated for the different

definitions of the output gap. To obtain an output gap series, output is detrended using linear, quadratic, cubic trends and HP filter. Residuals give us output gap and they are used in the above equation.

Table 1.2: Effects of Output on Inflation with Different Trend Definitions

Lag	First Difference	Deviation from linear trend	Deviation from quadratic trend	Deviation from cubic trend	HP-filtered
Y_t	-0.78	-0.77	-0.93	-0.92	0.31
	(-3.14)**	(-1.79)*	(-2.22)**	(-2.21)**	(0.67)
Y_{t-1}	-0.76	0.04	-0.04	-0.04	-0.40
	(-2.87)**	(0.10)	(-0.10)	(-0.11)	(-1.00)
Y_{t-2}	-0.56	0.20	0.18	0.17	-0.11
	(-1.99)**	(0.82)	(0.75)	(0.73)	(-0.39)
Y_{t-3}	-0.28	0.28	0.16	0.17	0.67
	(-1.05)	(2.41)	(1.33)	(1.32)	(2.79)**
Y_{t-4}	0.21	0.49	0.53	0.53	-0.95
	(0.80)	(1.25)	(1.44)	(1.44)	(-2.27)**
Y_{t-5}	0.53	0.32	0.28	0.28	1.13
	(2.04)**	(0.92)	(0.81)	(0.82)	(2.53)**
Y_{t-6}	0.02	-0.51	-0.61	-0.59	-0.74
	(0.06)	(-1.80)*	(-2.05)**	(-2.03)**	(-1.97)**

Numbers in parenthesis are t-statistics. * denote 5% and **denote 10% significance

level.

Table 1.1 reports the regression results. We note that the coefficients of growth rates are mainly negative and mostly statistically significant. That is higher output growth reduces the inflation rate. This is consistent with what we have observed in Figure 1.1. Moreover, filters used don't seem to matter much, since only the negative coefficients are statistically significant. After using HP filter, significant negative relationship between inflation and output is still observed.

1.4 VAR Modeling

The analysis of section 3 suggests that there is a negative relationship between inflation and output. Moreover, when we look at the historical movements of these variables, real exchange rate seems to be the underlying factor in this opposite movement. Therefore, we form a VAR model; so that we can identify the sources of the shocks and be able to control for important external shocks. In addition, VAR models have high predictive power and enable us to observe impulse response functions. We could have used conventional impulse response analysis. But this method is criticized because the results depend on the “orthogonality” assumption and they differ with the ordering choice. Hence we employ Generalized Impulse Response analysis developed by Koop et al. (1996) and Pesaran and Shin (1998). This method has two advantages over the standard impulse response analysis. First, it doesn't presuppose any ordering that may have theoretical implications and it doesn't rely on the ordering choice of the researcher. Secondly, it provides for a meaningful interpretation of the initial impact of the shocks.

Here, we give a brief explanation of the Generalized Impulse Response Analysis. Pesaran and Shin (1998) develop Generalized Impulse Response analysis first by considering an infinite moving average series of the VAR.

$$X_t = \sum_{j=0}^{\infty} A_j u_{t-j} \quad (2)$$

where X_t is an $m \times 1$ vector of variables under investigation.

$$A_j = \phi_1 A_{j-1} + \phi_2 A_{j-2} + \dots + \phi_p A_{j-p}, j=1,2,\dots \text{ with } A_0=I_n \text{ and } A_j=0 \text{ for } j<0^2 \quad (3)$$

The Generalized Impulse Response function for a shock, u_t^0 , to the entire system is defined as follows:

$$G_s = E(x_{t+N}|u_t = u_t^0, \Omega_{t-1}^0) - E(S_{t+N}, \Omega_{t-1}^0) \quad (4)$$

The process up to $t-1$ period is known and it is denoted by Ω_{t-1}^0 . $u_t \sim N(0, \Sigma)$ is assumed and

$$E(u_t | u_{jt} = \delta_j) = (\sigma_{1j}, \sigma_{2j}, \dots, \sigma_{mj})' \sigma_{jj}^{-1} \delta_j \quad (5)$$

where $\delta_j = (\sigma_{jj})^{-1/2}$ denotes one-standard error shocks. If e_i is an $m \times 1$ vector with the i -th element equal to 1 and all other elements to 0, then the Generalized Impulse Response (GIR) for a one-standard deviation shock to the i -th equation in the VAR model on the j -th variable at horizon N is:

$$GIR_{ij,N} = e_j' A_N \sum e_i / \sigma_{ii}^{1/2}, i,j=1,2,\dots,m \quad (6)$$

Since Generalized Impulse Response is invariant to changes in ordering, the results are more robust than those of the orthogonalized impulse response analysis.

Our benchmark model includes growth rate of GDP and inflation. The ordering doesn't matter since we use Generalized Impulse Response. Then we add real exchange rate to our model and observe how the variables react to shocks. We

² Unlike the traditional orthogonalized impulse response analysis which employs a Cholesky decomposition of the positive definite of the covariance matrix of the shocks, the generalized impulse response analysis does not impose such restriction.

further extend the model by adding oil prices, M2, government spending and tax revenues. We use quarterly data and our model includes constant terms and seasonal dummies for the first three quarters. Four lags of these variables are added to the model.³ In the first alternative model we add oil prices since they may have significant effects on inflation and growth due to a direct supply shock effect. In the second version we augment our model with M2 hoping to capture the monetary channels that affect inflation, output and real exchange rate. In the third exercise we add government spending because this variable is influential on inflation and output. In the fourth exercise we add tax revenues for the same reason. In all these extended experiments, we first check for the benchmark model and then check it again by including the real exchange rate.

1.5 Impulse-Response Analysis

Impulse responses of the benchmark model are obtained by Generalized Impulse Response method and we present them with 90% confidence intervals in Figure 1.4.⁴ The magnitude of the shocks is one-standard deviation and responses are also normalized by one-standard deviation. We have a benchmark VAR model with 2 endogenous variables bringing 4 different impulse response functions. In Figure 1.4, we analyze this benchmark model.

(Insert Figure 1.4 here)

We observe that one-standard deviation shock to growth reduces inflation in the first three periods but this effect is statistically significant only for the first

³ We also consider alternative lag orders, but the results were robust.

⁴ 90% significance level is used in all impulse response analyses otherwise noted.

period. Thus our benchmark model suggests a negative relation between inflation and growth.

(Insert Figure 1.5 here)

As elaborated earlier, there might be a third variable effect underlying this relation. To account for this, we include real exchange rate into the system. The analysis is performed and its impulse responses are reported in Figure 1.5. We observe that one-standard shock to growth decreases inflation but this is significant for only the first period. Real exchange rate appreciates, and this effect is significant. On the other hand one-standard shock to inflation decreases growth instantaneously. Real exchange rate initially depreciates and then begins to appreciate. Similarly, one-standard shock to real exchange rate increases inflation and decreases growth immediately. Note that positive growth innovation decreases inflation and positive inflation innovation decreases growth. But real exchange rate innovation decreases growth and increases inflation.

1.6 Extended Experiments

In this section we add different variables, which are theoretically expected to affect inflation and growth, to our benchmark and extended benchmark model and observe how inflation and growth react to these exogenous variables.

1.6.1 Oil Price as an Exogenous Variable

Increases in power resource prices may have significant effects on Turkish economy simply because Turkey is an importer of these resources and they are important inputs to production. Hence an increase in oil prices will increase production costs; supply curve will shift leftward, price goes up and output decreases. Moreover, Dick and et al. (1984) report that shocks to oil prices result in expenditure and wage reduction to accommodate the shock. Also Berument and Tasci (2002) report that when wages, income and three factors of income are adjusted for the general price level that includes oil prices, inflationary oil price increases become important. Hence, we add oil price to our model.

(Insert Figure 1.6 here)

Figure 1.6 reports the impulse responses. One-standard deviation shock to growth rate decreases inflation instantaneously. This effect is again observed in the third period but it is statistically insignificant. One-standard deviation shock to inflation decreases the growth rate of output. Responses of inflation and growth to these shocks are in opposite directions. We can conclude that adding oil prices as an exogenous variable to our model does not alter the negative relationship between inflation and output growth.

(Insert Figure 1.7 here)

Figure 1.7 reports the impulse responses of inflation, growth and real exchange rate when oil prices are taken into the model. One-standard shock to

growth decreases inflation immediately. However, in the remaining periods inflation rises while growth declines but these movements are not statistically significant. The response of the real exchange rate to itself reveals a statistically significant appreciation. A positive shock to inflation brings down the growth rate while the response of the real exchange rate is first appreciation and then depreciation. One-standard shock to real exchange rate lowers growth and increases inflation. These effects are significant for the first period.

Figure 1.6 shows us that the negative relationship between inflation and growth is still valid when oil prices are taken into account. Moreover, Figure 1.7 supports our claim that the variable underlying this negative relationship is the real exchange rate. In sum, in all impulse responses declines in growth and increases in inflation can be explained by depreciation of the real exchange rate.

1.6.2 Money as an Exogenous Variable

McCandless and Weber (1995) examine 110 country with a 30 years data and find that the correlation coefficient between inflation and money supply varies between 0,92 and 0,96. However, there may be an other story: in an environment where income is increasing, households and economic agents will demand more money. This will decrease the difference between money supply and money demand. The decrease in excess money supply will result in a fall in inflation. Therefore, income rises and inflation decreases; a negative relationship between inflation and growth appears. To control for this effect, money is added to our model as an exogenous variable.

(Insert Figure 1.8 here)

Figure 1.8 reports the results of the impulse response analysis. One-standard deviation shock to growth leads to a fall in inflation instantaneously. For the first period this effect is statistically significant. Positive shock to inflation decreases growth rate. This is again observed in the third period but this is relatively smaller and insignificant. We therefore conclude that the negative relationship between inflation and growth still holds when money is included in the model.

(Insert Figure 1.9 here)

Figure 1.9 shows the impulse responses of the Extended Benchmark Model when money is added as an exogenous variable. One-standard deviation shock to growth significantly decreases inflation and appreciates the real exchange rate in the first period. However, following a shock to inflation, output falls at once and the real exchange rate depreciates. These effects are statistically significant in the first period. On the other hand a depreciation shock to real exchange rate decreases growth and raises inflation. These effects are also statistically significant. We conclude that the extended benchmark model with money gives the same results we have already reached: opposite movements of inflation and growth are supported by real exchange rate movements.

1.6.3 Government Spending as an Exogenous Variable

In dynamic demand and supply analysis, an increase in government spending is generally taken to increase aggregate demand and hence prices. However, there is a huge debate about this effect in the literature. For one thing government purchases

may adversely affect competitiveness by allowing inefficient firms to survive causing a higher price level and vice versa. Accordingly we add government spending as an exogenous variable to our model.

(Insert Figure 1.10 here)

Figure 1.10 reports the impulse response of the Benchmark Model. One-standard deviation shock to growth decreases inflation instantaneously but in the following periods, inflation goes up while growth rate begins to decelerate. But these effects are significant only in the first period. On the other hand a positive shock to inflation decreases growth in the first period. This effect is again observed in the third period but it is relatively smaller. Hence, adding government spending as an exogenous variable to our model doesn't alter our main conclusion that inflation and growth move in opposite directions.

(Insert Figure 1.11 here)

Figure 1.11 shows the impulse responses of the Extended Benchmark Model. One-standard deviation shock to growth decreases inflation and appreciates the real exchange rate. In the following periods inflation rises and the real exchange rate depreciates while the growth rate declines. When we introduce one-standard shock to inflation, growth rate goes down and the real exchange rate depreciates immediately. These effects are statistically significant in the first period. In contrast a depreciation shock to the real exchange rate raises inflation and reduces growth in the first period and these are significant. Hence Figure 1.11 also supports our claim that there is a

negative relationship between growth and inflation which can be explained by real exchange rate movements.

1.6.4 Tax Revenue as an Exogenous Variable

Taxes affect economic performance. Higher indirect taxes lead to higher prices, since producers treat taxes as cost and reflect them in prices. On the other hand, higher income taxes reduce the disposable income of the consumers and they consume less. Hence, taxes increase inflation while they decrease output. Accordingly they are added as exogenous variables to our model.

(Insert Figure 1.12 here)

Figure 1.12 reports the impulse response of the Benchmark Model. One-standard deviation shock to growth decreases inflation instantaneously and in the following periods, inflation goes up while growth rate begins to loose its speed. But these effects are significant only in the first period. On the other hand a positive shock to inflation decreases growth in the first period. This effect is again observed in the third period but this is relatively smaller. Moreover, adding government spending as an exogenous variable to our model doesn't change the opposite movements of inflation and growth.

(Insert Figure 13 here)

Figure 13 reports the impulse responses of the Extended Benchmark Model. One-standard deviation shock to growth decreases inflation and appreciates the real

exchange rate in the first quarter. In the next periods, inflation rises and real exchange rate depreciates while growth rate declines. When we introduce one-standard shock to inflation, growth rate goes down and real exchange rate depreciates instantaneously. These effects are significant in the first period. A depreciation shock to the real exchange rate significantly increases inflation and decreases growth in the first period. Thus, Figure 13 also supports our claim that there is a negative relationship between growth and inflation and this negative relation can be explained by real exchange rate movements.

1.7 Conclusion

We have investigated the dynamics between growth and inflation in Turkey and found significant evidence that these two variables move in the opposite directions. We have shown that there is a possible third variable effect that lies behind this negative correlation and this is real exchange rate movements.

For reasons explained earlier we have used Generalized Impulse Response Analysis. We have established that real exchange rate appreciations are coupled with increases in growth and declines in inflation while depreciations are accompanied with higher inflation and negative growth rates. We have also shown that these conclusions also hold in alternative settings in which we control for the effects of other macroeconomic variables.

Figure 1.1: Historical Movements of Inflation and GDP Growth in Turkish Economy

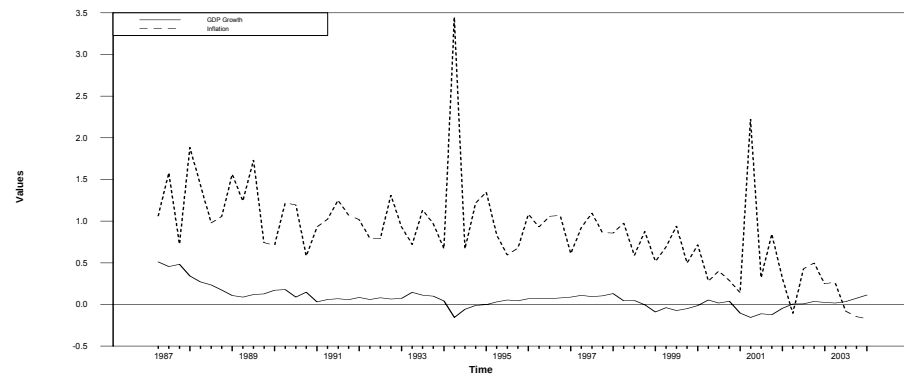


Figure 1.2: Historical Movements of GDP Growth and Real Exchange Rate in Turkish Economy

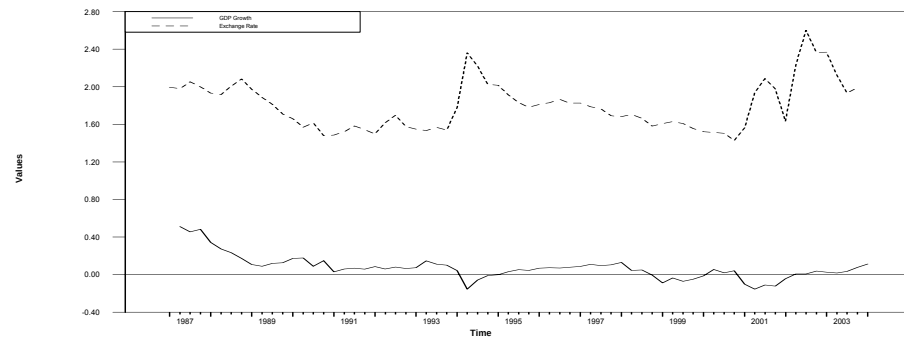


Figure 1.3: Historical Movements of Inflation and Real Exchange Rate in Turkish Economy

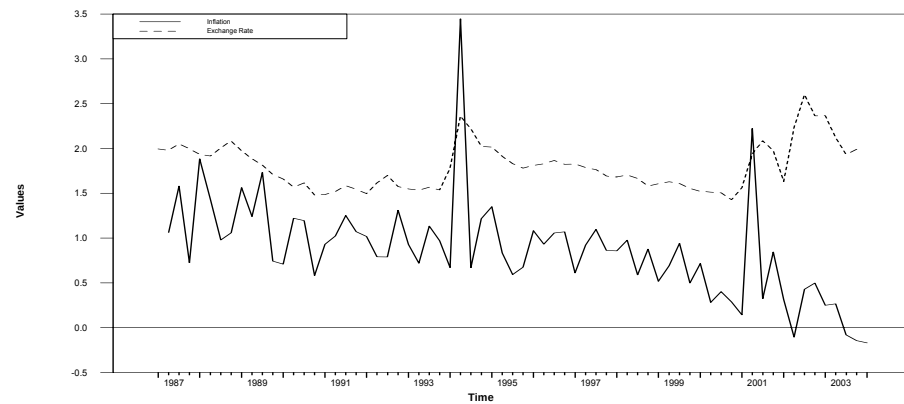


Figure 1.4: Benchmark model

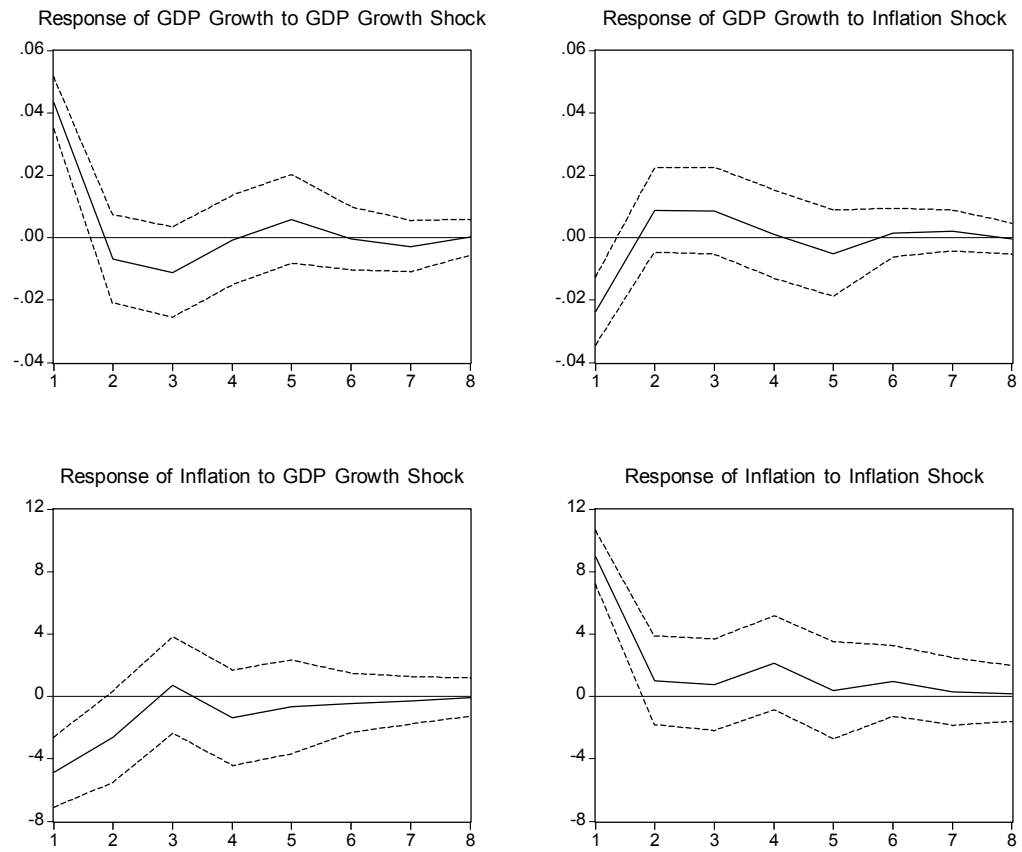


Figure 1.5: Benchmark Model with Real Exchange Rate (Extended Benchmark Model)

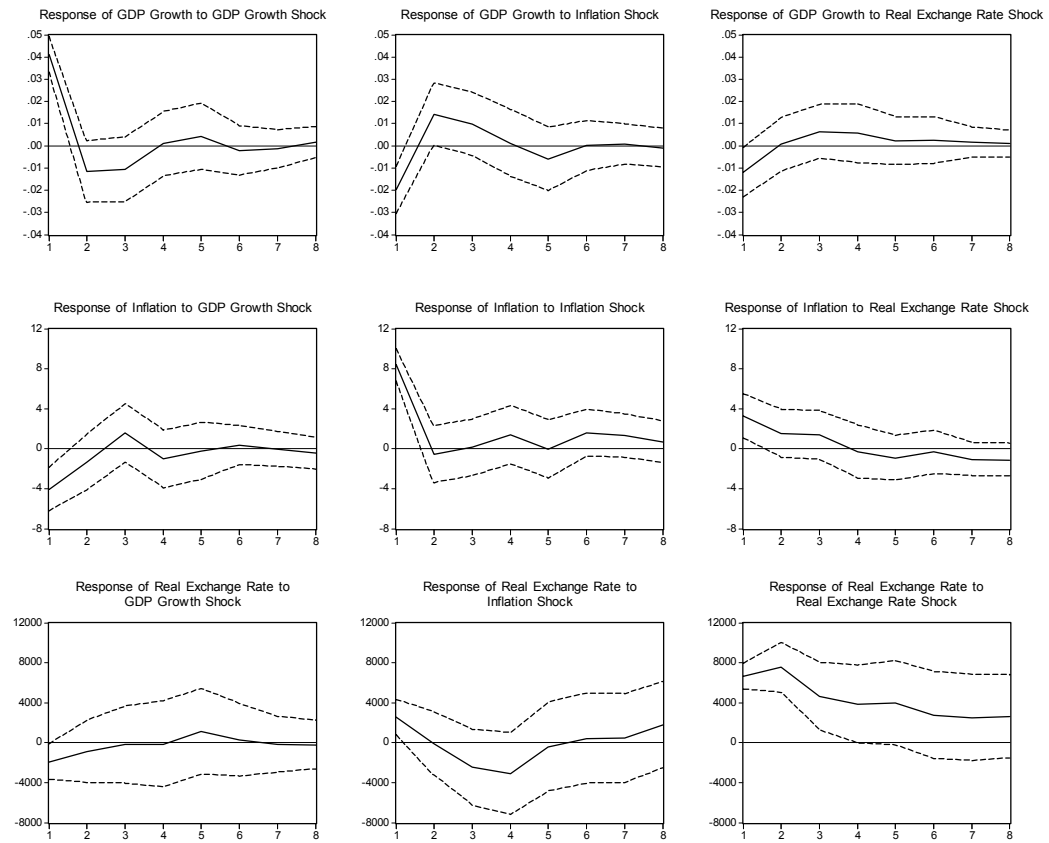


Figure 1.6: Oil Price as an Exogenous Variable in the Benchmark Model

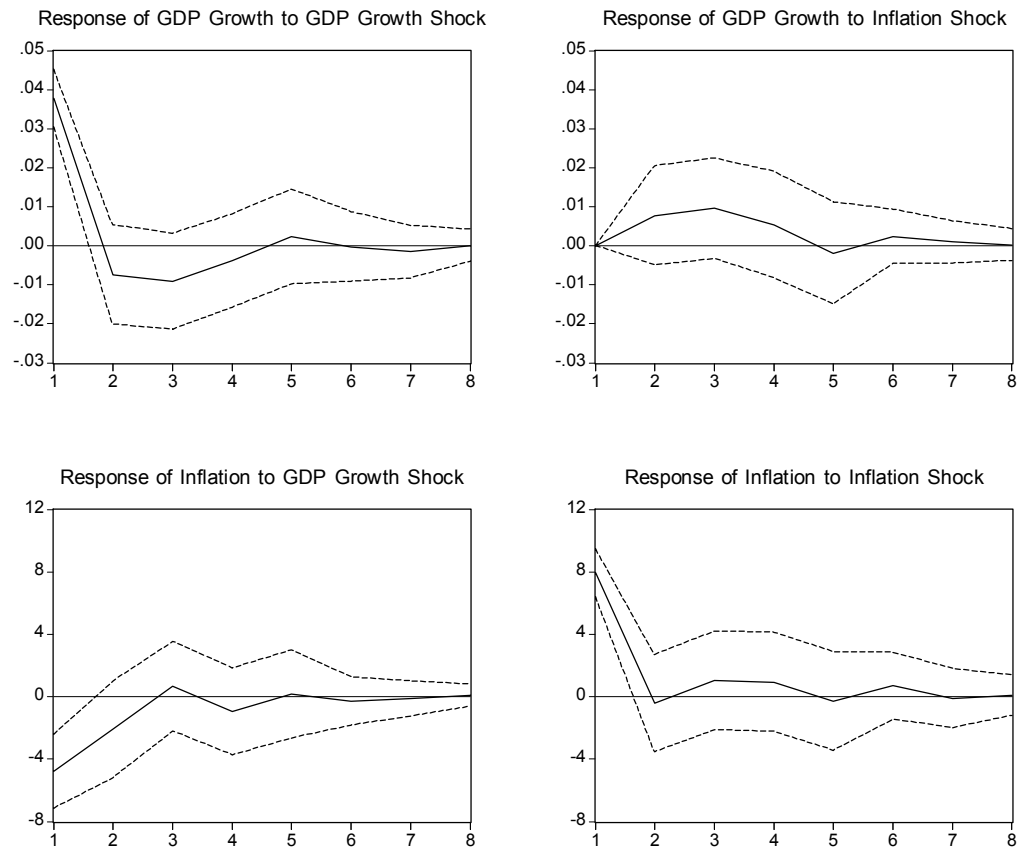


Figure 1.7: Oil Price as an Exogenous Variable in the Extended Benchmark

Model

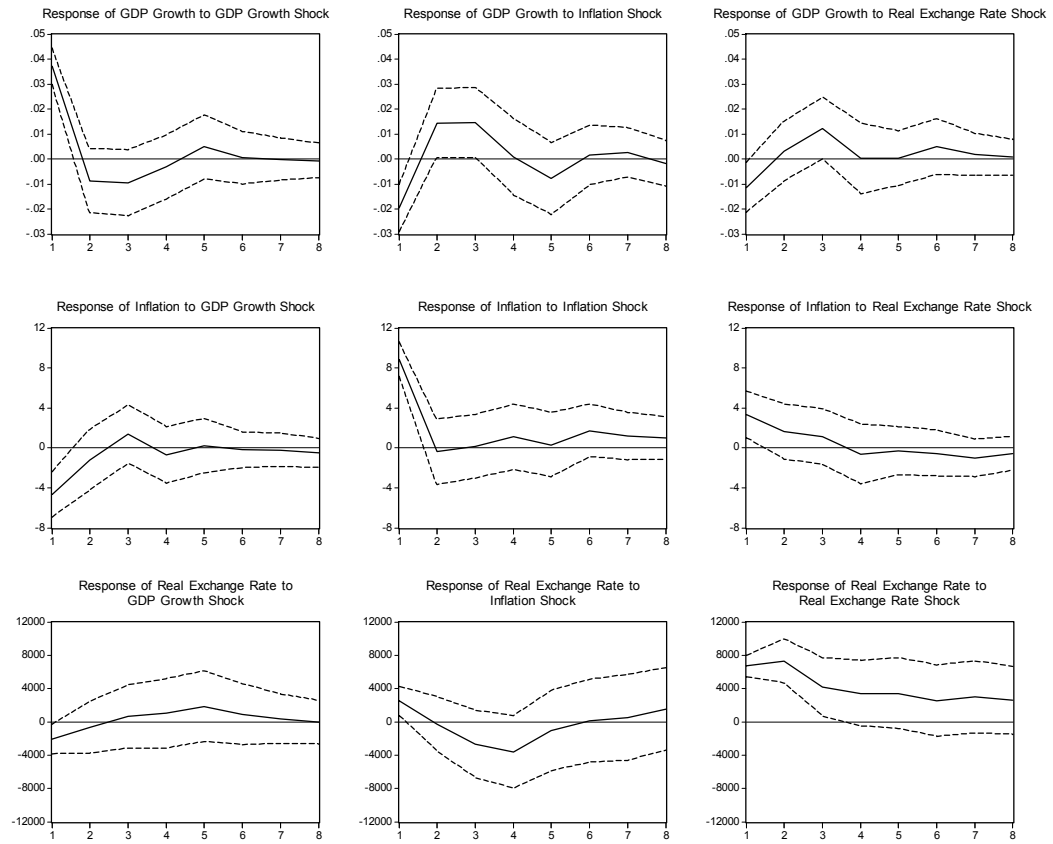


Figure 1.8: Money as an Exogenous Variable in the Benchmark Model

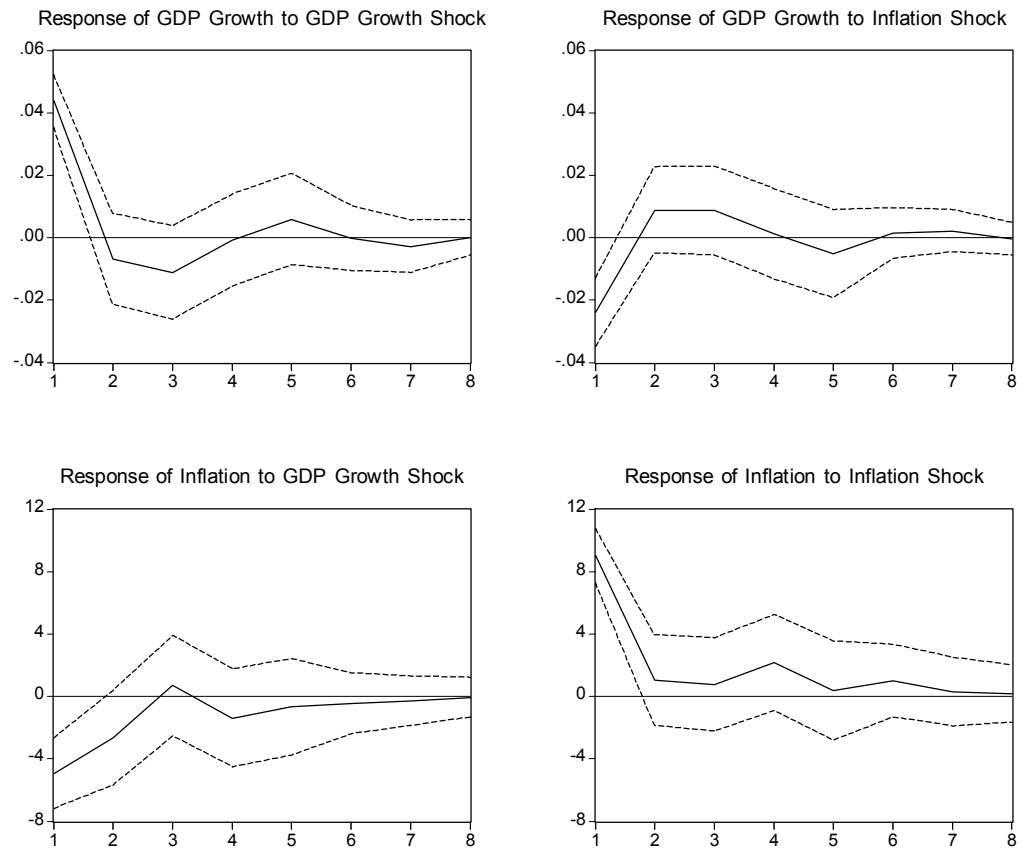


Figure 1.9: Money an Exogenous Variable in the Extended Benchmark Model

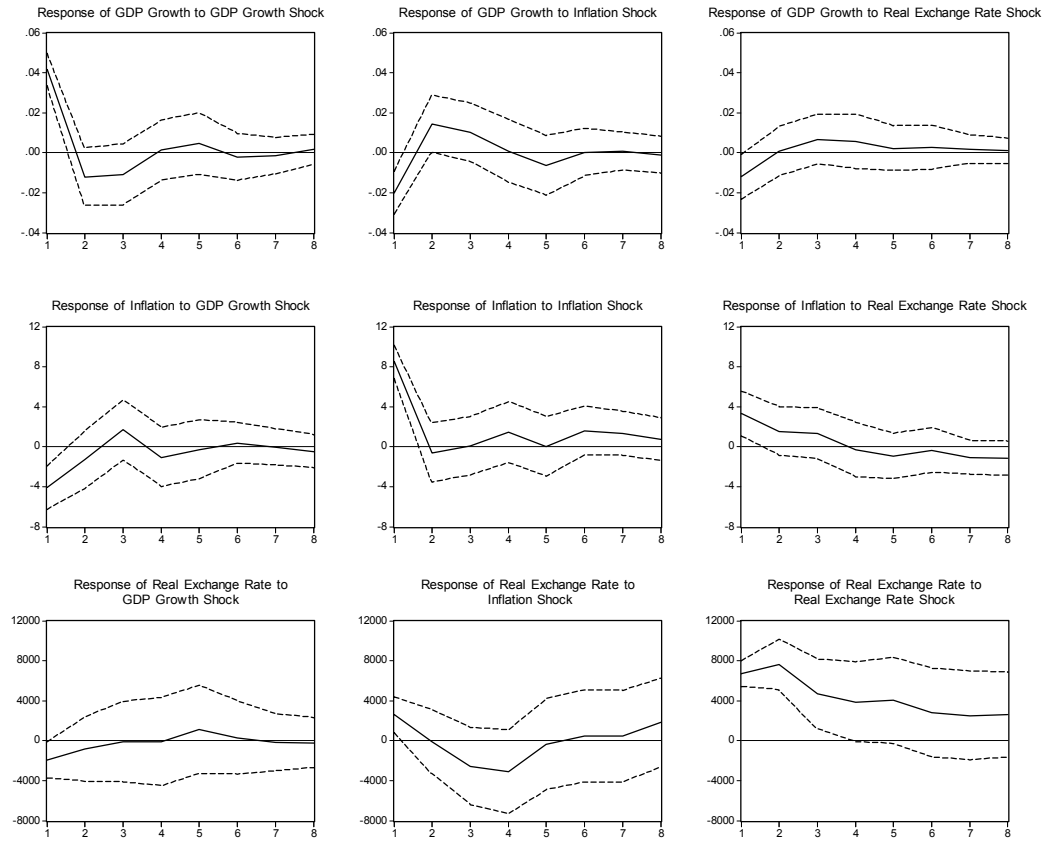


Figure 1.10: Government Spending as an Exogenous Variable in the Benchmark Model

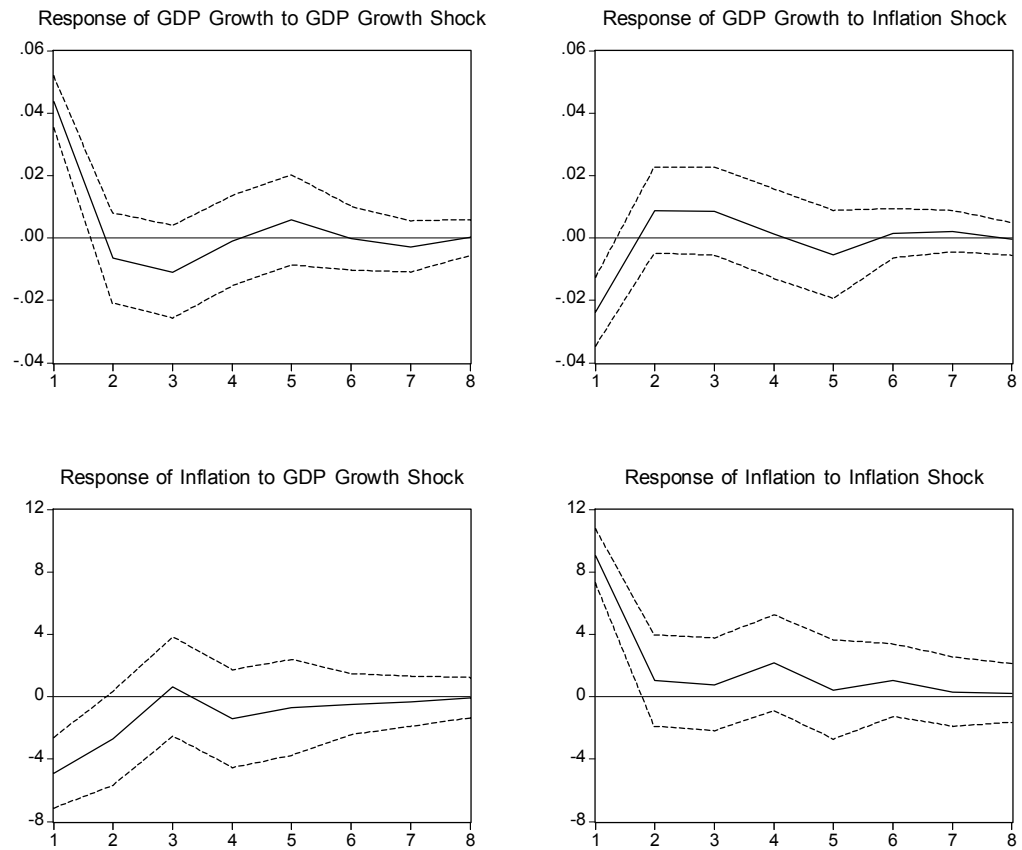


Figure 1.11: Government Spending as an Exogenous Variable in the Extended Benchmark Model

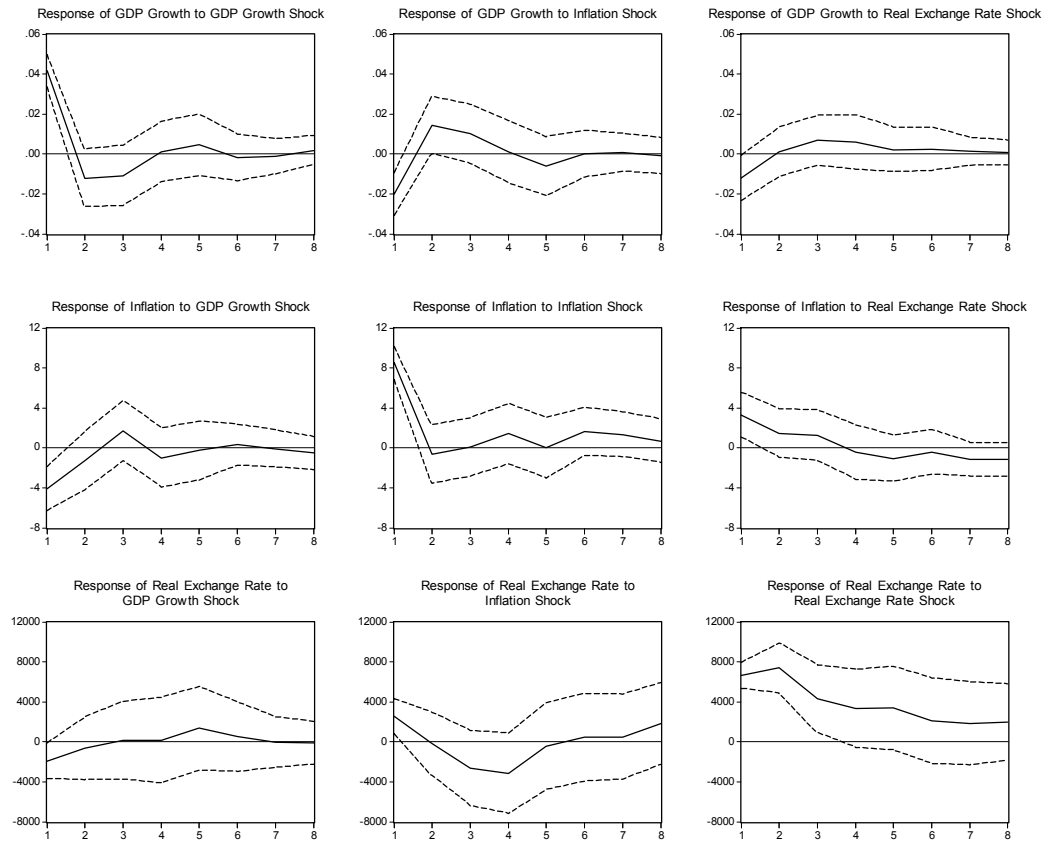


Figure 1.12: Tax Revenues as an Exogenous Variable in the Benchmark Model

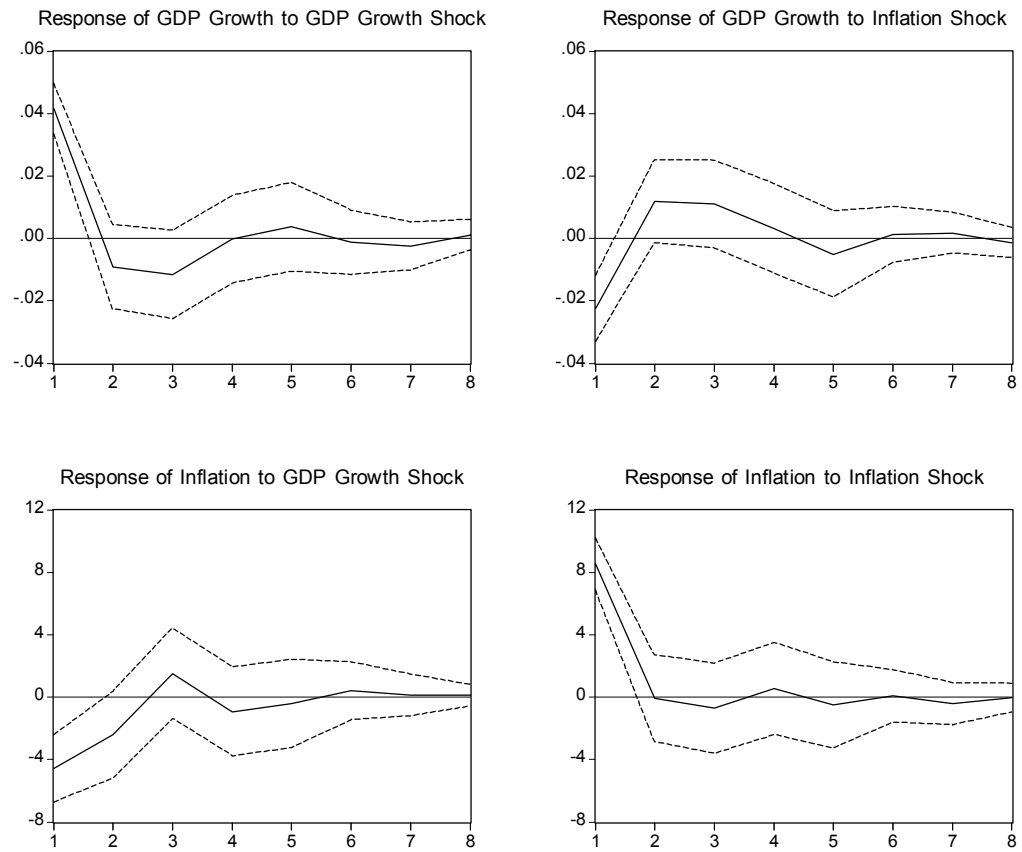
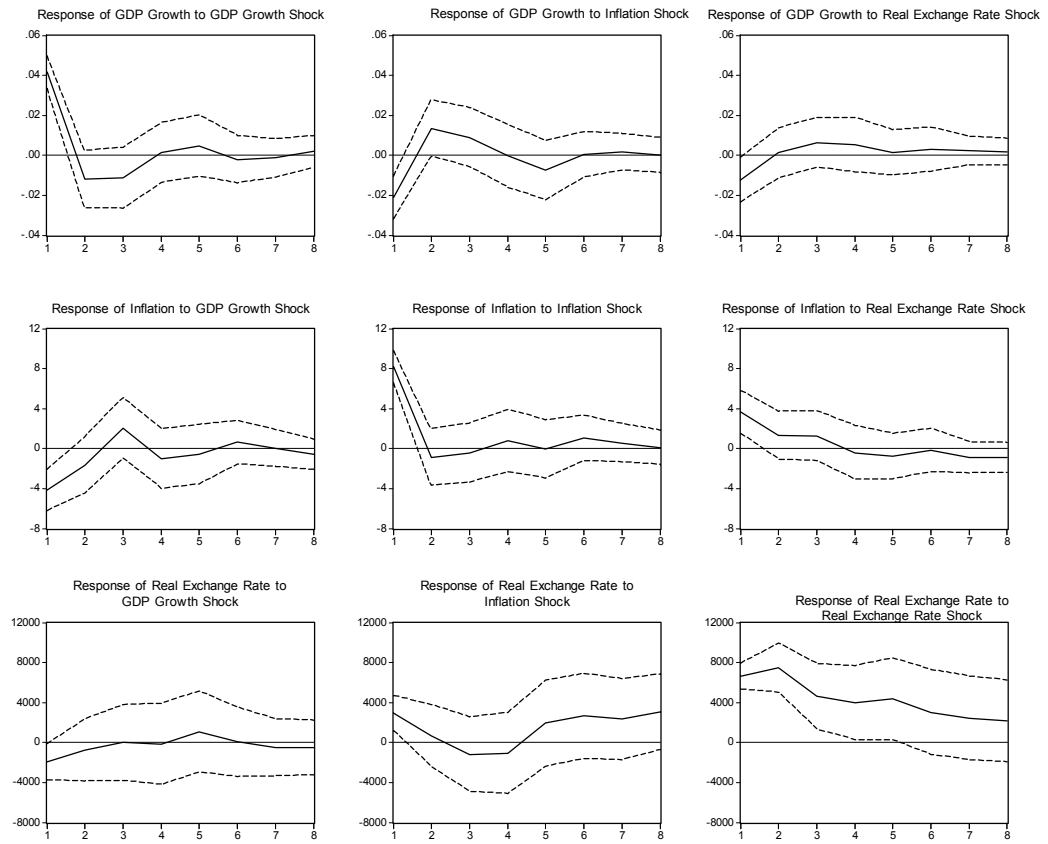


Figure 13: Tax Revenues as an Exogenous Variable in the Extended Benchmark Model



CHAPTER 2

THE DAY OF THE WEEK EFFECT ON STOCK MARKET VOLATILITY : ISTANBUL STOCK EXCHANGE

2.1 Introduction

Effect of the calendar anomalies have been widely studied in finance literature. These studies have shown us that return of stocks vary by the day of the week and this is known as the day of the week effect. Cross (1973), French (1980), Gibbons and Hess (1981), Keim and Stambaugh (1984), Lakonishok and Levi (1982) and Rogalski (1984), Balaban (1995) are researches who showed the day of the week effect.

Other researches have worked on the time series of stock market through generalized autoregressive conditional heteroskedasticity model. Among them are Akgiray (1989), Campbell and Hentschel (1992), French, Schwert and Stambaugh (1987), Glosten, Jaganathan and Runkle (1993) and Hamao, Masulis and Ng (1990). These studies lead us to the decision that unexpected returns and unexpected volatilities exhibit negative relation. Campbell and Hentschell (1992) report that an increasing stock market volatility raises the required rate of return on common stocks and hence lowers stock prices. The common point of all these studies are they report

returns in stock market is time varying and conditionally heteroskedastic. But, these studies haven't considered the day of the week effect for volatility.

It is expected from an investor to look at the return of the stock while buying it. But there is also another condition that can't be underestimated is the volatility of the stock price. It is very important to know if high volatility of stock price is related with high volatility for a given day. If investors could identify a certain pattern for the days, they could revise their position in the stock market to avoid high volatility in their portfolio. Kiyamaz and Berument (2003) report that volatility varies by the day of the week for developed countries.

Our study investigates the day of the week effect on return and volatility for the Istanbul Stock Exchange (ISE) with a GARCH model from 1986 to 04.08.2003. Our studies lead us to the result that we can say that there is the day of the week effect. Part 2 gives a brief review of literature and Part 3 gives information about data and our model. Part 4 is the conclusion part then comes our appendix.

2.2 Literature Review

Returns and how they are related with the days of the week is a popular study area in finance literature. Cross (1973), French (1980), Gibbons and Hess (1981), Keim and Stambaugh (1984), Lakonishok and Levi (1982) and Rogalski (1984) may be given as examples from the literature for the day of the week effect. An interesting result from these studies is that average returns on Monday are less than the other days of the week. This day of the week effect isn't only an issue for the U.S. equity market, researchers have found interesting results for equity, fixed income, derivative market for other countries and US. Among them are Aggarwall and Rivoli (1989), Athanassakos and Robinson (1994), Chang, Pinegar and

Ravichandran (1993), Dubois (1986), Kato and Schallheim (1985), Jaffe and Westerfield (1985a,1985b) and Solnik and Bouquet (1990) and they showed that the foreign stock market returns varies by the day. Also, Corhay, Fatemi and Rad (1995), Flannary and Protopapadakis (1988), Gay and Kim (1987), and Gesser and Poncet (1997) pointed that the return of the future and foreign exchange rate varies by the day. Balaban (1995) reports that the validity of the day of the week effect for ISE. He states that Friday has the highest return for ISE for the period 1988-94.

The studies mentioned above focus on the mean return, also an other way to investigate the return and the day of the week effect is the GARCH model. There are lots of specifications for this in the literature. For example, French et al. (1987) went through the relationship between stock return and volatility and shown that unexpected returns are negatively related with unexpected movements in volatility. Campbell and Hentschel (1992) report similar results and add that high volatility increases required rate of return but with lowering the stock prices. Glosten et al. (1993) and Nelson (1991) report that positive unanticipated return decreases conditional volatility but unanticipated negative returns increase the conditional volatility. Baillie and DeGennaro (1990) didn't find any evidence to relate mean return with volatility. Again, Chan, Karolyi and Stultz (1992) find no significant relationship between conditional expected excess return on S&P 500 and its variance. Corhay and Rad (1994) and Theodossiou and Lee (1993) report no significant evidence between stock market volatility and its expected return. Studies mentioned above report that the expected return on stock market is time varying and conditionally heteroskedastic.

An other question why there is volatility has been asked by reseraches. And it is accepted that the reasons for volatility lie on two aspects. The fist one is that volatility is caused by the arrival of the public information and the other one is that public information, itself. This public information can be accepted as macroeconomic news. French and Roll (1986) report that stock prices are more volatile during trading hours than non-trading hours and variances of the days after holidays are larger than the other days. Their explanation to this result is that traders are receiving public information during trading hours and are willing to trade while they can. Harvey and Huang (1991) report higher volatility in interest rates and foreign exchange future markets during the first trading hours on Thursday and Friday. Their interpretation to this result is that public information arrives more on Thursdays and Fridays. Balaban (1995) indicates that Monday is the most volatile day for ISE through the years 1988- 94 and also for each individual year.

Two milestones studies on the public information arrival and time-dependent patterns are Admati and Pfleiderer (1988) and Foster and Viswanathan (1990). Both studies show how information is incorporated into pricing and how investors effect prices. The main point is that how liquidity and informed traders effect volume and volatility. The difference between these two studies is the trading assumption of the informed and liquidity traders. Admati and Pfleiderer (1988) assumes that informers and liquidity traders trade together, while Foster and Viswanathan model says that public information is short lived and liquidity traders avoid to trade with informed traders. So the implications of the model are different Foster and Viswanathan say that liquidity traders avoid to trade with informed traders when public information is intense. Then volume must be low and volatility must increase. Admati and Pfleiderer trading volume is high when price volatility is high.

An other study by Berument and Kiymaz (2001) find that there is difference of volatility across the days of the week and the highest volatility is observed on Fridays. This study investigates the day of the week effect for return and volatility through a GARCH model for Istanbul Stock Exchange

2.3 Data and Methodology

Data consists of ISE 100 index including the time period from 23 October 1986 to 4 August 2003. Return is calculated as follows:

$$R_t = [\log(P_t) - \log(P_{t-1})] \quad (1)$$

We could have used standard OLS procedure as done in the literature for calculating the return and volatility of the stock market. But this model has two drawbacks. First, errors in the model may be autocorrelated and second drawback is that variance of the error terms may not be constant over time. Especially, to solve the second drawback variance of the error terms are allowed to be time dependent so as to include conditional heteroskedasticity. So, error terms have zero mean and variance that is changing with the time ht^2 [$\varepsilon_t \sim (0, h_t^2)$].

There are different types of conditional heteroskedasticity models suggested in the literature. The main two are ARCH and GARCH models. ARCH model developed by Engle (1982) permits the variances of the forecasted return terms to change with the squared lag values of the previous error terms.

$$h_t = V_c + \sum_{j=1}^q V_j \varepsilon_{t-j}^2 \quad (2)$$

The generalized version of the ARCH model seen above is developed by Bollerslev (1986) adding also the ht^2 terms.

$$h_t = V_c + \sum_{j=1}^q V_{ja} \varepsilon_{t-j}^2 + \sum_{j=1}^p V_{jb} h_{t-j}^2 \quad (3)$$

This model is known as GARCH(p,q). Conditional variance may effect stock market return. So, we hire various models to find out the relationship between return and volatility. Following Berument & Kiymaz:

$$R_t = \alpha_0 + \alpha_M M_T + \alpha_T T_T + \alpha_H H_T + \alpha_F F_T + \sum_{i=1}^n \alpha_i R_{t-i} + \varepsilon_t \quad (4a)$$

$$h_t^2 = V_c + V_{1a} \varepsilon_{t-1}^2 + V_{1b} h_{t-1}^2 \quad (4b)$$

R_t represents return and M_T , T_T , H_T , F_T are dummy variables for Monday, Tuesday, Thursday and Friday. We exclude Wednesday to avoid dummy trap. Here, it is necessary to note that lagged values of squared residuals and the conditional variance may be too restrictive. It is also possible to include exogeneous variables to the GARCH model and its specifications are usually used in the literature. Karolyi (1995) includes the volatility of foreign stock returns while investigating the conditional variance of the home country stock market. Hsieh (1998) includes the day of the week effect in volatility. we model conditional variability by icluding the day of the week effect into our volatility equation. Following Kiymaz and Berument (2003) our model is written as:

$$R_t = \alpha_0 + \alpha_M M_t + \alpha_T T_t + \alpha_H H_t + \alpha_F F_t + \sum_{i=1} \alpha_i R_{t-i} + \varepsilon_t \quad (5a)$$

$$h_t^2 = V_c + V_M M_t + V_T T_t + V_H H_t + V_F F_t + V_{j1} \varepsilon_{t-1}^2 + V_{1b} h_{t-1}^2 \quad (5b)$$

Here, we use the quasi-maximum likelihood estimation (QMLE). That was developed by Bollerslev and Wooldridge (1992) to estimate parameters.

2.4 Empirical Results

Table 2.1 reports the descriptive statistics on the day of the week effect on the ISE returns. The return series are calculated as the logarithmic first difference of the ISE 100 index where the index is gathered from the data delivery system of the Central Bank of the Republic of Turkey. The data span cover the observations from 23 October 1987 to 4 August 2003. It is seen that Friday has the highest return with 0,00306 on average. Following it, we see Thursday's return with 0,00170 on average. Then comes Wednesday with a return of 0,00091 on average. Monday and Tuesday have negative expected return. Tuesday has a negative return with 0,00013 and Monday has a return of -0,00052. When we look at the standard deviations of the returns as a volatility measure, Friday has the highest volatility on return. The volatilities of other days are similar to each other. Another striking result is that when skewness and kurtosis statistics are concerned Mondays' return is very similar to normal distribution. The other days statistics are far from being similar to normal distribution.

Table 2.2 reports the estimated parameters for the mean and variance specification as in Equations (4a) and (4b) for the full sample. Note that as we excluded Wednesday in our return equation to avoid dummy trap, the estimates are interpreted by comparing the one of Wednesday. We allow our variance to change with time (with a GARCH specification) and control the serial correlation with the lag dependent variable of the return variable.² The first column reports the estimates for the full sample. Friday has the highest return and the estimated coefficient is statistically significant (note that we report the p -values in parenthesis under the corresponding coefficient).³ This suggest that Fridays has higher returns compare to wednesdays. And Fridays is followed by Monday, Thursday and Tuesday but the

returns of these days are not statistically significantly different from Wednesday. Muradoglu et al. argue that the full sample cover a range that has different characteristics. Thus, next we consider various sub-samples.

The very first sub-sample that we consider is the period prior to self-inflicted financial crises of 1994. This includes sample from 2 January 1990 till 31 December 1993.⁴ For this period, even if the Fridays has the highest return, we could not find any statistical evidence that any single day has a different return than one of Wednesday. The second sub period covers the post 1994 crises starting from 2 January 1995 but end the sample in 31 October 2000 when there was another crises in November of 2000. The results are again parallel with first sub-sample: Friday has the highest return but none of the days has a statistically significantly different returns than ones in wednesdays. The last sub-sample covers the era that has relatively stable economic environment. This includes the observations from 2 January 2000 till 4 August 2003. Mondays and Tuesdays have negative, and Thursday and Friday have positive estimated coefficients for these days. However none of these coefficients are statistically significant.

Last we look at the estimates of the variance (GARCH) specification for robustness. Even if the magnitudes are small, the estimated coefficients for the constants are positive. Next the estimated coefficients for the V_{1a} and V_{1b} are positive. This satisfies the non-negativity conditions of the variance specification. Moreover, sums of V_{1a} and V_{1b} is less than 1 for all time periods in our analysis. Thus, these estimates satisfy the non-explosiveness of the implied variances

Beside we perform battery of the specification tests. Namely 4 non-parametric Bised tests. Sign Bias test, Negative Size Bias Test, Positive Size Bias tests and Joint tests. When we look at the overall, we could reject the null hypothesis.

But only for the full sample time period, we fail to reject null hypothesis for negative sign test. The Ljung-Box Q statistics of all time periods are also reported in the table. We cannot reject any of the statistics for autocorrelation. When we look at the ARCH-LM tests (see Engle, 1982) , for Table 2 we fail to reject our null hypothesis that is there is no heteroskedasticity except for the full sample period. Thus, both Ljung-Box Q, and ARCH-LM tests supports our specification.

Table 2.3 is for the estimates of the return and volatility specifications where the day of the week effect is present for the volatility specifications: Equations (5a) and (5b). In our full sample, Mondays and Tuesdays have negative and statistically significant coefficients. Thursday and Friday have positive estimated coefficients but these estimated coefficients are not significant. Thus like the previous specification Friday has the highest return but unlike the previous one this coefficient is not statistically significant. For the sub-samples the overall conclusion is the same but for the 1995-2000 era, the highest return is observed for Thursdays but not Fridays.

About volatility, we have statistical evidence to report for Mondays and Fridays volatilities are higher and for Tuesdays and Thursdays are lower than Wednesdays. This evidence is statistically significant for Mondays, Tuesdays and Fridays. When one look at the evidence for the sub samples. For the pre crises and post crisis periods Mondays has highest and Tuesdays have lowest volatilities. For the post 2002 era, we could not find any evidence that the day of the week effect is present for the volatility.

The estimated coefficient for the constant term, V_{1a} and V_{1b} of the GARCH(1,1) specification are always positive. This satisfies the non-negativity of the variance specification. When we look at the sum of V_{1a} and V_{1b} it is seen that their sum is less than 1 for all time periods except for the full sample period (for the

full sample we can not reject the null hypothesis that the sum of V_{1a} and V_{1b} is less than one) This suggests that the variance is non-explosive. As an robustness test, we look at the sign and size biased tests, we fail to reject our null hypotheses. Next we look at Ljung-Box Q autocorrelation tests. The presence of autocorrelation is present for the full sample and 1995-2000 era but not for others. We disregard this statistics because 1. the estimates reported in Table 2.3 is extension of Table 2.2 where the autocorrelation was not problem, and more importantly 2. other robustness tests was satisfactory for the specification that we had. Last, when we look at the ARCH tests, for Table 3 we fail to reject our null hypothesis that there is heteroskedasticity.

2.5 Conclusion

There is a new set of evidence that day of the week effect is present for both returns and volatility for the developed economies. Our study investigates this topic for ISE by using a GARCH specification. By using daily observation we show that highest volatility is observed for Mondays and lowest for Fridays. Moreover, Friday has the highest return and Monday has the lowest return.

Table 2.1: Descriptive Statistics on ISE Returns

	ALL DAYS	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
Average	0.00100	-0.00052	-0.00013	0.00091	0.00170	0.00306
Stad. Dev	0.02050	0.01558	0.01270	0.01345	0.01356	0.03643
Skewness	2753990	0.10174	0.35734	-0.59163	0.94564	24.44077
Kurtosis	1329.78817	3.04303	2.72543	6.14418	11.41341	664.01911

Table 2.2: Return Statistics with GARCH Specification

	FULL SAMPLE	BETWEEN 90- 94	BETWEEN 95- 2000:11	BETWEEN 2002-2003:8
Mean				
Constant	-0.008 (0.126)	0.001 (0.446)	0.013 (0.001)	-0.001 (0.764)
α_M	0.008 (0.214)	-0.003 (0.156)	-0.010 (0.080)	-0.007 (0.129)
α_T	0.001 (0.927)	-0.002 (0.475)	-0.009 (0.119)	-0.006 (0.222)
α_H	0.002 (0.742)	-0.002 (0.271)	-0.005 (0.362)	0.005 (0.286)
α_F	0.015 (0.034)	0.001 (0.510)	-0.005 (0.404)	0.002 (0.683)
Rt-1	0.270 (0.016)	0.201 (0.001)	-0.027 (0.796)	-0.025 (0.720)
Variance				
Constant	0.000 (0.005)	0.000 (0.001)	0.000 (0.548)	0.000 (0.326)
V1a	0.951 (0.002)	0.326 (0.001)	0.154 (0.175)	0.121 (0.044)
V1b	0.000 (0.999)	0.603 (0.000)	0.832 (0.000)	0.714 (0.001)
D	1.384 (0.000)	1.381 (0.000)	1.124 (0.001)	1.488 (0.000)
Skewness	1.037	0.176	-0.821	0.401
Kurtosis	6.226	4.772	5.283	3.847
Function value	306.944	2.123.914	233.656	578.841
Sign Bias Test	-1.485 (0.139)	-0.267 (0.789)	-0.386 (0.700)	0.217 (0.828)
Negative Size Bias Test	-2.122 (0.035)	0.931 (0.352)	0.479 (0.633)	0.639 (0.523)
Positive Size Bias Test	-1.044 (0.298)	-1.228 (0.219)	0.598 (0.551)	0.084 (0.932)
Joint Test	1.893 (0.133)	0.810 (0.488)	0.829 (0.481)	0.170 (0.916)
Q-statistics				
Q(5)	2.652 (0.753)	2.571 (0.765)	3.091 (0.685)	1.006 (0.962)
Q(10)	3.661 (0.961)	7.614 (0.666)	11.287	5.666 (0.842)
Q(20)	16.765 (0.668)	15.355 (0.755)	25.017 (0.200)	16.415 (0.690)
Q(60)	75.564 (0.084)	50.826 (0.794)	64.700 (0.316)	53.481 (0.711)
ARCH-LM (5)	1.854 (0.868)	3.951 (0.556)	1.687 (0.890)	4.379 (0.496)
ARCH-LM (10)	8.483 (0.581)	6.281 (0.791)	2.208 (0.994)	8.075 (0.621)
ARCH-LM (20)	42.505 (0.002)	11.687 (0.926)	7.943 (0.992)	10.042 (0.967)

ARCH-LM (60)	61.594 (0.418)	62.472 (0.388)	38.000 (0.988)	44.759 (0.929)
--------------	-------------------	-------------------	-------------------	-------------------

p-values are reported under the corresponding coefficients or statistics.

Table 2.3: Return and Volatility Statistics with GARCH Specification.

	FULL SAMPLE	BETWEEN 90-94	BETWEEN 95-2000:11	BETWEEN 2002-2003:8
Mean				
Constant	0.002 (0.037)	0.001 (0.249)	0.001 (0.073)	0.000 (0.786)
$A\mu$	-0.003 (0.009)	-0.001 (0.191)	-0.002 (0.013)	-0.003 (0.121)
αT	-0.002 (0.044)	-0.001 (0.323)	-0.001 (0.172)	-0.002 (0.265)
αH	0.000 (0.828)	-0.001 (0.135)	0.001 (0.087)	0.002 (0.358)
αF	0.001 (0.477)	0.000 (0.594)	0.000 (0.563)	0.001 (0.685)
R_{t-1}	0.120 (0.000)	0.196 (0.001)	0.044 (0.046)	-0.013 (0.848)
Variance				
Constant	0.789 (0.000)	0.000 (0.145)	0.000 (0.001)	0.000 (0.577)
VM	0.480 (0.001)	0.933 (0.001)	0.350 (0.046)	-0.212 (0.662)
VT	-0.446 (0.001)	-0.425 (0.051)	-0.716 (0.001)	0.072 (0.922)
VH	-0.129 (0.280)	0.045 (0.799)	-0.210 (0.337)	0.016 (0.979)
VF	-0.315 (0.002)	-0.175 (0.220)	-0.498 (0.002)	-0.341 (0.515)
V1a	0.450 (0.000)	0.327 (0.001)	0.200 (0.000)	0.106 (0.086)
V1b	0.879 (0.000)	0.549 (0.000)	0.669 (0.000)	0.740 (0.001)
D	1.379 (0.000)	1.519 (0.000)	1.371 (0.000)	1.509 (0.000)
Skewness	-0.168	0.173	-0.143	0.394
Kurtosis	6.017	3.830	4.670	3.865
Function Value	8.944.181	2.932.347	6.603.841	794.728
Sign Bias Test	-1.829 (0.067)	0.204 (0.838)	-0.187 (0.851)	0.369 (0.712)
Negative Size Bias Test	-0.745 (0.456)	1.038 (0.299)	-0.599 (0.549)	0.700 (0.484)
Positive Size Bias Test	-1.423 (0.154)	-1.054 (0.292)	-0.397 (0.691)	0.183 (0.855)
Joint Test	1.226 (0.298)	0.746 (0.524)	0.241 (0.868)	0.189 (0.903)
Q-statistics				
Q(5)	18.020 (0.002)	2.753 (0.738)	16.097 (0.006)	0.996 (0.962)
Q(10)	26.609 (0.003)	7.126 (0.713)	26.664 (0.002)	5.815 (0.830)
Q(20)	34.322 (0.024)	15.470 (0.748)	40.126 (0.004)	16.761 (0.668)

Q(60)	73.829 (0.108)	53.362 (0.715)	71.717 (0.142)	54.042 (0.692)
ARCH-LM (5)	4.934 (0.424)	2.298 (0.806)	3.111 (0.682)	7.084 (0.214)
ARCH-LM (10)	8.091 (0.620)	6.493 (0.772)	9.815 (0.456)	11.824 (0.297)
ARCH-LM (20)	16.959 (0.655)	14.562 (0.800)	21.395 (0.374)	12.919 (0.880)
ARCH-LM (60)	50.939 (0.791)	54.250 (0.684)	67.909 (0.225)	48.638 (0.852)

p-values are reported under the corresponding coefficients or statistics.

BIBLIOGRAPHY

- Admati A. & Pfleiderer. P. (1988). A theory of intraday patterns: Volume and price variability. *Review of Financial Studies*. 1.3-40
- Agenor, Pierre-Richard and Alexander W. Hoffmaister, 1997. Money Wages and Inflation in Middle-Income Developing Countries, IMF Working Paper
- Aggrawal. R. & Rivoli. P. (1989). Seasonal and day of the week effect in four emerging stock markets. *Financial Review*. 24. 541-550
- Akgiray. V. (1989) conditional Hetereskedasticity in time series of stock returns: Evidence and forecasts. *Journal of Business*. 62. 55-80
- Athanassakos. G. & Robinson. M.J. (1994). The day of the week anomaly: the Toronto stock exchange experience. *Journal of Business Finance and Accounting*. 21.833-856
- Baillie. R.T. & DeGennaro. R.P. (1990). Stock returns and volatility. *Journal of Financial and Quantitative Analysis*. 25. 203-214
- Balaban Ercan (1995) Day of the week effects : New evidence from an emerging market. *Applied Economic Letters*. 2. 139-143
- Ball, L. and Gregory Mankiw, 1994. What determines Sacrifice Ratio?, *Monetary Policy*. Chicago: University of Chicago Press
- Barro R. J., 1996. Inflation and Growth, *Federal Reserve Bank of St. Louis Review*, 78(3), 153-169
- Berument. H. & Halil Kiymaz. . (2001). The day of the week effect on stock market volatility. *Journal of Economics and Finance*. 25. 181-193
- Berument. H. & Halil Kiymaz.. (2003) the day of the week effect on stock market volatility and volume: International Evidence. *Review of Financial Economics* (forthcoming)
- Berument Hakan and Mehmet Pasaogullari, 2003. Effects of Real Exchange Rate on Output and Inflation: Evidence from Turkey. *Developing Economies*, v. 41, iss. 4, 401-35
- Berument Hakan and Hakan Tasci , 2002. Inflationary Effect of Crude Oil Prices in Turkey, *Physica A*, no.316, 568-580

- Bruno Michael and William Easterly, 1998. Inflation Crises and Long-Run Growth, *Journal of Monetary Economics*, vol. 41, 3-26
- Campbell. J.Y. & Hentschel. L. (1992). No news is good news: An asymmetric model of changing volatility in stock returns. *Journal of Financial Economics*. 31.281-318.
- Cosimano. Thomas and Dennis Jansen (1988). Estimates of the Variance of U.S. Inflation Based upon the ARCH Model: A Comment. *Journal of Money, Credit, and Banking*. 20(3). 409-21.
- Chan. K.C.. Karolyi. G.A. & Stuktz. R.M.(1992). Global financial markets and the risk premium on US equity. *Journal of Financial Economics*. 32. 137-167.
- Chang. E.. Pinegar. M. & Ravichandran. R. (1993). International evidence on the robustness of the day of the week effect. *Journal of Financial and Quantitative Analysis*. 28.497-513.
- Chang. E.. Pinegar. M. & Schachter. B. (1997). Interday variations in volume, variance and participation of large speculators. *Journal of banking and finance*. 21.271-282
- Corhay. A.. Fatemi A. & Rad A.T. (1995). On the presence of the day of the week effect in the foreign exchange market. *Managerial Finance*. 21.32-43
- Corhay. A.. & Rad A.T. (1994) Statistical properties of daily returns: Evidence from European Stock Markets. *Journal of Business Finance and Accounting*. 21. 271-282
- Cosimano. T.F. & Jansen. D.W. (1988). Estimates of the variance of US inflation based upon ARCH model. *Journal of Money, Credit and Banking* 20.409-421
- Cross. F. (1973. November-December) the behaviour of stock prices on Fridays and Mondays. *Financial Analysis Journal*. 67-69
- Den Haan, Wouter J., 2000. The Comovement Between Output and Prices. *Journal of Monetary Economics*, no. 46, 3-30
- Dick Hermann, et al., 1984. The Effect of Oil Price Increases on Four Oil-Poor Developing Countries: A Comparative Analysis, *Energy Economics*, 6(1), 59-70
- Dubois. M.L. (1986) the day of the week effect: the international evidence. *Journal of Banking and Finance*. 20. 1463-1484.
- Engle, Robert F.(1992). Autoregressive Conditional Heteroscedasticity with Estimates of the Variance of United Kingdom Inflation." *Econometrica* 50, July, 987-1007. 15
- Flannary. M.J. & Protopapadakis. A.A. (1988). From T-bills to common stocks: investigating the generality of intra-week return seasonality. *Journal of Finance*.. 431-439.

- Foster, F.D. & Viswanathan, S. (1990). A theory of the interday variations in volume, variances and trading cost: Evidence from recent price formulation models. *Journal of Finance*. 48. 187-211
- French K. (1980). Stock returns and the weekend effect. *Journal of Financial Economics*. 8. 55-69.
- French, K.R. & Roll, R. (1986). stock return variances: the arrival of information of reaction of traders. *Journal of Financial Economics*. 19. 3-30
- French, K., Schwert, G., & Stambaugh, R. (1987). Expected stock returns and volatility. *Journal of Financial Economics*. 19. 3-30
- Gay, G. & Kim, T. (1987) an investigation into seasonality in the futures market. *Journal of the Futures Market*. 7. 169-181
- Gerlach Stefan and Frank Smets, 1999. Output Gaps and Monetary Policy in the EMU Area, *European Economic Review*, no. 43, 801-812
- Gesser, V., & Poncet, P. (1997) volatility patterns: theory and some evidence from the dollar-mark option market. *Journal of Derivatives*. 5. 46-61.
- Ghosh, Atish and Steven Philips, 1998. Warning: Inflation May Be Harmful to Your Growth, *IMF Staff Papers*
- Gibbons, M., & Hess, P. (1981) day of the week effects and asset returns. *Journal of Business*. 54. 579-596.
- Glosten, L.R., Jagannathan, R., & Runkle, D.E. (1993) on the relation between the expected value and the volatility of the nominal excess returns on stocks. *Journal of Finance*. 48. 1779-1801.
- Hamao, Y., Masulis, R., & Ng, V. (1990). Correlations in price changes and volatility across international stock markets. *Review of Financial Studies*. 3. 281-308.
- Harvey, C., & Huang, R. (1991). Volatility in foreign exchange future markets. *Review of Financial Studies*. 4. 543-570.
- Hsieh, D.A. (1988). the statistical properties of daily foreign exchange rates: 1974-1983. *Journal of International Economics*. 24. 129-145
- Jaffe, J. & Westerfield, R. (1985) the week-end effect in common stock returns : the international evidence: *Journal of Finance*. 40. 433-454.
- Judd J. P., B. Trehan, 1995. The Cyclical Behavior of Prices : Interpreting The Evidence, *Journal of Money, Credit and Banking*, no. 27, 789-797
- Judson Ruth and Athanasios Orphanides, 1996. Inflation, Volatility and Growth, Board of Governors of the Federal Reserve System, Finance and Economic Discussion Series 96/19, 13

- Kamin S.B. and J.H. Rogers, 2000. Output and Real Exchange Rate in Developing Countries: An Application to Mexico, *Journal of Development Economics*, no. 61, 85-109
- Karolyi. A.G. (1995). A multivariate GARCH model of international transmission of stock returns and volatility: the case of the united states and Canada. *Journal of Business and Economic Statistics*. 13.11-25.
- Kato. K.. & Schallheim. J.S. (1985) seasonal and size anomalies in the japanese stock market. *Journal of Financial and Quantitative Analysis*. 20. 243-260.
- Keim. D.B..&Stambaugh. F. (1984). A further investigation of weekend effects in stock returns. *Journal of Finance*. 39. 819-840
- Kirmanoglu Hasan, 2001. Is There Inflation-Growth Tradeoff in the Turkish Economy?, *Canadian Economic Association Conference*
- Koop,G., M.H. Pesaran and S.M. Potter, 1996. Impulse response analysis in nonlinear multivariate models, *Journal of Econometrics*, no. 74, 119 –47.
- Kydland, F.E. and E. C. Prescott, 1990. Business Cycles: Real Facts and A Monetary Myth, *Quarterly Review*, Federal Reserve Bank of Minneapolis 14(2), 3-18
- Lakonishok. J.. & Levi. M. (1982) weekend effect in stock return: a note. *Journal of Finance*. 37.883-889
- Leigh Daniel and Marco Rossi, 2002. Exchange Rate Pass-Through in Turkey, IMF Working Paper
- Mallik Girijisankarand Anis Chowdhury, 2001. Inflation and Economic Growth: Evidence From Four South Asian Countries, *Asia-Pacific Development Journal*, vol. 8, no. 1, 123-134
- McCandless G. T. Jr and W. E. Weber, 1995. Some Monetary Facts, *Federal Reserve Bank of Minneapolis Quarterly Review*, 19(3), 2-11.
- Mendoza V. Alfonso, 2003. The Inflation-output Volatility Tradeoff and Exchange Rate Shocks in Mexico and Turkey, *Central Bank of Republic of Turkey, Central Bank Review*,3/1
- Muradoglu. G. & Berument. H. & Metin. K. (1999). Financial crisis and changes in determinants of risk and return : An empirical investigation of an emerging market (ISE). *Multinational Financa Journal*. 3. 223-252
- Nas Tevfik and Mark J Perry, 2001. Turkish Inflation and Real Output Growth, 1963-2000, *Russian and East European Finance Trade*, v. 37, iss. 6, 31-46

- Nelson. D.B. (1991). Conditional heteroskedasticity in asset returns: a new Approach. *Econometrica*. 59. 347-370.
- Ozbek Levent and Umit Ozlale 2004. Employing Extended Kalman Filter in Measuring Output Gap and Potential Output for The Turkish Economy, mimeo.
- Paul S., C. Kearney and K. Chowdhury, 1997. Inflation and Economic Growth: a Multi-Country Empirical Analysis, *Applied Economics*, vol. 29, 1387-1401
- Pesaran M. H. and Y. Shin ,1998. Generalized Impulse Response Analysis in Linear Multivariate Models, *Economics Letters*, 58, 17 –29.
- Rogalski. R.J. (1984). New finfings regarding day of the week returns over trading and non-trading periods: A note. *Journal of Finance*. 35. 1603-1614.
- Solnik. B.. & Bousquet. L. (1990) day of the week effect on the paris bourse. *Journal of Banking and Finance*. 14. 461-468.
- Theidossiou. P.. & Lee. U. (1993). Mean and volatility spillovers across major national stock markets: further empirical evidence. *Journal of Financial Research*. 16 . 337-350.

APPENDIX

Table 2A: Return and Volatility Statistics with GARCH Specification with 4 Lags.

	FULL SAMPLE	BETWEEN 90-94	BETWEEN 95- 2000:11	BETWEEN 2002-2003:8
Mean				
Constant	0.001 (0.063)	0.001 (0.012)	0.001 (0.096)	0.000 (0.906)
α_M	-0.002 (0.017)	-0.002 (0.001)	-0.002 (0.014)	-0.003 (0.066)
α_T	-0.002 (0.053)	-0.001 (0.071)	-0.001 (0.137)	-0.003 (0.070)
α_H	-0.001 (0.911)	0.000 (0.527)	0.001 (0.080)	0.002 (0.163)
α_Φ	0.001 (0.349)	0.000 (0.477)	0.000 (0.502)	0.000 (0.784)
Rt-1	0.118 (0.000)	0.095 (0.001)	0.040 (0.072)	-0.040 (0.444)
Rt-2	0.001 (0.992)	0.000 (0.980)	0.034 (0.119)	-0.056 (0.276)
Rt-3	0.026 (0.088)	0.021 (0.205)	0.023 (0.283)	-0.007 (0.892)
Rt-4	0.036 (0.010)	0.024 (0.129)	0.029 (0.153)	-0.082 (0.076)
Variance				
Constant	-0.801 (0.000)	0.000 (0.001)	0.000 (0.001)	0.000 (0.320)
VM	0.473 (0.001)	0.533 (0.001)	0.358 (0.042)	0.715 (0.085)
VT	-0.447 (0.001)	-0.626 (0.001)	-0.702 (0.042)	-0.170 (0.085)
VH	-0.141 (0.236)	-0.122 (0.402)	-0.203 (0.358)	0.109 (0.813)
VF	-0.321 (0.002)	-0.334 (0.002)	-0.501 (0.002)	-0.235 (0.508)
V1a	0.453 (0.000)	0.207 (0.000)	0.200 (0.000)	0.150 (0.049)
V1b	0.876 (0.000)	0.689 (0.000)	(0.671) (0.000)	0.474 (0.068)
D	1.372 (0.000)	1.438 (0.000)	1.369 (0.000)	1.247 (0.000)
Skewness	-0.16327	-0.064	-0.123	-0.120
Kurtosis	610754	4.339	4.686	5.002
Function Value	8.941.531	1.055.347	6.596.311	1.144.825
Sign Bias Test	0.224 (0.822)	-1.191 (0.233)	-0.475 (0.634)	-0.827 (0.408)
Negative Size Bias Test	0.295 (0.767)	-1.082 (0.279)	-0.841 (0.400)	-0.501 (0.617)
Positive Size Bias Test	-0.357 (0.721)	-1.026 (0.304)	-0.454 (0.649)	-0.663 (0.507)

Joint Test	0.116 (0.950)	0.750 (0.522)	0.326 (0.806)	0.269 (0.847)
Q-statistics				
Q(5)	10.626 (0.059)	8.161 (0.147)	7.468 (0.188)	4.589 (0.468)
Q(10)	17.780 (0.058)	18.279 (0.050)	18.301 (0.050)	7.399 (0.687)
Q(20)	26.247 (0.157)	28.419 (0.099)	31.754 (0.045)	16.343 (0.695)
Q(60)	66.154 (0.272)	64.468 (0.323)	64.312 (0.328)	63.830 (0.343)
ARCH-LM (5)	4.220 (0.518)	5.899 (0.316)	3.371 (0.643)	1.651 (0.895)
ARCH-LM (10)	7.097 (0.716)	98.454 (0.454)	10.088 (0.432)	11.326 (0.332)
ARCH-LM (20)	16.531 (0.683)	25.830 (0.171)	21.074 (0.392)	17.411 (0.626)
ARCH-LM (60)	50.581 (0.801)	87.754 (0.011)	67.851 (0.227)	51.342 (0.779)