3+1 ESSAYS ON THE TURKISH ECONOMY

A Ph.D. Dissertation

by
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September 2005

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3+1 ESSAYS ON THE TURKISH ECONOMY

The Institute of Economics and Social Sciences
of
Bilkent University

by

MUSTAFA ERAY YÜCEL

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

in

THE DEPARTMENT OF
ECONOMICS
BİLKENT UNIVERSITY
ANKARA

September 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 Doctor of Philosophy in Economics.

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ABSTRACT

3+1 ESSAYS ON THE TURKISH ECONOMY

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This dissertation comprise of four essays. The first essay studies the relationship between treasury auction maturity and auction interest rates. Using the Turkish auction data from 1988 to 2004, a reciprocal linkage between auction interest rates and maturities is observed, especially for the 1995-2000 period. This suggests that under an adverse shock, treasury decreases the auction maturity in order not to increase interest rates too much. A change in this reciprocal relationship is also reported for the post-2001 era. The second essay assesses the effect of USD-Euro parity on a small open economy for an economy where its exports are predominantly denominated in Euros and imports are denominated in USD. The empirical evidence suggests that a positive innovation in USD-Euro parity appreciates the local currency, decreases inflation and increases output. The third essay studies the

relationship between on-budget and off-budget expenditures in Turkey and concludes that information content of the budget deficit statistics is not empty; however, it might be misleading in assessing fiscal stance for Turkey. The final essay investigates the connection between Turkish industrial production performance and the success of a popular Turkish football team, namely Fenerbahce. The success of Fenerbahce is interpreted as a proxy for the workers' mood or morale. Performing a transfer function analysis on my monthly data set, I reveal a positive feedback from Fenerbahce's success, which proxies workers' mood/morale, to economic performance. Evidence of the effects of games against domestic rivals on industrial performance is not statistically significant.

Keywords: Confidence crisis, Debt management, Debt maturity and Yield curve, USD-Euro Parity, Output, Inflation, and Real Exchange Rate, Consolidated Budget, Public Sector Borrowing Requirement, Fiscal Stance, Vector Auto Regression. Mood, Morale and Productivity

ÖZET

TÜRKİYE EKONOMİSİ ÜSTÜNE 3+1 MAKALE

Yücel, Mustafa Eray

Doktora, İktisat Bölümü

Tez Yöneticisi: Doç. Dr. Hakan Berument

Eylül 2005

Bu tez dört makaleden oluşmaktadır. İlk makalede Hazine ihale vadeleri ile ihale faizleri arasındaki ilişki incelenmiştir. 1988'den 2004'e kadar Türkiye Hazine verileri kullanıldığında – özellikle 1995-2000 dönemi için – ihale faizleri ve vadeleri arasında ters yönlü bir ilişki gözlenmiştir. Bu bulgu Hazine'nin ihale vadelerini, faizleri fazla artırmayacak biçimde seçtiğine işaret etmektedir. 2001 sonrası dönem için ise söz konusu ters yönlü ilişkinin değiştiği rapor edilmektedir. İkinci makalede ABD doları-Avro paritesinin – ihracatı çoğunlukla Avro ve ithalatı çoğunlukla dolar cinsinden yapılan – bir küçük açık ekonomiye etkileri incelenmektedir. Ampirik bulgular, Dolar-Avro paritesindeki bir artışın ulusal para birimini değerlendirdiğini, enflasyonu düşürücü olduğunu ve çıktıyı artırdığını göstermiştir. Üçüncü makalede, bütçe dahilinde ve haricinde gelişen kamu harcamaları arasındaki ilişki

incelenmektedir. Çalışmanın ana bulgusu bütçe açığı istatistiklerinin enformasyon açısından değersiz olmadığıdır; ancak bu istatistikler Türkiye ekonomisi için maliye politikasının duruşunu ölçmekte kullanıldığında yanıltıcı neticeler doğurabilecektir. Son makalede, Türkiye'nin sanayi üretim performansı ile popüler bir futbol takımının – Fenerbahçe –başarısı arasındaki bağlantı ele alınmaktadır. Fenerbahçe'nin başarısı çalışanların ruh hallerinin veya morallerinin bir ölçüsü olarak yorumlanmaktadır. Gerçekleştirilen transfer fonksiyonu analizine göre, toplumsal moralin ölçüsü olan takımın uluslararası kupalardaki başarısı ile ekonomik performans arasında aynı yönlü ve anlamlı bir ilişki söz konusudur. Aynı ilişki takımın yurt içi başarıları için gözlenememiştir.

Anahtar Kelimeler: Güven bunalımı, Borç yönetimi, Borç vadesi, Verim eğrisi, Dolar-Avro paritesi, Çıktı, Enflasyon, Reel döviz kuru, Konsolide bütçe, Kamu kesimi borçlanma gereği, Mali duruş, Vektör Otoregresyon, Ruh hali, Maneviyat, Üretkenlik.

ACKNOWLEDGMENTS

Assoc. Prof. Dr. HAKAN BERUMENT, *for his support since 2002; for generously sharing many things with me not only about academics, but also about life…*// UĞUR ÇIPLAK, BURCU GÜRCİHAN, HAKAN TAŞÇI and CEM ÇEBI, *for their assistance in gathering part of my data sets…*// SIBEL KAZAK BERUMENT, REYHAN BILGIÇ, and PETER E. EARL *for their invaluable suggestions…*// ANITA AKKAŞ, *for linguistic review of the manuscripts…*// TAO ZHA, *for his generosity in providing his computer codes…*// EDITORS/ANONYMOUS REFEREES of the Fiscal Studies, Yapı Kredi Economic Review and the Journal of Economic Psychology, *for their constructive criticisms…*// Participants of the PAZAR11 DISCUSSION GROUP… *for their suggestions during the development stages of the essays…*// The EXAMINING COMMITTEE MEMBERS… *for devoting their precious time to review the essays…*// Assoc. Prof. Dr. SERDAR SAYAN…*for his encouragement and support…*

AYHAN YÜCEL, C. AYDAL YÜCEL and ŞEYMA BARUT… *for their everlasting support and trust…*// MURAT ÇELIKOĞLU and ŞÖHRET ÇELIKOĞLU…*for their encouragement since 2002…*

EMINE BIÇER, AYKUT ALTAY, ALI İHSAN KARBAN, SAVAŞ ÖZTÜRK, FARUK İÇKE, RIFAT KIRIK, ARIF YIĞIT, İSMAIL SELDERESI and AYŞE Abla... *for their warm friendship during my stay at the Bilkent Dormitory-75 during 1998-2002…*

MY COLLEAGUES AT THE CBRT... *for their friendship since 2003…*

BANU YÜKSEL, ALTAN ALDAN, ÇAĞRI SARIKAYA… *for their encouragement at desperate times…*

YELDA ÇELIKOĞLU… *I can never undo the negative reflections upon her of my study period… my best friend, loving wife, and lifelong ally... thanks God she was with me…*

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CHAPTER 1

INTRODUCTION: ANATOMY OF THE DISSERTATION

This dissertation is a collection of four essays, each of which is meant to deal with a specific question offered by the contemporary macroeconomic and/or social problems in Turkey. This chapter provides a cursory look at the dissertation essays and summarizes the main characteristics of each essay in attempt at providing the reader with a bird's eye view of the overall content.

Chapter 2 (Essay 1) is motivated by the observation that effective public debt management is one of the most important tasks for economic policy makers. It is especially important in countries that have debt rollover concerns due to financial stress and macroeconomic instability. In that sense, the Turkish economy provides a unique laboratory for studying the return-maturity relationship that could emerge under financial stress. Firstly, the Turkish debt was able to rollover throughout history but there was always a non-zero default risk. Secondly, the Turkish economy operated under chronic high and volatile inflation for more than three decades, which resembles the risk on real return. Merging these observations with the political instability of successive coalition governments, the "lack of confidence" in economic

policymakers can be easily comprehended. These observations underline the inherent financial stress and macroeconomic stability.

The first essay (Chapter 2), using the Turkish treasury auction data of the July 1988- December 2004 period, reveals a statistically significant negative relationship between treasury auction maturity and interest rates, indicating a negatively sloped yield curve, specifically for the pre-2001 sample. Based on this finding, I argue that the low credibility of policy-makers regarding inflation commitment that is associated with macroeconomic instability and the default risk shortens the maturities with higher interest rates due to the reluctance of creditors to extend funds for the long-term financing of public deficits. Changes in the slope of the estimated yield curve in the post-2001 sub-sample are also reported in Chapter 2. It is worth to note that the post-2001 period is characterized by lower deficits, lower default risk, successful stabilization to decrease inflation and higher political stability.

In the second essay (Chapter 3), I turn my attention to a recently highlighted development, namely the evolution of USD-Euro parity and its effects on Turkey, which is a small open economy (SOE). USD-Euro parity is one of the most widely followed variables in financial markets. Its sizable movements have often been elaborated on as regards their implications on developed economies. In Chapter 3, I assess the implications of USD-Euro parity (the US dollar value of the Euro) on an SOE under unbalanced trade denomination, where the exports are realized mainly in one currency and imports in another. In the essay, based on an illustrative model of the transmission of external parity movements to SOE dynamics, the effects of USD-Euro parity are analyzed using Turkish data. The relative movements of these major currencies are plausible to affect the major macroeconomic variables in Turkey. These effects may occur through the channels of the real exchange rate and/or the

terms of trade. In fact, neither overlaps the other in a one-to-one fashion nor are they isolated from each other. In either of these channels, net exports will respond to USD-Euro parity as a result of the change in the relative prices of tradables. In my illustrative model, USD-Euro parity enters the system by affecting net exports and domestic absorption.

The relevance of the relationship between USD-Euro parity and the real exchange rate is two-fold in the case of Turkey. Firstly, Turkey as an SOE cannot affect USD-Euro parity, but the reverse is true. Therefore, my investigation focuses only on the effects of exogenous USD-Euro parity shocks on domestic macroeconomic performance, rather than looking in the opposite direction. Secondly, the currency composition of Turkey's trade is not balanced. Moreover, Turkey is a net exporter of tourism services and receives revenue from tourism, mostly originating from Europe. This further enhances the effects of USD-Euro parity on the domestic economy. Hence, a change in USD-Euro parity is expected to have sizable effects on Turkish economic performance.

In order to account for the exogeneity of USD-Euro parity, I assess the relationship within the VAR framework with block exogeneity. In particular, I allow USD-Euro parity to affect the Turkish economic performance, but not vice versa. The empirical evidence provided in Chapter 3 suggests that an increase in the USD value of the Euro appreciates the real exchange rate, decreases inflation and increases output. The analysis and findings of Chapter 3 are important: The case of Turkey with regard to changes in USD-Euro parity establishes a benchmark example for similar *emerging market economies* by demonstrating the extent of the exposure of a small-open economy to the relative movements of two big currencies.

Chapter 4 (Essay 3) assesses the relationship between on-budget and off-budget public expenditures. This relationship is especially interesting for economies like Turkey, in which the ratio of the consolidated budget to the public sector borrowing requirement (PSBR) changes from year to year and does not exhibit a stable pattern. The analysis of Chapter 4 reveals that the information content of the consolidated budget deficit statistics is not empty. My major result is that the PSBR increases in response to a positive innovation to the consolidated budget deficit. In other words, even when the policy-makers induce an expansion of the consolidated budget, it is still possible for the off-budget items to increase. One another important point that needs to be highlighted is that a decrease in PSBR deficit is actually associated with an increase in budget deficit. This might be due to increased efforts in the past to limit off-consolidated budget deficit, so that total (PSBR) deficit decreases, but I put partly these decreased items to the consolidated budget. This suggests that even if a tight fiscal policy is adopted, the consolidated budget deficit might indicate loose fiscal policy. Thus, it is worth to mention that the information provided by the consolidated budget deficit might be misleading for judging about the stance of the fiscal policy in Turkey.

The significance of Chapter 4 is two-folds. First, I provide evidence regarding the low reliability of the consolidated budget deficit statistics in evaluating the stance of fiscal policy in Turkey. Then, I extend the previous work by performing the analysis under asymmetric movements of the consolidated government budget, hence accounting for the functional relationship between on-budget and off-budget activities.

The last essay (Chapter 5) examines the connection between Turkish industrial production performance and the success of a popular Turkish football

team, namely Fenerbahce. The success of Fenerbahce is interpreted as a proxy for the workers' mood/morale. Performing a transfer function analysis on my data set, I reveal a positive feedback from Fenerbahce's success to economic performance such that the monthly industrial growth rate increases with the number of games won by Fenerbahce in foreign cups, regardless of where the game is played. On the other hand, the evidence of the effects of Fenerbahce's domestic games on industrial performance is not statistically significant. Based on my findings, it can be argued that there is a psychological/social link between the success of a top rank Turkish team and the performance of workers in industry.

The main claim of Chapter 5 is that when people's favorite team is successful then they get in a better mood and become more productive. Since we do not have a direct measure of "mood", I employ the success of a popular football team as an indicator of people's "mood". I also provide an array of possible theoretical explanations for my hypothesis and propose a transmission mechanism that defines the process that links football success to workers' productivity. More specifically, Fenerbahce's success is expected to affect the industrial production growth positively and in a statistically significant manner. The validity of this hypothesis is tested under different setups to check for the robustness of my statistical assessment.

I should admit that my choice of Fenerbahce as the object of analysis does not represent any subjective preferences. This choice is basically motivated by the general perception of the team by the Turkish society often uses the phrase "Fenerbahce Republic". That is, the team is a stylized example/symbol of a long-lived sports institution and supporters' strong loyalty to it. The proposed mechanism linking the social mood and productivity is as follows: The process is triggered by some temporary innovations to social cohesion among the supporters of a team.

Football success, in this regard, is an innovation that boosts the morale and self-esteem of the fans of a team. This will elevate the individuals' morale and self-esteem. In this way, there will be a positive affect, then this higher self-esteem will lead to higher production due to better social behavior and more efficient decision making.

CHAPTER 2

RETURN AND MATURITY RELATIONSHIPS FOR TREASURY AUCTIONS: EVIDENCE FROM TURKEY

2.1. Introduction

Effective public debt management is one of the most important tasks for economic policy makers. This is especially important in countries that have debt rollover concerns due to financial stress and macroeconomic instability. This essay investigates the treasury auction maturity-yield relationship for Turkey and reveals a negative relationship between the auction maturity and interest rates —a downward sloping yield curve.

The perception of risk determines the way the risk is priced. Calvo and Guidotti (1990a,b) and Missale and Blanchard (1994) state that a government's opportunity to increase inflation is a channel through which perceivable risk emerges on creditors' returns, i.e. governments can induce higher inflation in the medium-to-long term in order to decrease the real value of its debt repayments, which causes a decrease in *ex post* real returns. Alesina, Prati and Tabellini (1990) consider the possibility of default as another channel.

Regarding the effect of maturity on sustainability, it is emphasized in the literature that short-maturity debt must be refinanced often, which increases financial stress (Giavazzi and Pagano, 1990; Alesina et al., 1990; Missale and Blanchard, 1994). Among these, Alesina et al. (1990) theoretically assess the management of debt when the government faces the possibility of a confidence crisis. They assert that optimal debt management requires issuing long maturity debt, which is evenly concentrated at all future dates, and even at relatively higher interest rates; rather than concentrating on short-term only.[1]

Calvo and Guidotti (1992) analyze the role of debt maturity in a framework of tax smoothing and time inconsistency of optimal policy[2]. Their model also suggests that a negative linkage between the maturity of a debt and the associated real return does exist. Drudi and Giordano (2000) study the default risk in a similar manner and show that long-term debt may not be operational when real rates are very high.[3]

This essay, using the Turkish treasury auction data of the July 1988-December 2004 period, reveals a statistically significant negative relationship between treasury auction maturity and interest rates, indicating a negatively sloped yield curve, specifically for the pre-2001 sample. Based on this finding, I argue that the low credibility of policy-makers regarding inflation commitment that is

[1] In a later article, Alesina, Broek, Prati and Tabellini (1992) investigate the default risk for indebted OECD countries and assert that the likelihood of default is low as long as the existing debt is rolled-over at reasonable interest rates. There is a positive association between the likelihood of a confidence crisis and the level of debt, where the default premium is positively associated with the size of the debt and negatively associated with average maturity.

[2] In Calvo and Guidotti (1992) optimality is achieved with perfect tax smoothing at zero inflation in the case of the government's full pre-commitment to its inflation and default policies. However, in the absence of the government's pre-commitment to its inflation and debt repudiation policies, a negative linkage between the average maturity and the level of debt is achieved as a second-best solution.

[3] Alesina et al. (1990) and Alesina et al. (1992) imply the conclusion of Calvo and Guidotti (1992) and Drudi and Giordano (2000) under different assumptions; the first two studies treat maturity as exogenous but the latter two treat it as endogenous.

associated with macroeconomic instability and the default risk shortens the maturities with higher interest rates due to the reluctance of creditors to extend funds for the long-term financing of public deficits. Changes in the slope of the estimated yield curve in the post-2001 sub-sample are also reported in the essay. It is worth noting that the post-2001 period is characterized by lower deficits, lower default risk, successful stabilization to decrease inflation and higher political stability.

The Turkish economy provides a unique laboratory for studying the return-maturity relationship that could emerge under financial stress. Firstly, the Turkish debt was able to rollover throughout history but there was always a non-zero default risk, as in Alesina et al. (1992). Secondly, the Turkish economy operated under chronic high and volatile inflation for more than three decades, which resembles the risk on real return as put forth by Calvo and Guidotti (1990a,b) and Missale and Blanchard (1994). Merging these observations with the political instability of successive coalition governments, the "lack of confidence" in economic policymakers can be easily comprehended.[4] These observations underline the inherent financial stress and macroeconomic stability.

Section 2 summarizes a framework upon which I develop my empirical analysis. Section 3 presents my modeling approach and the estimates. Section 4 discusses the findings and concludes the essay.

2.2. Theoretical Framework

The negative association between maturity and return can be deduced for a utility maximizing agent with tax distortions where the government can issue both short- and long-term bonds and with a non-zero default risk. One may consider a

[4] Ertugrul and Selcuk (2001) gives a recent history of the Turkish economy.

version of Alesina et al (1990) model, in which a representative individual maximizes her lifetime utility and the government minimizes its loss function.[5]

The individual derives non-negative utility from her consumption in each period through a regular concave utility function. In every period, she is endowed with one unit of non-storable output and pays a distortionary tax to government, where the size of the distortion is convex in the tax rate. She has access to perfect international capital markets in which she can borrow and lend at a risk-free interest rate equal to her discount factor.

There exist short- and long-term debt instruments. Government can repudiate some fraction of its obligations in each period. This fraction is called the default parameter and assumed to be invariant between the short- and long-term debts. The government finances the non-repudiated part of its obligations by means of newly levied taxes and/or newly issued debt. Its loss function includes the financing cost of the existing debt and the cost of tax distortions.

The government does not have any incentive to repudiate if the cost of repudiation is larger than the tax distortions needed for servicing the debt. However, this picture gets complicated when there is a non-zero repudiation risk. In order to illustrate this, suppose that the private expectations about the future fraction of repudiated debt do not depend on the history of the game, and that people expect full repudiation at some future date. Under such circumstances, the government will choose to repay only if the cost of repudiation exceeds the total discounted cost of future tax distortions. The discounted sum of tax distortions is larger in the case of a confidence crisis compared to a no-crisis scenario. Hence, if the government's cost of repudiation lies between these two figures, then there exists an equilibrium in

[5] A detailed presentation of this model is available in the Appendix 1. One could also use a version of Calvo and Guidotti's (1992) model to show the negative relationship between maturity and (real) interest rate. This version of the formal model is also given in the Appendix 1.

which a confidence crisis may occur in the current period or earlier. Eventually, the discounted sum of tax distortions, which is the government's threshold to pay or not to pay its existing obligations, depends on the maturity structure of public debt.

The basic lesson of the Alesina et al (1990) model is that equilibrium with a confidence crisis is less likely to occur if (1) only long-term debt is issued and (2) the same amount of debt matures in each period. One may further elaborate their model to show that the maturity of debt negatively affects the yield of bonds. That is, if the maturity shortens, the cost of tax distortions becomes higher, thus the fraction of the repudiated debt increases. This increase, using the no arbitrage condition, causes the bond price to decrease, which is equivalent to an increase in the real return on the bond. In a nutshell, Alesina et al (1990) suggests that the maturity of the debt negatively affects the yield of bonds [A].

The default risk premium is also taken into consideration by Alesina et al (1990). If the expected fraction of repudiated debt is non-zero in every period with a known probability, the government has to pay a risk premium on its liability to compensate for the default risk, until a confidence crisis occurs. Lengthening and balancing the maturity structure of government debt can reduce this premium [B].

Both [A] and [B] imply a drop in the real yield of bonds as maturity lengthens, and this is empirically assessed in the next section employing the Turkish data.

2.3. Empirical Analysis

Based on Section 2.2, a negative relationship between the return and maturity of public debt is tested empirically in this section of the essay. The evidence reveals a statistically significant and negative relationship between return and maturity, as

presented in subsections 2.3.4 and 2.3.5. However, before proceeding with my estimates, I introduce my estimation strategy in subsections 2.3.1, 2.3.2 and 2.3.3 in the order to (i) distinguish the properties of the auction and monthly data sets that I employ as well as the variable definitions, (ii) divide of the whole sample range into sub-samples, (iii) estimate the technique and the form of the specification.

2.3.1. Data Sets and Variables

My empirical analysis is based on two types of data covering the period from July 1988 to December 2004[6]. The first set, *auction data*, is based on the observations for each auction and compiled from the Central Bank of the Republic of Turkey and the State Planning Organization.[7] The basic variables in this data set are the nominal interest rate on each auction quoted monthly[8] ($R^{auction}$), and the maturity of each auction ($M^{auction}$) measured in years[9]. The real return on each auction is computed by deflating the nominal rates by the seasonally adjusted rate of the WPI (Wholesale Price Index, 1987=100) inflation (π), the rate of local currency depreciation (ρ), and the monthly quoted interbank interest rate (i) corresponding

[6] Auction data is available after 1985; however, the availability of the deflating variables that are used in my estimations restricts the start date of the usable data set to July-1988. Specifically, the interbank market has been operational only after this date. I end the data set in December 2004, but especially focus on the data prior to June 2001, which corresponds to the date of a high volume swap of treasury bonds with the public institutions and the public sector banks. This swap was aimed at handling the operational losses of various banks that were taken over by the Savings Deposits Insurance Fund (SDIF) following the February 2001 financial crisis. Afterwards, the denomination of the debt changed and the maturity was lengthened. Since the default, exchange rate and inflation risk compositions of the government debt changed considerably after that, the main focus of the study is on the before-2001 episode.

[7] In this essay, I only include the treasury auctions in Turkish lira denominated bills and bonds and exclude foreign exchange denominated and inflation indexed bills and bonds. The reason for this exclusion is that neither foreign exchange denominated nor inflation indexed assets were traded in secondary markets regularly (thus these bills and bonds had high liquidity premiums) and the Treasury was often reluctant to issue these bills and bonds due to their exchange rate or inflation risks for a significant portion of my sample span.

[8] The monthly equivalent of the auction (simple) interest rates is computed by dividing the per annum figures by 12. The official convention for reporting auction interest rates is to report the simple, rather than compound, figures. I follow the same convention in this study as well.

[9] Following Grabbe (1996), I took one year as 360 calendar days.

to the month in which the auctions are held. The rationale for using these three deflators originates from the fact that inflation and currency depreciation affect the intertemporal allocation of resources for domestic agents and the real return on domestic bonds for foreign investors. Similarly, the interbank interest rate is taken as a benchmark by domestic investors when they bid for treasury auctions. The rate of depreciation is computed as the percentage change of the Turkish lira value of a currency basket that is composed of 1 US dollar and 0.77 euro (prior to the circulation of euro, 1 US dollar and 1.5 Deutsche mark), which is the official exchange rate basket that the Central Bank of the Republic of Turkey follows for its operations.

The deflated (real) auction interest rates that are used in this essay are as follows. The real interest rate, $r^{\pi}_{Auction}$, is defined as $(R^{auction} - \pi)/(1+\pi)$. $r^{\pi_{-1}}_{Auction}$ is defined as $(R^{auction} - \pi_{-1})/(1+\pi_{-1})$ where π_{-1} is the previous month's rate of inflation, and it is used as an instrumental variable. When ρ and i, instead of π, are used to obtain the real interest rate measures[10], the resulting real interest rates are denoted as $r^{\rho}_{Auction}$ and $r^{i}_{Auction}$, respectively. I have also defined $r^{\rho_{-1}}_{Auction}$ and $r^{i_{-1}}_{Auction}$ for $r^{\pi_{-1}}_{Auction}$, where the first two are the notational convention for the last one, but the depreciation and interbank rate were used rather than inflation.

[10] The reader will realize that my choice of deflators, while obtaining the real interest rate measures, stems from three important economic constructs, such that the choices of seasonally adjusted rate of WPI inflation, the rate of currency depreciation and the interbank overnight interest rate are linked with the *Fisher Equation*, *Uncovered Interest Parity* condition and a more general *Financing condition*, respectively. The Fisher Equation relates nominal interest rates to the inflation rate. In its strong form, there is a one-to-one relationship between these rates -- thus the real interest rate is constant. Then uncovered interest rate parity condition suggests that the interest rate difference between domestic and foreign countries is a function of depreciation. One may assume that the domestic interest rate is determined by depreciation if the domestic interest rates are considerably higher and more volatile than foreign interest rates. Lastly, the financing condition dictates the long-term rates as a function of short terms due to the Expectation Theory of the Term Structure of Interest Rates.

The auction data set does not have a regular periodicity; therefore, inferences from the *auction data* might be subject to criticisms such as, (1) the auction-based data set that we employ is not adequately balanced (e.g. there are some months with no treasury auctions), (2) the frequency of auctions in different months is not necessarily the same[11], and (3) the volume of borrowing is not the same for every single auction. In order to handle these potential criticisms, we estimate the interest rate-maturity relationship by using *monthly data*. The nominal interest rate quoted monthly and the monthly average maturity are denoted by R_t and M_t, respectively. Explicitly, R_t is the monthly interest rate on treasury auctions, calculated for each month as a weighted average of the interest rates of the treasury auctions held in that particular month, where the weights are chosen as the volume of borrowing in each auction. Similarly, the maturity figures are obtained as averages from the original auction data. For the other variables, such as the rate of seasonally adjusted WPI inflation and the rate of currency depreciation, the usual conventions are followed. The interbank interest rate figures are taken from the Central Bank of the Republic of Turkey, quoted annually. In addition, π_t, ρ_t and i_t are the monthly counterparts of π, ρ and i of the auction data set. Then, my real return measures in the monthly data set are r_t^{π}, r_t^{ρ}, and r_t^{i}, standing for the monthly nominal interest rate deflated by the monthly rate of inflation, the monthly rate of currency depreciation, and the monthly quoted interbank interest rate respectively. In the case of r_t^{π}, the formula $(R_t - \pi_t)/(1+\pi_t)$ is used to deflate the nominal interest rate. For r_t^{ρ} and r_t^{i}, the

[11] Owing to this imbalance, rate of inflation, rate of currency depreciation and interbank interest rates may be overemphasized for months with more treasury auctions and simply be ignored for the months with no treasury auctions.

depreciation rate and the interbank interest rate are employed as deflators, instead of the monthly inflation rate. M_t is the maturity measured in years.

2.3.2. Choice of Sample Periods and Descriptive Statistics of Data

The whole sample of my analysis covers the period from July 1988 to December 2004. However, the Turkish economy experienced two severe financial crises within this period, which may alter the quality of empirical analysis. This makes us regenerate my estimates for some sub-samples to ensure stability. Indeed, I have performed the Chow breakpoint tests in order to assess the robustness of my specifications between these crises. These tests gave support to the segmentation of the sample span as presented in this sub-section.

The first big crisis in recent Turkish economic history, namely the 1994 crisis, started in January 1994 and led to the announcement of a new stabilization program in April 1994, and its devastating effects did not disappear until 1995. The second crisis, which was even more devastating, occurred in February 2001. However, the vulnerability of the Turkish economy had increased considerably before that, namely in November 2000 after the financial collapse of a medium-sized commercial bank.[12] In May 2001, the 2001 macroeconomic stabilization program, which was also supported by the International Monetary Fund (IMF), was introduced.

Given the availability of data and the crises experience of the Turkish economy, I have designated my sub-samples as [1] July 1988-May 2001, [2] January 1995- October 2000 and [3] June 2001-December 2004. The episode from July 1988

[12] The management of that bank was taken over by the Savings Deposits Insurance Fund (SDIF). Although there had been other takeovers before November 2000, they did not create a severe impact.

to May 2001 runs from the beginning of my data to the start of the 2001 macroeconomic stabilization program. However, it includes both the 1994 and the 2001 financial crises; therefore, it is likely that the estimated econometric relationship is subject to change within the episode. The January 1995-October 2000 period allows us to avoid the effects of above-mentioned crises on my estimates. The third sub-sample covers the part of the data set after June 2001. Thus, it includes no crisis effects and reflects the developments in the last three years, which helped reduce financial stress and enhance macroeconomic stability (CBRT, 2004, 2005).

In sum, the first sub-sample corresponds to a period dominated by financial stress and crises; the second sub-sample can be marked as a between-crises period that is still subject to high financial stress; and the last sub-sample is characterized by successful stabilization efforts.

Table 2-1 (auction data) and Table 2-2 (monthly data) report the descriptive statistics of the data for the whole- and sub-sample periods. Sample means and the standard deviations suggest that the level and variability of the interest rates (the auction as well as its deflated measures) have almost always been high for my samples, especially for the whole sample and sub-sample [1].

Among descriptive statistics, Jarque-Bera test statistics might deserve special attention. Table 2-1 and Table 2-2 suggest that majority of the variables display normal distributions in sub-sample [2] and sub-sample [3], but not in the whole sample or in sub-sample [1]. Indeed, excess kurtosis (i.e. kurtosis above a value of 3) is observed for most of my series in the whole sample and in sub-sample [1]. For these sample ranges, I can hardly talk about the normality of my data. However, in sub-samples [2] and [3], the data set displays normality with only minor exceptions.

Non-normality of some of the variables is also reported in earlier empirical evidence on Turkey. For example, Berument and Gunay (2003) reports the ARCH effect[13] in exchange rate; and Berument and Malatyali (2001) reports the ARCH effect in inflation. Aydin (2004) studies the variants of ARCH models on interest rates and suggests the existence of significant ARCH effects. Since I employ these variables in my study, ARCH effects are expected in my deflated measures of the real return, simply ruling out the normality of series. However, the incorporation of ARCH effects into my investigation of the yield curve is left for further studies.

The levels of the data series and their differences are plotted in Figure 2-1&Figure 2-2 and Figure 2-3&Figure 2-4 respectively. Figure 2-1 and Figure 2-2 clearly reflect the trends in data series and display the effects of the financial crises on my variables. It can be noted that none of the series demonstrate an explosive behavior. Figure 2-3 and Figure 2-4, along with Figure 2-1 and Figure 2-2 also demonstrate the time changing variability of the series.

2.3.3. Estimation Technique and Form of Estimating Equation

A problem of simultaneity is inherent in the data due to the very nature of the treasury-auction process, which determines the maturities and interest rates simultaneously. Under these circumstances, the *Ordinary Least Squares* estimates will be biased. The *Instrumental Variable (or Two-Stage Regression)* (IV) technique was used to account for this problem in obtaining my parameter estimates.

The first Equation form that I investigate is given in (Eq. 2-1):

(Eq. 2-1) $Real\ Return = \alpha_0 + \alpha_1 Maturity + \varepsilon$

[13] ARCH stands for AutoRegressive Conditional Heteroskedasticity and measures the volatility and risks in terms of the dynamics of the conditional variance of returns over time. Failing to reject the existence of ARCH effects within a series is an indication of heteroskedasticity in that series.

where the *Real Return*, $[(Nominal\ Return - X)/(1+X)]$, is obtained as described in subsection 2.3.1 and *Maturity* is measured in years. X is a deflating variable, such as the rate of inflation, the depreciation rate of the local currency or the interbank interest rate. This form simply helps us to obtain the relationship between real interest rates and maturity.

On the other hand, it is probable that deflating variables, such as rate of inflation, rate of currency depreciation and interbank interest rate, do not affect the real returns in a one-to-one manner, i.e. as in the numerator of the *Real Return* expression in (Eq. 2-1). Therefore, I have also employed a second Equation form, in which the deflating variables might have coefficients other than unity. This relaxation is expressed by means of (Eq. 2-2):

(Eq. 2-2) $Nominal\ Return = \alpha_0 + \alpha_1 Maturity + \alpha_2 X + \varepsilon$

where *Nominal Return* is the nominal interest rate. (Eq. 2-1) and (Eq. 2-2) are the generic Equations that assess the basis for my analysis in the following subsections, where the latter is motivated by Tobin (1965). This suggests that nominal interest rates increase less than the amount by which inflation increases, under the assumption that money and capital are the only forms of wealth and the economy has decreasing returns to scale production function. Under these circumstances, if the opportunity cost of holding money increases due to higher inflation, then money holdings decrease and capital stock increases. The assumption of decreasing returns to scale causes the interest rate to increase less than inflation; therefore, α_2 becomes less than unity. Regarding how α_2 can be less than unity in the case of X being the interbank interest rate; one might see Cook and Hahn (1989) and Berument and Froyen (2005) for empirical support. Finally, in the case of the local currency

depreciation, the deflating effect of depreciation can be disproportionate due to the dynamic effects of risk premia (see CBRT, 2003).

While estimating (Eq. 2-1) and (Eq. 2-2) for different sub-samples, the reliability of the estimates is a key consideration. Although the IV technique grants that the estimated coefficients are unbiased, the significance of the estimates may be mismeasured if I do not use robust standard errors. In order to avoid such a shortfall, I have employed the Newey-West procedure for non-spherical robust disturbances.

In the next subsection, I present my analysis based on auction data and (Eq. 2-1). Then my results on monthly data under (Eq. 2-1) and (Eq. 2-2) are presented.

2.3.4. Estimates Based on Auction Data

Estimated coefficients based on the auction data for the return-maturity relationship are reported in Table 2-3. In the first column, my dependent variable is $r^{\pi}_{Auction}$, which is regressed on constant term and bond maturity. The instrumental variables are the constant term, the first three lags of $r^{\pi_{-1}}_{Auction}$ and the lag of $M^{auction}$. In the second and the third columns, $r^{\rho}_{Auction}$ and $r^{i}_{Auction}$ are used as the left hand side variables. When the nominal interest rates are deflated with the depreciation rate and the interbank rate, the instrument sets are modified accordingly. That is, $r^{\rho_{-1}}_{Auction}$ and $r^{i_{-1}}_{Auction}$ are used as instruments when $r^{\rho}_{Auction}$ and $r^{i}_{Auction}$ are used as the dependent variables.

Table 2-3 suggests – for the whole sample – that there is a statistically significant[14] and negative relationship between real interest rates on auctions and the

[14] The level of significance is 5% throughout the chapter, unless otherwise mentioned.

maturities of newly issued debt, as I hypothesized before. Moreover, the largest coefficient in absolute value is observed when the interest rate is deflated with the depreciation rate. The same observation is valid for sub-sample [1], namely for July 1988-May 2001 auctions. When the focus is shifted to the between-crises episode (sub-sample[2]), maturity remains statistically significant with a negative sign. Furthermore, it possesses the largest absolute coefficient when the nominal interest rate is deflated by the rate of inflation.

The post-2001 sub-sample displays a different overall picture of the yield curve. When the nominal interest rate is deflated by inflation rate or rate of currency depreciation, the slope of the estimated yield curve turns out to be positive; whereas, these estimates of the slope are not statistically significant at the 10% level. This is possibly due to the change in the exchange rate regime. Although the exchange rate was a useful indicator of expected inflation before the 2001 financial crisis, it is not so after February 2001, when the exchange rate was allowed to float freely.

It is worth noting that the slope of the yield curve remains negative and statistically significant for the post-2001 sub-sample, when I compute the real auction return in excess of the interbank interest rate. This possibly reflects the change in people's perception of the economic dynamics after May 2001.

The above-mentioned change from pre-2001 to post-2001 episode is worth further elaboration. In the absence of a confidence crisis, an upward-sloping yield curve is associated with the expectations of 'increasing inflation'; i.e. investors require higher nominal returns if they believe that the future course of inflation will trend upwards. However, the presence of a confidence crisis (e.g. low confidence) reverses this picture, as elaborated in Section 2. That is, there is no period before 2001 during which inflation continuously falls, and this should normally imply an

upward-sloping yield curve. However, the risk profile of the Turkish TL-denominated domestic debt causes the slope to be downwards, rather than upwards, in the pre-2001 episode.

In the post-2001 episode, both the actual consumer price inflation and inflation expectations have been steadily falling. This is clearly a textbook case of a downward-sloping yield curve. My empirical estimates, however, reveal the opposite, probably indicating the continuation of the high-risk profile of the Treasury.

2.3.5. Estimates Based on Monthly Data

My auction-based estimates depict a negative linkage between the interest rate of government auctions and auction maturity, confirming my theoretical finding in Section 2 for the pre-2001. Thus, this sub-section provides evidence from the *monthly data*. Due to the lack of treasury auctions in December 1999 and December 2000, there are two missing values in the maturity series. The State Planning Organization provided observations for those months by substituting information on the Treasury's sale of bonds to public institutions. This anomaly of data is handled by defining intercept dummy variables for each of the two months. These dummy variables are included in both the functional specification and the set of instrumental variables, so as to control for the effect of missing observations.

In my first series of regressions, I use r_t^{π}, r_t^{ρ}, and r_t^{i} as the left-hand-side variables. The set of regressors include the constant term, maturity M_t, and the dummy variables for December 1999 (*D9912*) and December 2000 (*D0012*). I use the constant term, two dummy variables (*D9912 and D0012*) and one to four lags of the i_t, π_t, and ρ_t as my instrumental variables. The estimates in Table 2-4 suggest

– for the whole sample – a negative relationship between real bond return and maturity, supporting my previous findings in the auction-based regressions. When the nominal interest rate is deflated with the inflation rate, the slope estimate of the yield curve is significant at 1% and when it is deflated by the interbank interest rate, the significance is at the 10% level. Although the yield curve has a negative slope for r_t^{ρ}, this estimate is insignificant. Table 2-4 further replicates these estimations for my three sub-samples. In sub-sample [1], I observe a significantly negative slope estimate in the first column only. The real interest rate, computed using the depreciation rate and the interbank interest rate, does not have a statistically significant association with maturity in sub-sample [1].

Estimates for sub-sample [2] suggest a negatively sloped yield curve, regardless of the deflating variable. All these estimates are statistically significant at the 1% level. One may realize the disappearance of the insignificance after excluding the crises from the sample. This is mainly due to the fact that during the crisis episodes, the series under consideration display erratic behavior and act as outliers.

The last column of Table 2-4 closely mimics those of Table 2-3; e.g. the estimated yield curves attain positive but insignificant slopes when inflation and depreciation rates are used as deflators in sub-sample [3]. The case of the interbank interest rate still suggests a negatively sloped yield curve after May 2001.

One may be skeptical of the regressions presented in Table 2-4 since I impose a coefficient of unity on the deflating variable in each of the regressions. Following Tobin (1965), Cook and Hahn (1989) and inflation risk premium arguments that a change in the deflating variables may not be reflected in the nominal interest rate on a one-to-one basis[15], I estimate another set of regressions in which the monthly

[15] See Berument and Malatyali (2001) for elaboration on this for Turkey.

nominal interest rate (R_t) is regressed on the constant term, M_t , *D9912*, *D0012*, and either π_t , ρ_t , or i_t , and where the set of instrumental variables includes the constant term, dummy variables *D9912* and *D0012*, one to three lags of i_t , π_t , ρ_t . My IV estimates of these specifications are reported in Table 2-5, which suggests the previously observed negative relationship between interest rates and maturity variables with tighter levels of significance.[16] However, there are some changes in the pattern of slope estimates across sub-samples and across deflating variables. For instance, the whole sample suggests significantly negative estimates in all three specifications. In contrast to what I have observed in Table 2-4, in Table 2-5 these significant and negative estimates are maintained in sub-sample [1]. Moreover, sub-sample [2] and [3] also suggested negatively sloped yield curves for all specifications except for the third in sub-sample [2]. In sum, the overall picture suggests a negatively sloping yield curve.

Due to the persistence of the variables of concern, there might exist a problem of serial correlation in my estimates. One may realize that the lagged values of the dependent variable have not been included in either Table 2-4 or Table 2-5. This kind of specification may raise suspicion about the robustness of the results. For instance, if real interest rates and maturity are both serially correlated variables, estimating an Equation without a lagged dependent variable, or without correction for serial correlation, may make the maturity variable statistically significant only because it is a proxy for the lagged dependent variable or the serial correlation correction.[17] Consequently, I have regenerated my specifications in Table 2-4 and Table 2-5 by adding three lagged values of dependent and deflating variables as

[16] The same estimation could not be performed for the specifications in the previous subsection due to the structure of the auction data set.
[17] Hamilton (1994, pp.557-62) can be seen for a discussion of these issues.

regressors.[18] Table 2-6 and Table 2-7, are the counterparts of Table 2-4 and Table 2-5, respectively.[19]

The estimates of Table 2-6 suggest the same negative relationship between maturity and real interest rates. However, the level of statistical significance has dropped considerably. For the whole sample, maturity has negative coefficients in all cases, but they are not statistically significant. In sub-sample [1], the coefficient of maturity is negative and significant only for r_t^{π}. For r_t^{ρ} and r_t^{i} it is negative as well, yet not statistically significant. Sub-sample [2] suggests a similar pattern of estimates, although the slope of the yield curve is smaller in magnitude. In the last sub-sample, namely June 2001-December 2004 episode, for r_t^{π} and r_t^{ρ} the coefficient of maturity turns positive, but these positive estimates are not statistically significant. For r_t^{i}, the maturity variable has a negative and significant coefficient estimate, implying a negatively sloped yield curve.

Similar to the relationship between Table 2-6 and Table 2-4, Table 2-7 verifies the findings of Table 2-5. Indeed, inclusion of the lagged dependent variable as a regressor remedied the residuals' autocorrelation problem in practically all the specifications and sub-samples, without altering the key findings.[20] Although the aforementioned non-normality of data in the whole sample and in sub-sample [1] affected the normality of the residuals in the estimations for these sample episodes, it did not change the quality of my findings.[21]

[18] The choice of three lags is due to the frequency of the financial statements prepared for the majority of financial institutions in Turkey. The basic results were robust for a set of alternative lag structures.
[19] I have also performed the Ljung-Box (1978) tests (up to 6 lags) and could reject the null hypothesis of no autocorrelation for all specifications reported in Table 2-4 and Table 2-5 (not reported).
[20] Based on the Ljung-Box (1978) tests.
[21] Based on Jarque-Bera (1987) tests.

As mentioned previously, I have also assessed the robustness of my specifications to the existence of the financial crises in my sample span. The Chow test statistics, which are presented in Table 2-8, provide support for my segmentation of the whole sample into sub-samples.

All in all, the negative linkage between interest rates and maturity that I have revealed using auction data, presented in Table 2-3, remained intact despite changes in the data structure, i.e. using monthly data instead of auction data, and despite different specifications, i.e. specifications that include, versus those that do not include, the lagged values of the dependent variable as a right-hand-side variable. However, the signs and significance levels of my parameter estimates do differ in the pre-2001 and post-2001 samples.

The findings for the pre-2001 sub-samples are in line with my elaboration and interpretation of Alesina et al (1990), the model that is presented in Section 2, as well as Giavazzi and Pagano (1990), Alesina et al. (1992), Calvo and Guidotti (1992) and Missale and Blanchard (1994).

2.4. Discussion and Concluding Remarks

2.4.1. Discussion

In sub-section 3.4, the auction-based estimates suggested that the slope of the yield curve is negative for Turkish treasury auctions, which is repeatedly revealed in the whole sample, in the July 1988-May 2001 and in the January 1995-October 2000 samples. However, I observe a change in this pattern after June 2001, when the maturity variable attains a significantly negative coefficient estimate only when the nominal interest rate on auctions is deflated by the interbank interest rate to obtain

the real interest rate. Maturity does not have a significant coefficient in the other regressions. At this point, it is important to summarize to what extent my empirical findings remain intact and where they display a pattern change.

First of all, the findings on auction data are further supported by my monthly estimates in sub-section 2.3.5, regardless of the relationship estimated for nominal or real measures of return. That is, whether I estimate (Eq. 2-1) or (Eq. 2-2) of subsection 2.3.3, I have revealed the same evidence as I had on auction data.

Secondly, the between-crises sub-sample is the most stable episode in terms of the durability of empirical findings. This situation augments my views on the low public confidence in the governments' debt management policies in Turkey for the 1995-2000 period.

Thirdly, the post-2001 May sample yields a radical pattern change. In most cases, in the post-2001 episode I observe that the real auction return computed by using the interbank interest rate is still negatively associated with maturity of debt. However, the sign of the coefficient of maturity turns positive in other cases, along with lower statistical significance. That is, the people's perception with regard to the rate of inflation and the depreciation of the Turkish lira must have changed after May 2001. In the light of recent Turkish policy making experience, this might be intuitive. Indeed, the policy view of the Central Bank of Turkey toward reducing inflation was formulated and has been implemented in terms of the "implicit inflation targeting" framework and the Bank was set to an "independent" position starting in April-May 2001. After this date, the Bank manifested its fundamental goal as the stability of prices. The exchange rate regime, in the same episode was set as the "floating exchange rate" regime.[22] Eventually, the changes in the public perception of inflation

[22] The exchange rate regime is determined by the government, together with the Central Bank of Turkey, and implemented by the Central Bank, as required by the Central Bank Law.

and currency depreciation can be considered as a consequence of these changes in the monetary policy making framework.[23]

2.4.2. Concluding Remarks

On the theoretical front, the further elaboration of the Alesina et al (1990) model, as presented in Section 2 and Appendix 1, suggests a negative relationship between the treasury auction interest rates and auction maturity, under the assumption of a nonzero default risk and confidence crises. My study provides empirical evidence from the Turkish economy on this relationship. I have performed my analysis through two types of data sets. First, I have used a data set that contains the data from each treasury auction. Second, I have used monthly data, which was obtained from the first data set through aggregation.

The finding of a *downward sloping yield curve* is quite consistent with some specific conditions of the Turkish economy, such as chronic-high and volatile levels of inflation, a high and volatile default risk, frequent occurrences of financial crisis, an inflation-devaluation cycle, and the low credibility of policy makers, specifically until mid-2001. Due to real return and default risks, those conditions shape the maturity-return relationship in a different way from the case for developed countries. In this setup, the low credibility of policy makers makes shorter auction maturities and higher interest rates necessary. Consequently, once the market is unable to generate its long-term assets, returns on treasury bills are pushed far above the

[23] It should also be noted that the primary surplus target of the stabilization program started in June 2001, which is also supported by the International Monetary Fund, helped reducing the need to generate new debt. As the expenditures of the political authority are radically restricted, the skepticism regarding the roll-over of existing debt stock was limited after May 2001. Another important ingredient of the recent political climate of Turkey can be marked as the switch from a sequence of coalitional governments to a majority cabinet in the Grand National Assembly. These observations highlight the reduction of fiscal risks and political uncertainties.

generally prescribed levels. As far as the outcome is concerned, it can be argued that such management of debt is expected to be self-promoting and further unsustainability of debt is unavoidable. The post-2001 developments should be studied in more depth in order to reach a better understanding of possible changes in macroeconomic fundamentals. This may gain feasibility over time, as more observations are accumulated.

Table 2-1: Descriptive Statistics (Auction Data)

	$r^{\pi}_{Auction}$	$r^{\rho}_{Auction}$	$r^{i}_{Auction}$	R	π	ρ	i	$M^{auction}$
***Whole Sample:* Jul 1988-Dec 2004 Auctions**								
Mean	0.0221	0.0291	0.0069	0.0612	0.0385	0.0326	0.0546	0.6591
Median	0.0198	0.0268	0.0082	0.0590	0.0364	0.0336	0.0519	0.5056
Maximum	0.1179	0.2345	0.1141	0.1872	0.2677	0.4445	0.3633	3.0417
Minimum	-0.1389	-0.2443	-0.2316	0.0090	-0.0061	-0.0726	0.0159	0.0778
Std. Dev.	0.0231	0.0420	0.0262	0.0249	0.0235	0.0436	0.0365	0.4528
Skewness	-0.1267	0.0205	-3.0976	0.7225	2.6758	2.5376	4.5024	1.9923
Kurtosis	8.5905	10.5504	26.1054	4.1541	24.8341	24.3739	29.0538	9.4267
Jarque-Bera*	1075.26	1957.37	19646.84	117.43	17350.87	16569.33	26089.46	1963.18
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Sample Size	824	824	824	824	824	824	824	824
***Sub-sample [1]:* Jul 1988-May 2001 Auctions**								
Mean	0.0227	0.0282	0.0070	0.0672	0.0438	0.0392	0.0606	0.6538
Median	0.0205	0.0255	0.0088	0.0636	0.0406	0.0362	0.0550	0.5056
Maximum	0.1179	0.2345	0.1141	0.1872	0.2677	0.4445	0.3633	3.0417
Minimum	-0.1389	-0.2443	-0.2316	0.0235	-0.0003	-0.0726	0.0180	0.0778
Std. Dev.	0.0248	0.0403	0.0294	0.0237	0.0225	0.0401	0.0389	0.4597
Skewness	-0.1857	0.0865	-2.8006	0.8463	3.6490	4.1172	4.4317	2.1971
Kurtosis	8.1853	14.6793	20.9505	4.3611	33.3336	39.3684	26.2100	10.6743
Jarque-Bera*	721.81	3643.96	9443.88	125.99	25997.59	37137.01	16486.12	2088.68
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Sample Size	641	641	641	641	641	641	641	641
Sub-sample [2]: Jan 1995-Oct 2000 Auctions								
Mean	0.0340	0.0362	0.0177	0.0765	0.0412	0.0390	0.0578	0.7580
Median	0.0329	0.0355	0.0167	0.0805	0.0418	0.0403	0.0613	0.5833
Maximum	0.1094	0.0869	0.0563	0.1257	0.0700	0.0836	0.0886	3.0333
Minimum	-0.0012	-0.0038	-0.0082	0.0235	0.0088	0.0046	0.0216	0.1389
Std. Dev.	0.0196	0.0173	0.0130	0.0219	0.0140	0.0158	0.0128	0.5390
Skewness	0.5746	0.2210	0.2716	-0.7831	0.0375	0.0980	-0.7804	2.0333
Kurtosis	3.6040	2.6455	2.6704	3.3856	2.3604	3.0581	3.8208	8.2226
Jarque-Bera*	15.24	2.90	3.65	23.52	3.75	0.38	28.12	396.13
	(0.00)	(0.23)	(0.16)	(0.00)	(0.15)	(0.83)	(0.00)	(0.00)
Sample Size	217	217	217	217	217	217	217	217
Sub-sample [3]: Jun 2001-Dec 2004 Auctions								
Mean	0.0197	0.0324	0.0066	0.0402	0.0202	0.0095	0.0334	0.6774
Median	0.0176	0.0406	0.0053	0.0429	0.0157	-0.0048	0.0367	0.5444
Maximum	0.0617	0.1295	0.0253	0.0735	0.0594	0.1094	0.0543	2.0222
Minimum	-0.0476	-0.0748	-0.0382	0.0090	-0.0061	-0.0600	0.0159	0.2333
Std. Dev.	0.0159	0.0474	0.0067	0.0160	0.0166	0.0473	0.0120	0.4283
Skewness	0.0647	-0.1809	-0.8938	-0.0246	0.6705	0.6579	-0.0005	1.1141
Kurtosis	4.3100	2.4225	12.7847	1.6394	2.7198	2.3802	1.6705	3.7157
Jarque-Bera*	13.21	3.54	754.38	14.13	14.31	16.13	13.48	41.76
	(0.00)	(0.17)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Sample Size	183	183	183	183	183	183	183	183

* *p*-values of Jarque-Bera tests are reported in parentheses.

Table 2-2: Descriptive Statistics (Monthly Data)

	r_t^{π}	r_t^{ρ}	r_t^{i}	R_t	π_t	ρ_t	i_t	M_t
***Whole Sample:* Jul 1988-Dec 2004**								
Mean	0.0226	0.0267	0.0072	0.0616	0.0384	0.0355	0.0548	0.7359
Median	0.0224	0.0287	0.0089	0.0606	0.0361	0.0344	0.0524	0.6962
Maximum	0.0899	0.2036	0.0862	0.1350	0.2677	0.4445	0.3633	2.0278
Minimum	-0.1284	-0.2350	-0.2200	0.0190	-0.0061	-0.0726	0.0159	0.1231
Std. Dev.	0.0226	0.0395	0.0273	0.0240	0.0257	0.0486	0.0377	0.3432
Skewness	-1.2090	-1.3670	-4.3322	0.3030	3.8165	3.6935	5.0230	1.5286
Kurtosis	12.3294	15.2388	32.5747	2.7104	34.1263	30.2616	35.2518	6.3812
Jarque-Bera*	766.28	1297.42	7835.34	3.72	8473.65	6581.56	9414.09	171.42
	(0.00)	(0.00)	(0.00)	(0.16)	(0.00)	(0.00)	(0.00)	(0.00)
Sample Size	198	198	198	198	198	198	198	198
***Sub-sample [1]:* Jul 1988-May 2001**								
Mean	0.0236	0.0253	0.0074	0.0676	0.0434	0.0428	0.0608	0.7438
Median	0.0236	0.0277	0.0111	0.0675	0.0402	0.0382	0.0556	0.6825
Maximum	0.0899	0.2036	0.0862	0.1350	0.2677	0.4445	0.3633	2.0278
Minimum	-0.1284	-0.2350	-0.2200	0.0275	-0.0003	-0.0726	0.0180	0.1231
Std. Dev.	0.0244	0.0379	0.0308	0.0225	0.0255	0.0468	0.0401	0.3704
Skewness	-1.3197	-1.9733	-3.8953	0.2918	4.7055	5.1445	4.9608	1.5150
Kurtosis	11.6317	21.3916	25.9691	2.6793	40.6611	40.9216	31.9715	5.8162
Jarque-Bera*	526.18	2285.13	3799.26	2.86	9732.23	9971.11	6056.53	110.52
	(0.00)	(0.00)	(0.00)	(0.24)	(0.00)	(0.00)	(0.00)	(0.00)
Sample Size	155	155	155	155	155	155	155	155
***Sub-sample [2]:* Jan 1995-Oct 2000**								
Mean	0.0337	0.0361	0.0183	0.0765	0.0415	0.0390	0.0571	0.8855
Median	0.0344	0.0368	0.0189	0.0813	0.0410	0.0419	0.0601	0.8000
Maximum	0.0770	0.0680	0.0495	0.1142	0.0700	0.0836	0.0886	2.0278
Minimum	-0.0214	-0.0048	-0.0118	0.0275	0.0088	0.0046	0.0216	0.2389
Std. Dev.	0.0193	0.0166	0.0130	0.0222	0.0142	0.0154	0.0125	0.4699
Skewness	-0.0452	-0.2376	-0.1293	-0.9708	0.0524	-0.0623	-0.8550	0.9282
Kurtosis	3.1938	2.7354	2.6869	3.1986	2.3450	3.0480	3.8824	3.1416
Jarque-Bera*	0.13	0.86	0.48	11.11	1.28	0.05	10.80	10.11
	(0.94)	(0.65)	(0.79)	(0.00)	(0.53)	(0.97)	(0.00)	(0.01)
Sample Size	70	70	70	70	70	70	70	70
***Sub-sample [3]:* Jun 2001-Dec 2004**								
Mean	0.0191	0.0321	0.0064	0.0399	0.0205	0.0094	0.0333	0.7074
Median	0.0175	0.0404	0.0056	0.0441	0.0157	-0.0048	0.0367	0.7222
Maximum	0.0544	0.1215	0.0196	0.0642	0.0594	0.1094	0.0543	1.2028
Minimum	-0.0133	-0.0730	-0.0004	0.0190	-0.0061	-0.0600	0.0159	0.3306
Std. Dev.	0.0137	0.0449	0.0049	0.0155	0.0170	0.0463	0.0124	0.2200
Skewness	0.3544	-0.1168	1.0167	-0.1221	0.5987	0.6608	0.0489	-0.0006
Kurtosis	3.2694	2.4639	3.6303	1.4426	2.5470	2.4093	1.6387	2.2213
Jarque-Bera*	1.03	0.61	8.12	4.45	2.94	3.75	3.34	1.09
	(0.60)	(0.74)	(0.02)	(0.11)	(0.23)	(0.15)	(0.19)	(0.58)
Sample Size	43	43	43	43	43	43	43	43

* *p*-values of Jarque-Bera tests are reported in parentheses.

Table 2-3: Real Interest Rate-Maturity Relationships: Auction Data

Independent Variables	$r^{\pi}_{Auction}$	$r^{\rho}_{Auction}$	$r^{i}_{Auction}$
***Whole Sample:* Jul 1988-Dec 2004 Auctions**			
Constant	0.138***	0.159***	0.0207***
	(2.805)	(2.203)	(3.747)
$M^{auction}$	-0.176***	-0.197*	-0.0209***
	(-2.354)	(-1.811)	(-2.549)
***Sub-sample [1]:* Jul 1988-May 2001 Auctions**			
Constant	0.096***	0.137***	0.0202***
	(4.375)	(3.602)	(3.508)
$M^{auction}$	-0.112***	-0.166***	-0.0202***
	(-3.349)	(-2.895)	(-2.403)
***Sub-sample [2]:* Jan 1995-Oct 2000 Auctions**			
Constant	0.093***	0.072	0.029
	(7.359)	(8.337)	(9.634)
$M^{auction}$	-0.078***	-0.047***	-0.016***
	(-4.564)	(-4.380)	(-3.896)
***Sub-sample [3]:* Jun 2001-Dec 2004 Auctions**			
Constant	0.006	0.002	0.012***
	(0.661)	(0.110)	(5.098)
$M^{auction}$	0.021	0.044	-0.0094***
	(1.622)	(1.509)	(-2.544)

Note: t-statistics are reported in parentheses under the corresponding estimated parameters, where the underlying standard errors are (White's) heteroskedasticity-consistent standard errors. (*), (**) and (***) correspond to statistical significance at the 10%, 5% and 1% levels.

Table 2-4: Real Interest Rate-Maturity Relationships: Monthly Data

Independent Variables	r_t^{π}	r_t^{ρ}	r_t^{i}
***Whole Sample:* Jul 1988-Dec 2004**			
Constant	0.069***	0.087*	0.028***
	(3.220)	(1.773)	(2.271)
M_t	-0.063***	-0.082	-0.0289*
	(-2.242)	(-1.265)	(-1.737)
D9912	0.031	0.067	0.014
	(0.949)	(0.873)	(0.757)
D0012	0.012*	0.022	-0.109***
	(1.905)	(1.637)	(-27.964)
***Sub-sample [1]:* Jul 1988-May 2001**			
Constant	0.071***	0.092*	0.010
	(3.668)	(1.830)	(0.543)
M_t	-0.065***	-0.091	-0.0024
	(-2.475)	(-1.367)	(-0.102)
D9912	0.031	0.077	-0.017
	(1.009)	(0.999)	(-0.653)
D0012	0.011*	0.026*	-0.115***
	(1.663)	(1.834)	(-25.646)
***Sub-sample [2]:* Jan 1995-Oct 2000**			
Constant	0.088***	0.067***	0.027***
	(5.818)	(5.729)	(7.621)
M_t	-0.061***	-0.035***	-0.010***
	(-3.822)	(-2.805)	(-2.368)
D9912	0.008	-0.004	-0.019***
	(0.505)	(-0.339)	(-3.837)
***Sub-sample [3]:* Jun 2001-Dec 2004**			
Constant	0.016***	-0.007	0.014***
	(2.273)	(-0.263)	(6.041)
M_t	0.0036	0.055	-0.011***
	(0.352)	(1.601)	(-3.976)

Note: t-statistics are reported in parentheses under the corresponding estimated parameters, where the underlying standard errors are (White's) heteroskedasticity-consistent standard errors. (*), (**) and (***) correspond to statistical significance at the 10%, 5% and 1% levels. D0012 is not usable in sub-sample [2]; and neither D9912 nor D0012 is usable in sub-sample [3] to avoid singularity.

Table 2-5: Nominal Interest Rate-Maturity Relationships: Monthly Data

Independent Variables	R_t	R_t	R_t
***Whole Sample:* Jul 1988-Dec 2004**			
Constant	0.124***	0.162***	0.111***
	(5.017)	(7.947)	(5.272)
M_t	-0.111***	-0.146***	-0.098***
	(-3.947)	(-5.758)	(-3.702)
D9912	0.101***	0.155***	0.098***
	(2.763)	(5.133)	(3.150)
D0012	0.013***	0.016***	-0.042***
	(2.275)	(2.631)	(-3.062)
π_t	0.488***		
	(3.111)		
ρ_t		0.161*	
		(1.909)	
i_t			0.387***
			(4.153)
***Sub-sample [1]:* Jul 1988-May 2001**			
Constant	0.103***	0.131***	0.089***
	(5.123)	(7.121)	(4.379)
M_t	-0.075***	-0.094***	-0.056***
	(-3.337)	(-4.029)	(-2.208)
D9912	0.055*	0.088***	0.045
	(1.939)	(3.198)	(1.532)
D0012	-0.00067	-0.0027	-0.050***
	(-0.129)	(-0.476)	(-5.482)
π_t	0.446***		
	(3.044)		
ρ_t		0.125***	
		(2.057)	
i_t			0.331***
			(5.193)
***Sub-sample [2]:* Jan 1995-Oct 2000**			
Constant	0.105***	0.089***	0.008
	(3.378)	(3.452)	(0.239)
M_t	-0.069***	-0.051***	-0.0149
	(-3.288)	(-2.712)	(-0.827)
D9912	0.019	0.012	-0.017
	(0.639)	(0.553)	(-0.868)
π_t	0.780*		
	(1.929)		
ρ_t		0.831***	
		(2.672)	
i_t			1.436***
			(4.297)
***Sub-sample [3]:* Jun 2001-Dec 2004**			
Constant	0.081***	0.107***	0.016***
	(4.726)	(8.360)	(2.230)
M_t	-0.061***	-0.092***	-0.015***
	(-3.562)	(-5.649)	(-2.233)
π_t	0.094		
	(0.390)		
ρ_t		-0.231*	
		(-1.836)	
i_t			1.019***
			(12.248)

Note: t-statistics are reported in parentheses under the corresponding estimated parameters, where the underlying standard errors are (White's) heteroskedasticity-consistent standard errors. (*), (**) and (***) correspond to statistical significance at the 10%, 5% and 1% levels. D0012 is not usable in sub-sample [2]; and neither D9912 nor D0012 is usable in sub-sample [3] to avoid singularity.

Table 2-6: Real Interest Rate-Maturity Relationships: Monthly Data

	Whole Sample **Jul 1988-Dec 2004**			***Sub-sample [1]*** **Jul 1988-May 2001**		
	r_t^{π}	r_t^{ρ}	r_t^{i}	r_t^{π}	r_t^{ρ}	r_t^{i}
Constant	0.046*	0.067	0.061	0.050***	0.077	0.017
	(1.795)	(1.282)	(1.244)	(2.565)	(1.506)	(0.521)
M_t	-0.050	-0.068	-0.080	-0.0552***	-0.0810	-0.0178
	(-1.438)	(-0.996)	(-1.136)	(-2.070)	(-1.245)	(-0.350)
D9912	0.019	0.054	0.074	0.024	0.070	0.001
	(0.483)	(0.684)	(0.910)	(0.797)	(0.957)	(0.020)
D0012	0.016***	0.020	-0.084***	0.017***	0.023*	-0.101***
	(2.132)	(1.413)	(-4.741)	(2.644)	(1.762)	(-5.760)
r_{t-1}^{π}	0.491***			0.475***		
	(3.258)			(3.181)		
r_{t-2}^{π}	0.026			0.018		
	(0.168)			(0.119)		
r_{t-3}^{π}	0.063			0.085		
	(0.526)			(0.806)		
r_{t-1}^{ρ}		0.441***			0.531***	
		(2.822)			(2.556)	
r_{t-2}^{ρ}		-0.117			-0.284	
		(-0.778)			(-1.641)	
r_{t-3}^{ρ}		0.050			0.097	
		(0.479)			(0.793)	
r_{t-1}^{i}			0.214			0.227
			(1.321)			(1.297)
r_{t-2}^{i}			0.432			0.340
			(1.282)			(1.166)
r_{t-3}^{i}			0.083			-0.045
			(0.413)			(-0.212)

Table 2-6: Real Interest Rate-Maturity Relationships: Monthly Data (continued)

	Sub-sample [2] **Jan 1995-Oct 2000**			*Sub-sample [3]* **Jun 2001-Dec 2004**		
	r_t^{π}	r_t^{ρ}	r_t^{i}	r_t^{π}	r_t^{ρ}	r_t^{i}
Constant	0.036***	0.025***	0.015	0.006	-0.004	0.010***
	(3.011)	(2.238)	(1.366)	(1.207)	(-0.153)	(2.313)
M_t	-0.0257***	-0.0142	-0.0122	0.002	0.036	-0.010***
	(-2.402)	(-1.498)	(-1.060)	(0.335)	(0.956)	(-2.245)
D9912	-0.018*	-0.019***	-0.0088			
	(-1.887)	(-2.062)	(-0.7966)			
D0012						
r_{t-1}^{π}	0.448***			0.696***		
	(2.314)			(5.148)		
r_{t-2}^{π}	0.134			0.023		
	(0.714)			(0.188)		
r_{t-3}^{π}	0.015			-0.122		
	(0.099)			(-1.282)		
r_{t-1}^{ρ}		0.221			0.318*	
		(1.337)			(1.932)	
r_{t-2}^{ρ}		0.254**			0.002	
		(1.985)			(0.017)	
r_{t-3}^{ρ}		0.165			-0.016	
		(1.364)			(-0.155)	
r_{t-1}^{i}			0.469***			0.627***
			(3.388)			(4.529)
r_{t-2}^{i}			0.059			-0.206
			(0.333)			(-1.579)
r_{t-3}^{i}			0.194*			0.077
			(1.654)			(0.666)

Table 2-7: Nominal Interest Rate-Maturity Relationships: Monthly Data

	Whole Sample Jul 1988-Dec 2004			***Sub-sample [1]* Jul 1988-May 2001**		
	R_t	R_t	R_t	R_t	R_t	R_t
Constant	0.005**	0.007***	0.005	0.010***	0.009***	0.007***
	(1.962)	(2.744)	(1.593)	(2.608)	(2.981)	(2.331)
M_t	-0.005*	-0.006**	-0.005**	-0.0072***	-0.0065***	-0.0059**
	(-1.806)	(-1.964)	(-2.018)	(-2.243)	(-2.133)	(-2.015)
D9912	-0.014***	-0.011***	-0.010***	-0.011***	-0.010***	-0.010***
	(-2.980)	(-2.868)	(-3.097)	(-2.417)	(-2.543)	(-2.774)
D0012	0.008***	0.008***	-0.008	0.007***	0.0077***	-0.001
	(9.083)	(8.939)	(-0.945)	(4.427)	(4.448)	(-0.105)
R_{t-1}	0.857***	0.799***	0.786***	0.845***	0.766***	0.748***
	(7.470)	(6.704)	(7.022)	(6.969)	(5.343)	(6.557)
R_{t-2}	-0.163	-0.086	-0.034	-0.147	-0.076	0.016
	(-1.034)	(-0.587)	(-0.218)	(-0.819)	(-0.465)	(0.099)
R_{t-3}	0.190	0.186*	0.137	0.187	0.192	0.126
	(1.641)	(1.710)	(1.419)	(1.426)	(1.497)	(1.132)
π_t	0.162			0.109		
	(1.622)			(1.249)		
π_{t-1}	0.002			0.019		
	(0.031)			(0.237)		
π_{t-2}	-0.019			-0.015		
	(-0.360)			(-0.287)		
π_{t-3}	-0.022			-0.042		
	(-0.348)			(-0.572)		
ρ_t		0.081*			0.084	
		(1.891)			(1.622)	
ρ_{t-1}		0.010			0.008	
		(0.281)			(0.157)	
ρ_{t-2}		0.012			0.028	
		(0.526)			(0.814)	
ρ_{t-3}		-0.025			-0.045	
		(-1.080)			(-1.444)	
i_t			0.099			0.027
			(1.414)			(0.458)
i_{t-1}			0.108***			0.131***
			(3.145)			(4.048)
i_{t-2}			-0.059			-0.034
			(-1.624)			(-0.965)
i_{t-3}			-0.039			-0.055***
			(-1.373)			(-2.171)

Table 2-7: Nominal Interest Rate-Maturity Relationships: Monthly Data (continued)

	Jan 1995-Oct 2000			Jun 2001-Dec 2004		
	R_t	R_t	R_t	R_t	R_t	R_t
Constant	0.006	0.015***	-0.0009	-0.017***	-0.006	0.010
	(0.725)	(2.641)	(-0.101)	(-2.086)	(-0.949)	(1.604)
M_t	-0.0102*	-0.007**	-0.0026	0.016***	-0.006	-0.009
	(-1.779)	(-1.852)	(-0.738)	(2.215)	(1.023)	(-1.629)
D9912	-0.055***	-0.021***	-0.019***			
	(-3.689)	(-3.330)	(-3.714)			
D0012						
R_{t-1}	0.695***	0.543***	0.576***	0.869***	0.866***	0.698***
	(2.702)	(3.285)	(3.889)	(5.869)	(5.854)	(3.855)
R_{t-2}	-0.065	0.046	0.086	0.121	0.094	-0.278
	(-0.182)	(0.234)	(0.538)	(0.537)	(0.361)	(-1.152)
R_{t-3}	-0.037	0.179	0.010	0.010	0.045	0.159
	(-0.148)	(1.276)	(0.083)	(0.081)	(0.288)	(0.782)
π_t	1.697***			0.439***		
	(2.802)			(3.011)		
π_{t-1}	-0.758***			-0.149*		
	(-2.190)			(-1.733)		
π_{t-2}	-0.307*			-0.091		
	(-1.659)			(-1.383)		
π_{t-3}	0.208			0.048		
	(1.294)			(1.220)		
ρ_t		0.664***			0.042*	
		(2.266)			(1.690)	
ρ_{t-1}		-0.099			0.019	
		(-0.584)			(1.161)	
ρ_{t-2}		-0.185			-0.017	
		(-1.445)			(-1.109)	
ρ_{t-3}		-0.165			0.013	
		(-1.493)			(-1.396)	
i_t			0.842***			0.751
			(2.475)			(1.463)
i_{t-1}			-0.010			-0.264
			(-0.048)			(-0.314)
i_{t-2}			-0.178			0.107
			(-0.814)			(0.225)
i_{t-3}			-0.155			-0.193
			(-0.885)			(-0.450)

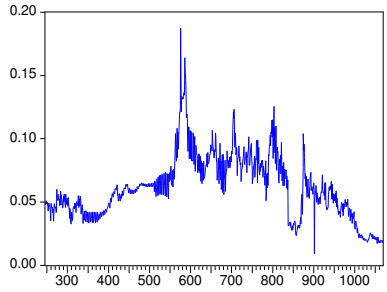
Table 2-8: Chow Breakpoint Tests

	Deflating Variable		
Breakpoints Tested	π_t	ρ_t	i_t
Table 2-3 Specification			
1994:04 and 2001:02 in the whole sample	22.88*** (0.000)	20.59*** (0.000)	11.90*** (0.000)
1994:04 in the pre-2000 October sub-sample	42.18*** (0.000)	40.91*** (0.000)	25.50*** (0.000)
2001:02 in the post-1995 January sub-sample	3.85** (0.022)	2.22 (0.109)	14.46*** (0.000)
Table 2-4 Specification			
1994:04 and 2001:02 in the whole sample	5.66*** (0.000)	8.39*** (0.000)	3.52*** (0.008)
1994:04 in the pre-2000 October sub-sample	-0.56 (1.000)	-5.90 (1.000)	11.76*** (0.000)
2001:02 in the post-1995 January sub-sample	11.85*** (0.000)	6.34*** (0.002)	5.89*** (0.004)
Table 2-5 Specification			
1994:04 and 2001:02 in the whole sample	4.90*** (0.000)	6.20*** (0.000)	9.04*** (0.000)
1994:04 in the pre-2000 October sub-sample	4.46*** (0.005)	5.62*** (0.001)	10.31*** (0.000)
2001:02 in the post-1995 January sub-sample	9.99*** (0.000)	28.68*** (0.000)	17.08*** (0.000)
Table 2-6 Specification			
1994:04 and 2001:02 in the whole sample	1.86* (0.053)	2.24** (0.017)	4.55*** (0.000)
1994:04 in the pre-2000 October sub-sample	-0.87 (1.000)	-2.93 (1.000)	7.61*** (0.000)
2001:02 in the post-1995 January sub-sample	2.94** (0.015)	2.85** (0.018)	1.84 (0.109)
Table 2-7 Specification			
1994:04 and 2001:02 in the whole sample	3.15*** (0.000)	2.94*** (0.000)	1.35 (0.159)
1994:04 in the pre-2000 October sub-sample	2.25** (0.022)	1.09 (0.367)	1.23 (0.276)
2001:02 in the post-1995 January sub-sample	1.44 (0.180)	1.22 (0.288)	1.27 (0.260)

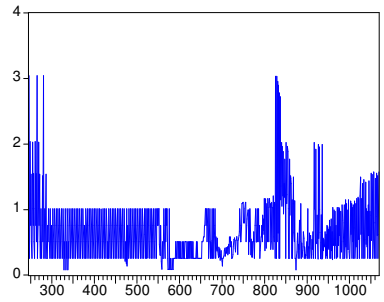
Note: F-statistics and the p-values (in parentheses) of the Chow tests are provided in the table. (*), (**) and (***) correspond to rejection of the null-hypothesis at the significance levels of 10%, 5% and 1%, respectively. For each specification, three tests are computed. In the first test, the null hypothesis that no structural break exists is jointly tested for April-1994 and February-2001 over the whole sample estimates. In the second test, the April-1994 structural break is tested over the pre-2000 October sub-sample. The third test considers the February-2001 break over the post-1995 January period.

Figure 2-1: Evolution of the Series (Auction Data)

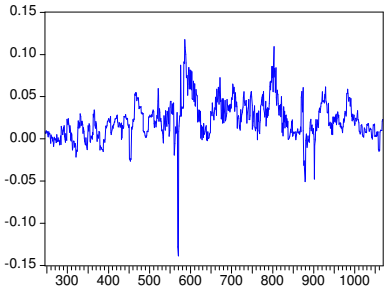
a. Auction Interest Rate, Nominal ($R^{auction}$)*



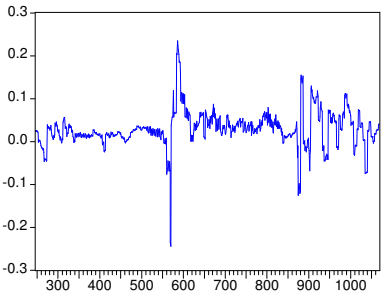
b. Auction Maturity ($M^{auction}$)



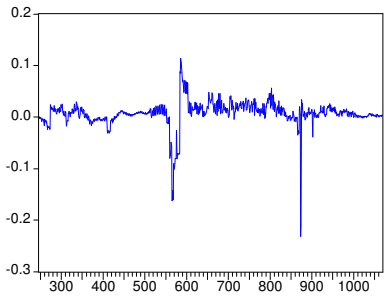
c. $r^{\pi}_{Auction}$ Auction Interest Rate Deflated by the Seasonally Adjusted Rate of WPI Inflation



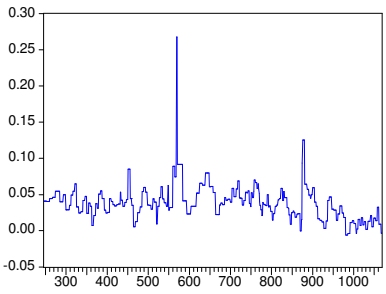
d. $r^{\rho}_{Auction}$ Auction Interest Rate Deflated by the Depreciation Rate of the Official Currency Basket



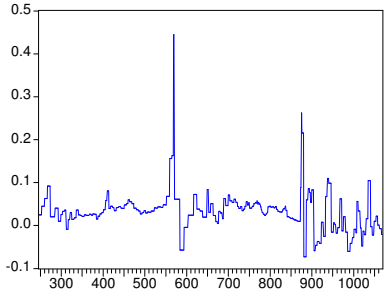
e. $r^{i}_{Auction}$ Auction Interest Rate Deflated by the Interbank Interest Rate



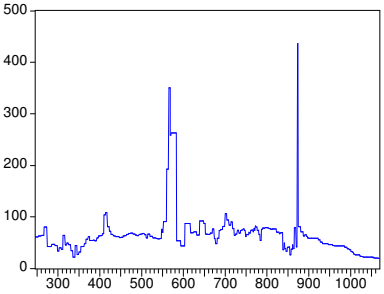
f. Seasonally Adjusted Rate of WPI Inflation



g. Depreciation of the Official Currency Basket



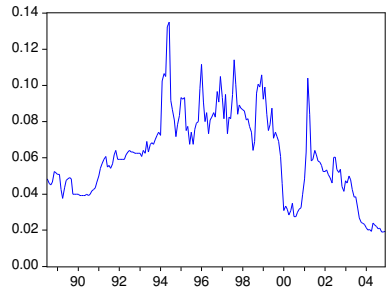
h. Interbank Interest Rate



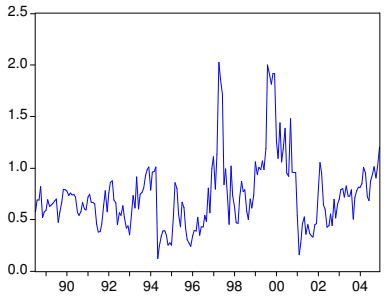
* In all panels, the horizontal axis shows the observation numbers. Maturity is measured in 360-day years and other variables are displayed in decimals.

Figure 2-2: Evolution of the Series (Monthly Data)

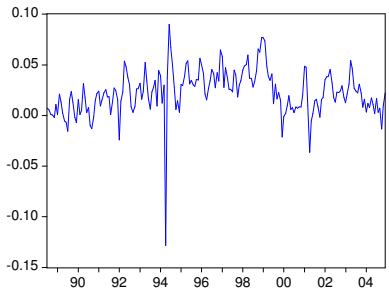
a. Nominal Weighted Average Auction Interest Rate (R_t)*



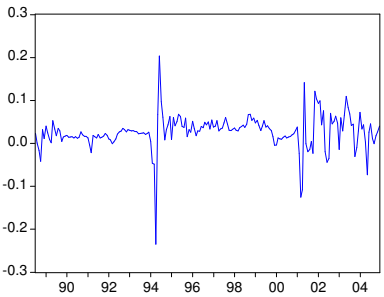
b. Average Auction Maturity (M_t)



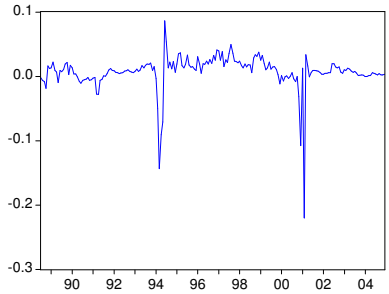
c. r_t^{π} Interest Rate Deflated by Seasonally Adjusted WPI Inflation Rate



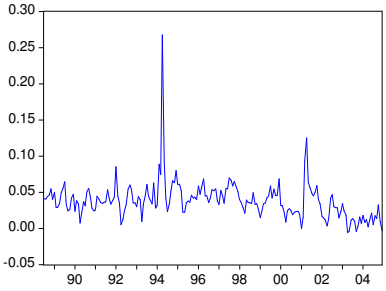
d. r_t^{ρ} Interest Rate Deflated by Depreciation Rate of the Official Currency Basket



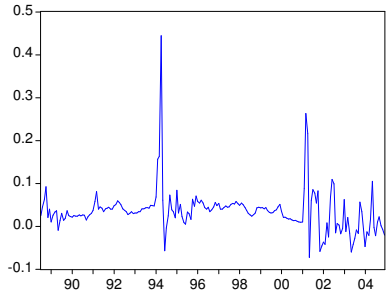
e. r_t^{i} Interest Rate Deflated by Interbank Interest Rate



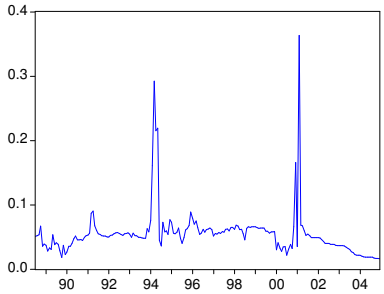
f. π_t Seasonally Adjusted Rate of WPI Inflation



g. ρ_t Depreciation Rate of the Official Currency Basket



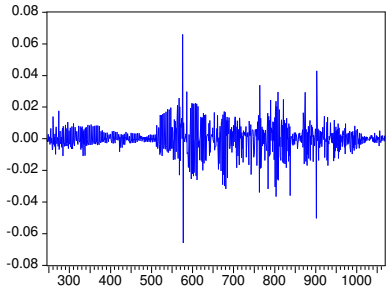
h. i_t Interbank Interest Rate



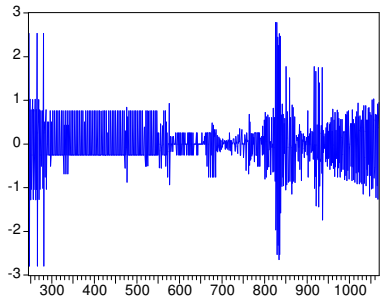
* In all panels, the horizontal axis shows time periods (months). Maturity is measured in 360-day years and other variables are displayed in decimals.

Figure 2-3: Evolution of the First Differences of the Series (Auction Data)

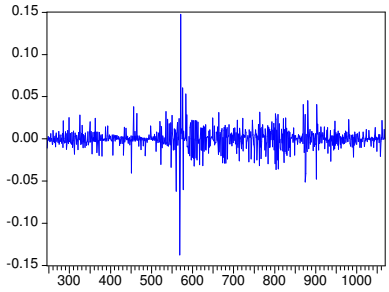
a. Auction Interest Rate, Nominal ($R^{auction}$)*



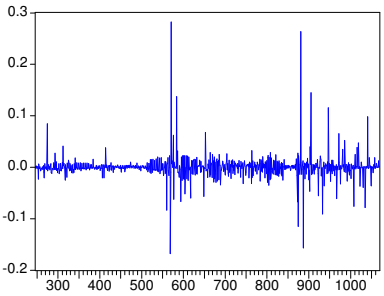
b. Auction Maturity ($M^{auction}$)



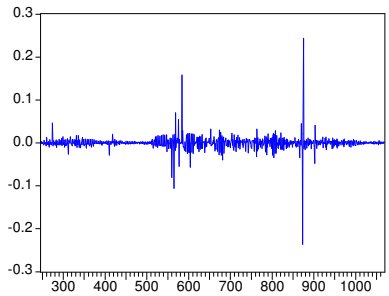
c. $r^{\pi}_{Auction}$ Auction Interest Rate Deflated by the Seasonally Adjusted Rate of WPI Inflation



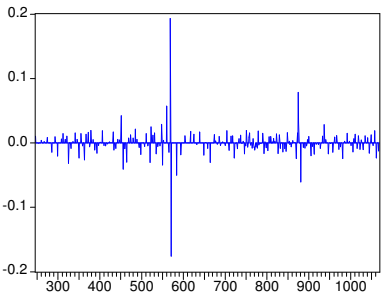
d. $r^{\rho}_{Auction}$ Auction Interest Rate Deflated by the Depreciation Rate of the Official Currency Basket



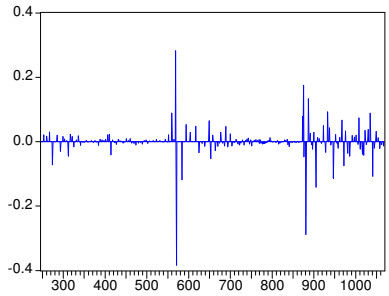
e. $r^{i}_{Auction}$ Auction Interest Rate Deflated by the Interbank Interest Rate



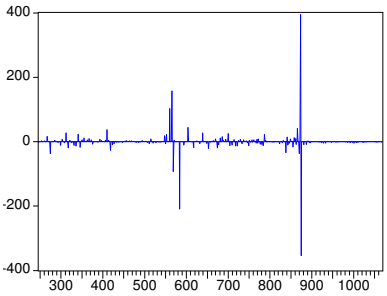
f. Seasonally Adjusted Rate of WPI Inflation



g. Depreciation of the Official Currency Basket



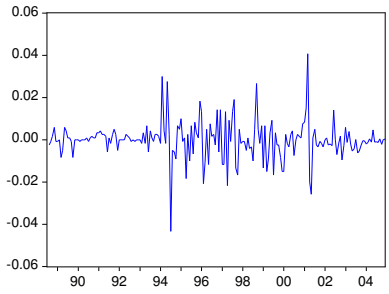
h. Interbank Interest Rate



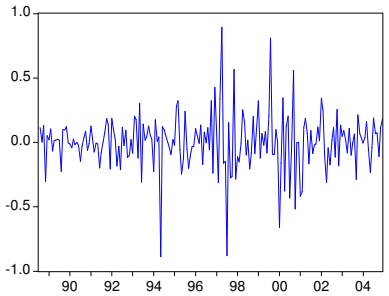
* In all panels, the horizontal axis shows the observation numbers. Maturity is measured in 360-day years and other variables are displayed in decimals.

Figure 2-4: Evolution of the First Differences of the Series (Monthly Data)

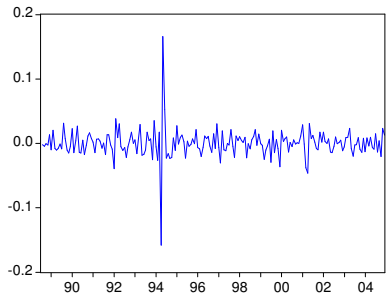
a. Nominal Weighted Average Auction Interest Rate (R_t)*



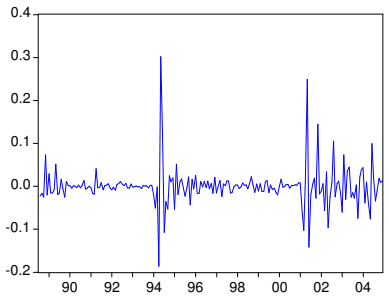
b. Average Auction Maturity (M_t)



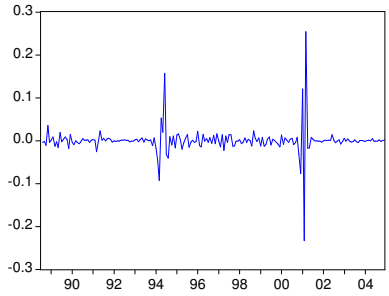
c. r_t^{π} Interest Rate Deflated by Seasonally Adjusted WPI Inflation Rate



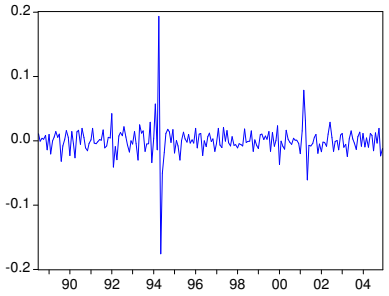
d. r_t^{ρ} Interest Rate Deflated by Depreciation Rate of the Official Currency Basket



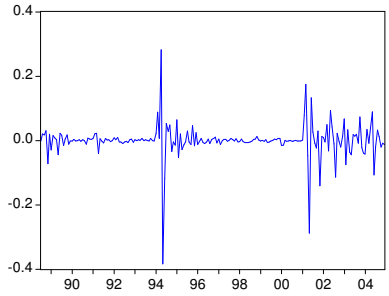
e. r_t^{i} Interest Rate Deflated by Interbank Interest Rate



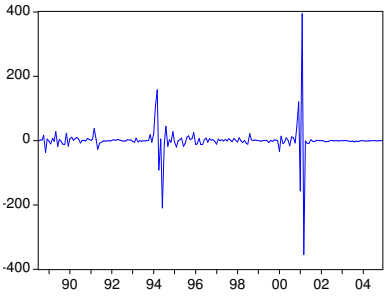
f. π_t Seasonally Adjusted Rate of WPI Inflation



g. ρ_t Depreciation rate of the Official Currency Basket



h. i_t Interbank Interest Rate



* In all panels, the horizontal axis shows time periods (months). Maturity is measured in 360-day years and other variables are displayed in decimals.

CHAPTER 3

EFFECTS OF USD-EURO PARITY ON A SMALL OPEN ECONOMY: EVIDENCE FROM TURKEY

3.1. Introduction

USD-Euro parity is one of the most widely followed variables in financial markets. Its sizable movements (see Figure 3-1) have often been elaborated on as regards their implications on developed economies. In this essay, I will assess the implications of USD-Euro parity (the US dollar value of the Euro) on a small open economy (SOE) under unbalanced trade denomination, where the exports are realized mainly in one currency and imports in another.

In this essay, based on an illustrative model of the transmission of external parity movements to SOE dynamics, the effects of USD-Euro parity are analyzed using Turkish data. Note that Turkey is an SOE, and the relative movements of these major currencies are plausible to affect its major macroeconomic variables. These effects may occur through the channels of the real exchange rate and/or the terms of trade. In fact, neither overlaps the other in a one-to-one fashion nor are they isolated from each other. In either of these channels, net exports will respond to USD-Euro

parity as a result of the change in the relative prices of tradables. The theoretical transmission mechanism that I propose is demonstrated with an illustrative model in Appendix 2, where USD-Euro parity enters the system by affecting net exports and domestic absorption.

The relevance of the relationship between USD-Euro parity and the real exchange rate is two-fold in the case of Turkey. Firstly, Turkey is a small open economy and cannot affect USD-Euro parity, but the reverse is true. Therefore, my investigation focuses only on the effects of exogenous USD-Euro parity shocks on domestic macroeconomic performance, rather than looking in the opposite direction. Secondly, the currency composition of Turkey's trade is not balanced. For instance, for the year 2004, 50.1% of Turkish exports were denominated in Euros and 42.9% were denominated in USD. However, the composition of imports is such that the Euro and the USD have respective shares of 40.3% and 55.0%. Moreover, Turkey is a net exporter of tourism services and receives revenue from tourism, mostly originating from Europe. This further enhances the effects of USD-Euro parity on the domestic economy. Hence, a change in USD-Euro parity is expected to have sizable effects on Turkish economic performance.

In the literature, to the best of my knowledge, there is no study specifically considering the effects of USD-Euro parity on economic performance for a small open economy, except for Berument and Dincer (2005). They look at the effects of USD-Euro parity on the Turkish trade balance and argue that an increase in the USD value of the Euro appreciates local currency and increase net exports.

Spatafora (2003) looked at a similar issue by investigating the effects of G-3[24] exchange rate volatility (not the level of the exchange rate as I do, but its

[24] G-3 describes the three major currency areas, namely the United States, Japan and the Euro areas.

volatility) on developing economies.[25] He noted that even after the collapse of the Bretton Woods system one-half to two-thirds of all developing countries actually continued pegging their exchange rates to the currencies of industrial countries. Therefore, the volatility of the major industrial countries' currencies affects the volatility of the developing countries' exchange rates. Then he argued that exports are affected positively (not statistically significant) and imports are affected negatively (significant) for the case of emerging markets. Nevertheless, Spatafora (2003) employed a broad panel of countries in his analysis and did not focus on any specific country.

In the current study, in order to account for the exogeneity of USD-Euro parity, I assess the relationship within the VAR framework with block exogeneity. In particular, I allow USD-Euro parity to affect economic performance, but not vice versa. In order to capture the dynamics of the domestic economy – similar to Kamin and Rogers (2000) and Berument and Pasaogullari (2003) – I employ 3 variable VAR that include the real exchange rate, the inflation rate and the real GDP. The response of the real exchange rate to USD-Euro parity indirectly reveals whether there is really an ultimate improvement in trade competitiveness and thus income. The empirical evidence provided in this essay suggests that an increase in the USD value of the Euro appreciates the real exchange rate, decreases inflation and increases output.

The analysis and findings of this essay are important: The case of Turkey with regard to changes in USD-Euro parity establishes a benchmark example for similar emerging market economies by demonstrating the extent of the exposure of a small-open economy to the relative movements of two big currencies. The essay is

[25] The impact that large currencies' exchange rate movements have on advanced economies has been investigated and generally found to be small (World Economic Outlook, April 2002, Appendix 1.2; World Economic Outlook, May 2001, Appendix II).

structured as follows: Section 2 presents the data and the results of my bivariate analysis. In Section 3, my VAR specification is given. I present and interpret the estimated impulse-responses in Section 4. Finally, Section 5 concludes the essay.

3.2. Data and Bivariate Analysis

In this section, I first describe the data sources and give the definitions of my variables. Then, I provide the cross-correlations, unit-root and cointegration tests for these variables. The data were obtained from the Central Bank of the Republic of Turkey[26] with the exception of the GDP deflator, which was taken from the International Financial Statistics of the International Monetary Fund.[27] My data set covers the period from the first quarter of 1987 to the last quarter of 2004. In my analysis, *Parity* is the natural logarithm of the USD value of the Euro. The real exchange rate ($rexch$) is computed as the natural logarithm of the wholesale price index (1994=100) deflated Turkish lira value of the USD.[28,29] The measure of the output (y) is the natural logarithm of the real GDP. Inflation (Inf) is calculated as the quarterly percentage change in the GDP deflator.

In Table 3-1, the cross-correlations of *Parity* with y, $rexch$, and Inf are reported from 0 to 8 quarter lags, variables being used in the form of levels and first differences, as well as deviations from linear, quadratic, cubic and HP trends. Table

[26] Accessible at http://tcmbf40.tcmb.gov.tr/cbt.html
[27] Accessible at http://ifs.apdi.net/imf
[28] For USD-Euro parity and the TL/USD exchange rate raw data, I have used the period average values. For the time period before the circulation of the Euro, USD-Euro parity is computed using the Euro to DEM (Deutsche Mark) conversion factor of 1.95 and the DEM/USD period average exchange rate. I did not use the US CPI while computing the real exchange rate since Turkish inflation is remarkably high compared to that of the US. For instance, the average annual consumer price inflation in Turkey and the United States for the 1987-2003 period are nearly 69% and 3%, respectively.
[29] I have computed the real exchange rate based on the Turkish lira value of US dollar (instead of the Euro) following the usual convention in the empirical literature; see for instance Kamin and Rogers (2000) or Berument and Pasaogullari (2003).

3-1 suggests that, as far as the variables are considered in their levels, the cross-correlation between *Inf* and *Parity* is significantly[30] negative contemporaneously as well as when *Parity* lags inflation by four quarters. The cross-correlation between *rexch* and *Parity* is negative and significant at the lags of 3, 2, 1, and 0. For *y* and *Parity*, the cross-correlations are significant and positive for 2, 1 and 0 lags. When I look at the cross-correlations between the first-differenced series, it can be seen that there is a negative association between *Inf* and *Parity* contemporaneously; that is, the amount of increase in inflation is negatively correlated with the rate of appreciation of the Euro against the USD. At the lag of 4, the relationship is negative and significant, whereas at one lag of parity the relationship is positive. The relationship between *rexch* and *Parity* is significantly positive only contemporaneously. In other words, the rate of real appreciation of the Turkish lira and the rate of appreciation of the Euro against the USD are positively associated at zero lags. The correlation between *y* (i.e. the growth rate of real income after the first differencing) and *Parity* (the rate of appreciation of the Euro against the USD) is negative and statistically significant when *y* leads *Parity* by 3 and 7 lags. I have also assessed the cross correlations between the deviations of my variables from their respective linear trends estimated via ordinary least squares. These figures suggest that *Inf* and *Parity* are significantly negatively correlated at the lag of 4 and contemporaneously. The variables *rexch* and *Parity* are correlated at the lags of 3 and 4 negatively. There is no statistically significant association between the deviations from the linear trend of *y* and *Parity*. Repeating the same exercise using the deviations of my series from their quadratic, cubic and HP-filtered trends, I

[30] The level of statistical significance is 5%, unless otherwise noted.

observe no statistically significant cross-correlations among my variables of concern, except that there is a significant and positive association between *rexch* and *Parity* when the former leads the latter by 8 lags. All in all, Table 3-1 provides statistical evidence; upon which I can argue that movements of *Parity* lead to changes in the domestic economy, before I go into a more sophisticated modeling of the variables of interest.

The unit-root tests of *Inf*, *Parity*, *rexch* and *y* are reported in Table 3-2. I have performed Augmented Dickey-Fuller tests for each variable in two different setups. In the first one, I include the constant term but exclude the trend term, whereas both are included in the second one. The null hypothesis is such that the variable of concern includes a unit-root. In Table 3-2, the ADF test statistics for the first differences of my variables are also reported. For each test presented in this table, the optimal lag length of the ADF Equation is obtained by minimizing the modified-Schwarz criterion. Based on the ADF test statistics, I fail to reject the hypothesis of a unit-root for all of *Parity*, *rexch*, *Inf*, and *y* in levels. This observation is robust up to the inclusion of the trend in the ADF tests. Consequently, I can conclude that all my series include unit-roots. It can be seen that the unit-roots disappear when the test is conducted for the first differenced data series. Thus, I can conclude that all my data series are $I(1)$ in their levels; that is, each series is integrated of order one.

Table 3-3 presents Johansen's cointegration test results for my variables of concern. The cointegration test is performed for the endogenous *Inf*, *rexch* and *y*, using *Parity* as an exogenous variable. Based on the λ_{trace} statistic, I reject the null hypothesis that the number of distinct cointegrating vectors is zero against the alternative that a larger number of cointegrating vectors exist at the 5% level of

significance. In support of this, I reject, at the 5% level of significance, the null hypothesis of zero cointegrating vectors against the alternative of one cointegrating vector using the $\lambda_{\max}$ test statistics. Therefore, using both tests, I fail to reject the null hypotheses that one cointegrating vector exists against respective alternatives, whereas I could reject the existence of two cointegrating vectors. Consequently, I conclude that one cointegrating vector exists for my endogenous variables. Eventually, I perform my VAR analysis in logarithmic levels, following Sims, Stock and Watson (1990).

Based on the findings of Table 3-3, it can be said that there is a long-run relationship among my variables of concern. Furthermore, the cross-correlation results that are presented in Table 3-1 show some associations between *Parity* and the other variables. However, these patterns are not robust for different filters applied to my series. More importantly, these observations neither rule out the possibility of a spurious relationship among my variables nor do they account for the transmission mechanism through which *Parity* affects the other variables. Therefore, I specify and estimate a VAR model, which has the major advantage of capturing and measuring the effects of external parity shocks properly while accounting for the dynamic relationships among the variables of concern.

3.3. Specification of the VAR System

My bivariate analysis results do not provide us with a satisfying comprehension of the relationships among my variables. Although I have failed to reject the existence of a long-run association among them, I have not obtained a clear

econometric description of such an association. Therefore, I employ a VAR setup to account for the interaction among the variables under consideration.

I basically use the impulse-response functions to describe the relationships that I am seeking within a VAR setup. However, the standard form of VAR as used by Sims (1972) has a serious drawback in that the external variables are affected by the domestic variables with lags. That is, I aim to measure the effects of external shocks on a small open economy, so the impact of a foreign shock on the domestic economy is important but not vice versa. An *identified VAR model with block exogeneity* would overcome the above-mentioned problem as well as having the advantage of specifying economically meaningful simultaneous interactions among variables, instead of a complete set of Equations lacking economic intuition. The restrictions on the lagged relationships are determined by the data.

The general specification of Cushman and Zha (1997) and Zha (1999) can be used to assess the details of the identified VAR model with block exogeneity:

(Eq. 3-1) $A(L)z(t) = \varepsilon(t)$

In (Eq. 3-1), $z(t)$ is an $m \times 1$ vector of observations, $A(L)$ is an $m \times m$ matrix polynomial in the lag operator L and $\varepsilon(t)$ is an $m \times 1$ vector of structural disturbances. The specification in matrix form is as follows:

(Eq. 3-2) $$z(t) = \begin{bmatrix} z_1(t) \\ z_2(t) \end{bmatrix}, \quad A(L) = \begin{bmatrix} A_{11}(L) & 0 \\ A_{21}(L) & A_{22}(L) \end{bmatrix}, \quad \varepsilon(t) = \begin{bmatrix} \varepsilon_1(t) \\ \varepsilon_2(t) \end{bmatrix}.$$

The assumptions of (Eq. 3-2) are that the coefficient matrix of L^0 in $A(L)$, A_0 is non-singular and $\varepsilon(t)$ is uncorrelated with $z(t-s)$ for $s > 0$.

In the matrix $A(L)$, $A_{12}(L)$ is zero so as to represent the block exogeneity. This means that the second block $z_1(t)$ is exogenous to the first block $z_2(t)$ both contemporaneously and for lagged values of the variables. Thus, the maximum likelihood estimation of VAR models as in Sims (1986) and Gordon and Leeper (1994) is not applicable to the identified VAR model with block exogeneity. 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 (1999).

The lag order, suggested by the Schwarz Information Criterion, of my identified VAR model with block exogeneity is 2, and it is constructed as $z_1 = [Parity]$ and $z_2 = [rexch, Inf, y]'$. Therefore, the foreign shock that I are trying to analyze is in the USD-Euro parity. Within this framework, USD-Euro parity does not get any feedback from the domestic economy. The reverse is, by definition, valid in that the USD-Euro parity affects the domestic economy. The ordering of the variables in z_2 is important. My assumption is that the first variable that would be affected from an innovation in the parity is the real exchange rate. The second variable in the ordering is inflation, which I assume will not affect the real exchange rate but is affected by the real exchange rate contemporaneously. The last variable in the ordering is output because it is affected by both the real exchange rate and inflation contemporaneously, but not vice versa. However, these three variables affect each other with lags. In my specification, I also employ a constant term, and quarterly dummy variables to account for seasonality.

My VAR specification, except for the inclusion of parity, is the same as those of Kamin and Rogers (2000), and Berument and Pasaogullari (2003), which respectively studied the cases of Mexico and Turkey. The above-mentioned ordering

of endogenous variables in the VAR follows the same reasoning as proposed in those studies.

3.4. Impulse Response Functions: Capturing the Effects of USD-Euro Parity

The impulse response functions for 8 periods computed by using my VAR specifications are reported in Figure 3-2. A one standard deviation shock is given to parity within the SVAR specification described in Section 3.[31]

In Figure 3-2, the self-response of parity is positive and statistically significant for seven periods. The real exchange rate, *rexch*, responds negatively to an innovation in *Parity* for seven quarters, i.e. a real appreciation of the TL against the USD. Although the illustrative model of Appendix 2 shows the ambiguity of the sign of *Parity* in the reduced-form real exchange rate Equation, this finding does not depict the same ambiguity. The response of *Inf* to *Parity* is significantly negative for seven quarters. In other words, when the USD value of the Euro increases, domestic inflation falls, which is consistent with recent developments in the Turkish economy.[32] The real GDP (y) responds positively to *Parity*. Its response is statistically significant for six quarters. The responses of *rexch* and y to *Parity* are economically meaningful according to my illustrative model given in Appendix 2. Although there is no clear implication about *Inf* in the same model, the response of *Inf* to *Parity* has been clearly revealed by my Structural Vector Auto Regressions (SVAR) specification. All these findings are *acceptable by intuition*, since an

[31] I use the conventional "RATS" Bayesian simulation method based on Sims and Zha (1999) to produce the error bands for the impulse responses, where the error bands are 68% bands from the Bayesian procedure.

[32] Starting at the end of 2001, the rate of inflation in Turkey displayed a noticeable decline, the key target of the latest stabilization package, which was also supported by the IMF. The parity developments in international foreign exchange markets have also been believed to partly support this disinflation process.

increase in the USD value of the Euro may cause an increase in the terms of trade, measured as the ratio of the price of exportables to the price of importables. Such an increase improves the trade balance in the short-to-medium term, assuming that the real quantities of exports and imports will not be affected during this same period.[33] It is clear that such improvement in the trade balance will also improve output. As far as domestic inflation is concerned, an increase in the USD value of the Euro is associated with the relative cheapening of imported inputs priced in USD terms. In this way, domestic inflation drops significantly.

In order to check for the robustness of my SVAR specification to crises, I replicate the results of Figure 3-2 after controlling for the occurrence of the two major financial crises in Turkey during the last decade, using the three additive dummy variables. The first crisis occurred in the second quarter of 1994 whereas the second and third dummies cover the last quarter of 2000 and the first quarter of 2001. The major findings of Figure 3-2 do not change, as a visual comparison of Figure 3-3 and Figure 3-2 reveals. The negative response of inflation (*Inf*) is statistically significant for seven quarters (with the exception of the third quarter) and the positive response of the real GDP (*y*) is statistically significant for five quarters. The negative response of *rexch* to *Parity* runs from the second to the seventh period following the *Parity* innovation. Therefore, I can say that the impulse-responses are robust even with the inclusion of crisis dummy variables.[34]

[33] See Berument and Dincer (2005) on the effects of USD-Euro parity on the trade balance.
[34] The sensitivity exercise that I have carried out using binary dummy variables is more mechanical in its nature; i.e. I want to control for any possible breaks in the estimated VAR relationship, without specific reference to the literature.

3.5. Conclusion

This essay examines how changes in USD-Euro parity affect the economic performance of a small open economy with different currency compositions of exports and imports, using Turkish data. This research question is especially relevant since the relative movements of two of the world's major currencies may have unidirectional and sizable effects on a small open economy, such as Turkey. These effects will be through the channels of real exchange rate and/or the terms of trade, where these two neither totally overlap, nor are they mutually exclusive. Regardless of the channel, net exports and output will eventually respond to changes in relative trade prices. An unbalanced currency composition of trade can be viewed as a pre-condition for this last statement. Since USD-Euro parity is an important exogenous variable for the case of Turkey, its effects are elaborated on in this study, where the empirical evidence suggests that inflation drops and output increases following positive parity innovations, the real exchange rate being negatively affected by USD-Euro parity.

The econometrics of the feedback from USD-Euro parity to the Turkish economy is carried out within a VAR system with block exogeneity. This approach particularly suits the case at hand, owing to the one-way nature of the feedback. That is, USD-Euro parity will have reflections on a small open economy while the occurrence of the opposite causality is never expected. My results are robust up to the inclusion of crisis dummies and the terms of trade in the VAR setup.

The impact of the results of this essay is considerable since the case of Turkey, as a small open economy, establishes a benchmark example for similar economies with regard to changes in USD-Euro parity. The extent of the exposure of a small open economy to the relative movements of two major currencies is clearly

depicted. The fundamental conclusion of this study, hence, is that macroeconomic policies should be dependent on external parity shocks originating from the world's major currencies.

Table 3-1: Cross-correlations of Parity and Other Variables of Concern

	Levels [a]			**First differences**			**Deviations from linear trend**		
Lag[b]	*Inf*	*rexch*	*y*	*Inf*	*rexch*	*y*	*Inf*	*rexch*	*y*
0	**-0.357***	**-0.280***	**0.324***	**-0.323***	**0.197***	-0.046	**-0.300***	-0.166	-0.040
1	**-0.220***	**-0.248***	**0.332***	**0.203***	0.101	0.172	-0.136	-0.162	0.069
2	**-0.209***	**-0.247***	**0.271***	0.020	-0.083	0.115	-0.105	-0.191	0.043
3	**-0.215***	**-0.235***	0.156	0.104	-0.093	**-0.270***	-0.133	**-0.212***	-0.102
4	**-0.288***	-0.192	0.154	**-0.262***	-0.141	0.027	**-0.252***	**-0.194***	-0.041
5	-0.193	-0.133	0.150	0.081	0.046	0.176	-0.151	-0.148	0.034
6	-0.145	-0.096	0.076	0.055	-0.071	0.060	-0.083	-0.128	-0.024
7	-0.136	-0.045	-0.032	0.030	-0.187	**-0.232***	-0.086	-0.099	-0.163
8	-0.146	0.028	-0.029	-0.183	0.178	-0.007	-0.118	-0.042	-0.113
	Deviations from Quadratic trend			**Deviations from Cubic trend**			**Deviations from HP trend**		
Lag[b]	*Inf*	*rexch*	*y*	*Inf*	*rexch*	*y*	*Inf*	*rexch*	*y*
0	-0.121	-0.131	0.036	-0.121	-0.116	0.031	-0.125	-0.072	0.002
1	0.079	-0.096	0.142	0.081	-0.099	0.144	0.103	-0.058	0.138
2	0.044	-0.114	0.079	0.050	-0.143	0.083	0.075	-0.124	0.082
3	0.005	-0.103	-0.084	0.009	-0.151	-0.084	0.029	-0.152	-0.102
4	-0.156	-0.045	0.019	-0.156	-0.124	0.020	-0.157	-0.130	0.021
5	-0.018	0.043	0.084	-0.020	-0.040	0.091	-0.006	-0.042	0.113
6	0.020	0.098	-0.025	0.022	0.011	-0.016	0.044	0.003	0.006
7	0.004	0.187	-0.180	0.004	0.092	-0.174	0.025	0.087	-0.166
8	-0.032	**0.324***	-0.107	-0.035	**0.263***	-0.101	-0.021	**0.271***	-0.079

a. The table shows the cross-correlations between *Parity* and *Inf*, *rexch*, and *y*. The transformation above each three-column block is applied to all variables included in that block.

b. Lag refers to the number of periods by which USD-Euro parity lags a series.

* Indicates that the cross-correlation figure is significant at the 10% level of significance. Standard deviations of cross-correlations are computed as $1/\sqrt{T}$, where T is the sample size.

Table 3-2: Augmented Dickey-Fuller Test Statistics

	ADF test in levels*		**ADF test in first differences**	
	With constant Without trend	**With constant With trend**		**With constant Without trend**
Inf	-2.382	-2.955	*Inf*	-2.382
Parity	-0.795	-1.723	*Parity*	-0.795
rexch	-1.376	-1.548	*rexch*	-1.376
y	-0.309	-1.504	*y*	-0.309

* Rejection of the null-hypothesis of a unit-root at the 1% level of significance. The optimal number of lags of the first difference of the test variable in the ADF test Equation is determined by using the modified-Schwarz criterion.

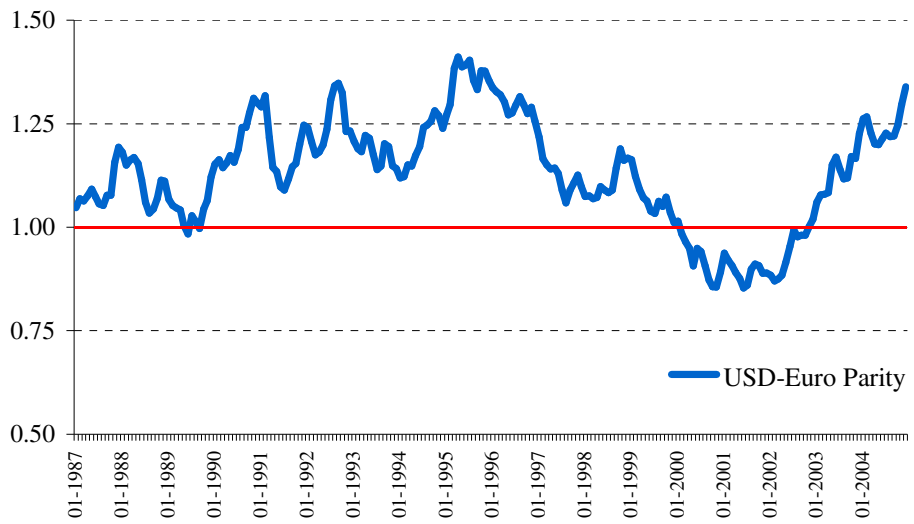
* * *

Table 3-3: Cointegration Test Among the Variables *Inf*, *Rexch* and *y* with the Exogenous Series *Parity*

Hypothesized Number of Cointegrating Equations	Eigenvalue	$\lambda_{\max}$	5 percent Critical Value	λ_{trace}	5 percent Critical Value
None*	0.467	42.83	20.97	49.28	29.68
At most 1	0.059	4.18	14.07	6.45	15.41
At most 2	0.032	2.27	3.76	2.27	3.76

* denotes rejection of the hypothesis at the 5% level of significance. The critical values are based on Osterwald-Lenum (1992).

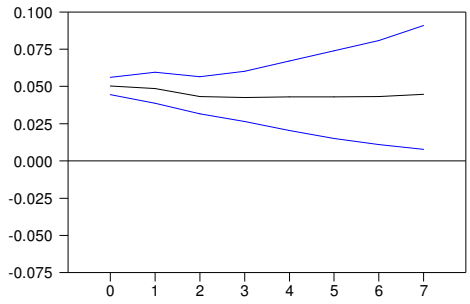
Figure 3-1: USD-Euro Parity



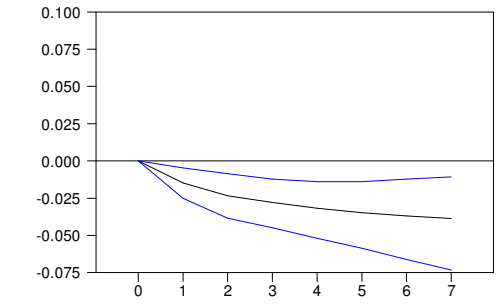
USD-Euro parity is measured as the USD value of the Euro. An increase in the parity figures, hence, shows the appreciation of the Euro against the USD.

Figure 3-2: Impulse-Response Functions

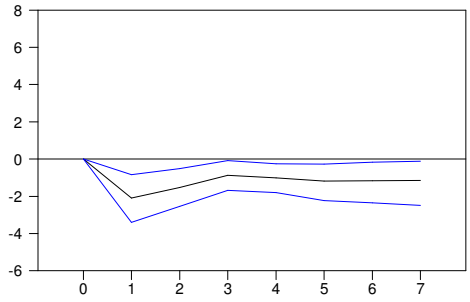
Response of Parity to Parity



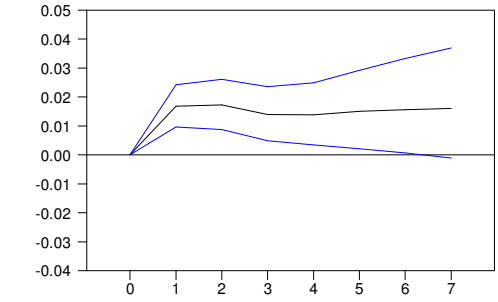
Response of Real Exchange Rate to Parity



Response of Inflation to Parity



Response of Real GDP to Parity

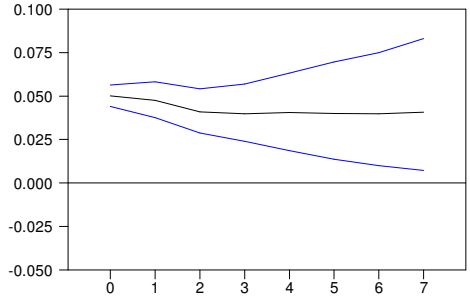


The central line in each panel presents the impulse-response function. The envelopes are the 68% error bands obtained from the Bayesian procedure, based on Sims and Zha (1999).

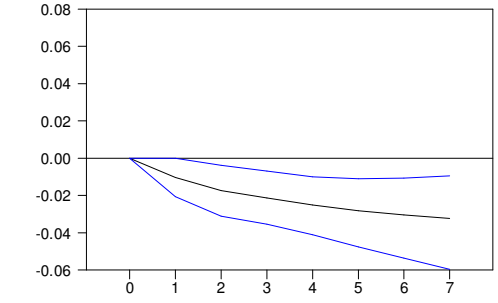
* * *

Figure 3-3: Impulse-Response Functions: With crisis dummies

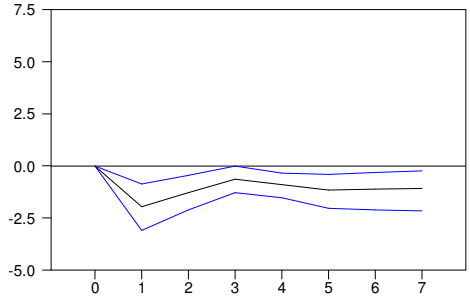
Response of Parity to Parity



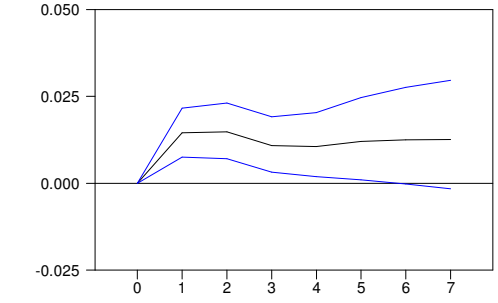
Response of Real Exchange Rate to Parity



Response of Inflation to Parity



Response of Real GDP to Parity



The central line in each panel presents the impulse-response function. The envelopes are the 68% error bands obtained from the Bayesian procedure, based on Sims and Zha (1999).

CHAPTER 4

IS BUDGET DEFICIT AN APPROPRIATE MEASURE OF FISCAL STANCE?

4.1. Introduction

Inflation is a monetary phenomenon, but Fischer and Easterly (1990) argue that fiscal expansion is the main motive of monetary expansion; thus, inflation should be a fiscal phenomenon. All the attempts made by Turkey to decrease inflation or to stabilize the economy are also associated with the fiscal tightening. In all these attempts, consolidated budget figures are used to measure the fiscal tightness. However, measuring and monitoring fiscal tightness is problematic. Deficit from consolidated budget does not measure the stance of fiscal policy and its information content for the future economic performance is weak. For example, Polackova (1998) argues that the government's hidden financial commitments and contingent liabilities become a major concern for macroeconomic and fiscal instability in a number of countries. Similar argumentation can be found in Easterly (1999) where it is argued that government can respond to forces which impose contractionary changes in its conventional deficit by lowering its asset accumulation

or increasing its hidden liabilities. Clearly, fiscal adjustment is illusionary under such circumstances. To be particular, Metin (1998) finds a positive relationship between inflation and the public sector borrowing requirement (PSBR), Ozmen and Koru (2000) cannot find a similar relationship between inflation and the consolidated budget deficit for Turkey. Thus, consolidated budget deficit could be a misleading measure to stabilize the economy. Moreover, Joulfaian and Marlow (1991), using U.S. data and employing a Granger causality framework, find sound evidence that the information content of the budget deficit statistics is not conclusive about the stance of the fiscal policy. Their study is motivated with the hypothesis that controls on on-budget government spending leads to greater off-budget activity. In this study, the analysis by Joulfaian and Marlow (1991) is extended by further investigating for the linkage between the consolidated budget deficit and the total public budget deficit under asymmetric situations in which the on-budget activity goes under expansionary or contractionary changes.

Turkey forms an appropriate example for the mentioned case of on-budget and off-budget relationship. In Turkey, the public sector borrowing requirement (PSBR) consists of a number of items, which are not the consolidated central government; these are losses of state-owned enterprises, subsidies to the social security system, duty-losses of the publicly owned banks, contribution to revolving-fund institutions, budgets of local governments, default payments on guaranteed investment, and project credits by the Treasury. Among those, only the central government budget is subject to the control of the Ministry of Finance. The consolidated budget constitutes around 60 to 80% of the PSBR and this ratio changes from year to year. Therefore, a stable relationship between the figures of the consolidated budget and PSBR does not exist.

My analysis reveals that the information content of the consolidated budget deficit statistics is not empty, as opposed to the case of Joulfaian and Marlow (1991). My major result is that the PSBR increases in response to a positive innovation to the consolidated budget deficit, indicating the absence of the substitution effect proposed by Joulfaian and Marlow (1991). In other words, even when the policy-makers induce an expansion of the consolidated budget, it is still possible for the off-budget items to increase. One another important point that needs to be highlighted is that a decrease in PSBR deficit is actually associated with an increase in budget deficit. This might be due to increased efforts in the past to limit off-consolidated budget deficit, so that total (PSBR) deficit decreases, but I put partly these decreased items to the consolidated budget. This suggests that even if I adopt a tight fiscal policy consolidated budget deficit might be showing loose fiscal policy. Thus, it is worth to mention that the information provided by the consolidated budget deficit might be misleading for judging about the stance of the fiscal policy in Turkey.

The significance of my study is two-folds. First, I provide evidence regarding the low reliability of the consolidated budget deficit statistics in evaluating the stance of fiscal policy in Turkey, hence finding a reason for the dispute between Metin (1998) and Ozmen and Koru (2000). Second, I extend the work of Joulfaian and Marlow (1991) by performing the analysis under asymmetric movements of the consolidated government budget, hence accounting for the functional relationship between on-budget and off-budget activities. In Section 2, I describe my data and variables. Section 3 presents the methodology and the empirical results. Finally, Section 4 concludes the essay.

4.2. Data and Variables

The data on the *consolidated budget deficit*, the *public sector borrowing requirement*, and *gross domestic product* are provided by the Undersecretariat of Treasury and the State Institute of Statistics[35], all measured in current billion TL. Then, my variables *BD* and *PSBR* are defined as the ratios of the nominal consolidated budget deficit and nominal public sector borrowing requirement to nominal *GDP*, respectively. A positive value of *BD* indicates a consolidated budget deficit, by definition, and vice versa. The data set is annual from 1975, the official start of data series, to 2000. Although data exist for 2001, I exclude this year in my data set since the huge transfers to public sector banks largely distorted the public sector borrowing requirement figure for 2001. The time plots of my variables of interest are given in Figure 4-1 which suggests an association between my variables of interest on the surface.

4.3. Empirical Analysis

4.3.1. Symmetric Effects

I analyze the linkage between the ratio of the consolidated budget deficit to GDP (*BD*) and the ratio of the total public budget deficit, measured by the public sector borrowing requirement, to GDP (*PSBR*), using Vector Auto Regression (VAR) models. I define my basic VAR model as follows:

[35] All data series can be reached at the data delivery system of the Central Bank of the Republic of Turkey, http://tcmbf40.tcmb.gov.tr/cbt.html

Specification 1:

$$\begin{bmatrix} PSBR_t \\ BD_t \end{bmatrix} = \begin{bmatrix} \alpha_{01} \\ \alpha_{02} \end{bmatrix} + \begin{bmatrix} \alpha_{11} & \beta_{11} \\ \alpha_{12} & \beta_{12} \end{bmatrix} \begin{bmatrix} PSBR_{t-1} \\ BD_{t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{bmatrix}$$

Using Specification 1, I seek for the baseline relationship between *PSBR* and *BD*. I obtain the impulse response functions from Specification 1[36], using a Monte Carlo procedure with 500 replications. In my VAR specification, the ordering of the variables is such that the consolidated budget deficit is affected first and then the impact of any possible shock is transmitted to my second variable, namely the total government budget deficit contemporaneously. This ordering is important in the sense that I introduce a shock to my variable over which more control can be exercised. In other words, I first let the government take expansionary or contractionary actions over its consolidated budget; then I observe the incidence of such action on other items of the public budget. Hence, I follow the basic hypothesis structure offered by Joulfaian and Marlow (1991). The graphs of these impulse response functions can be seen in Figure 4-2.[37] The figure suggests that the consolidated budget deficit gives a negative response to a one-standard-deviation innovation to the total public budget deficit, yet this relationship is not statistically significant. On the other hand, as I introduce a one standard deviation positive innovation to the consolidated budget deficit, the total public budget deficit increases, and this is statistically significant at least for two years. This result differs from that of Joulfaian and Marlow (1991) in the sense that no substitution exists between the on-budget and off-budget activities in my study.

[36] The lag length of 1 is determined by using Schwarz Information Criterion.

[37] The estimates of the impulse response coefficients are plotted with 90% confidence bounds unless otherwise specified.

4.3.2. A Contraction in the Consolidated Budget

It is worth to mention that the relationship that is presented in the previous subsection provides only a basic understanding of the linkage between the budget deficit and the public sector borrowing requirement. Moreover, the reader may notice that the process presented by Specification 1 does not account for any asymmetric effects; yet I extend my analysis in order to capture possible asymmetric effects of the size of the consolidated budget deficit on the public sector borrowing requirement. It may be quite possible that a contraction of the consolidated budget affects the total public budget differently than an expansion of the consolidated budget does. Under a contraction of on-budget activity I can expect an increase in off-budget activity due to the resource constraints faced by policy makers other than the central government. On the other hand, such distortion of the constraint on financial resources will not be seen in the case of an expansion of the consolidated budget. Following Specification 1, the consolidated budget is modeled as:

$$\text{(Eq. 4-1)} \quad BD_t = \alpha_0 + \sum_{i=1}^{n} \alpha_i BD_{t-i} + \sum_{i=1}^{n} \beta_i PSBR_{t-i} + \varepsilon_t$$

Having obtained the residuals from (Eq. 4-1), I define my dummy variables which are designated as indicators of the situations in which the actual consolidated budget deficit figure is above and below the estimate of it obtained from (Eq. 4-1) to account for unanticipated fiscal easiness and tightness as measured with the consolidated budget. I call these variables P_t and N_t, respectively; and define them in terms of residuals from (Eq. 4-1) as follows:

$$P_t = \begin{cases} 1, & \text{if } \varepsilon_t \geq 0 \\ 0, & \text{otherwise} \end{cases}$$

$$N_t = \begin{cases} 1, & if\ \varepsilon_t < 0 \\ 0, & otherwise \end{cases}$$

In my next specification, I add P_t, and its interactions with BD_{t-i} and $PSBR_{t-i}$ to my basic VAR model. In this way, I intend to control for the observations at which the actual budget deficit figure is larger than the estimated one; hence, I distill the relationship under the case of the contraction of the consolidated budget. I estimate the following VAR model:

Specification 2:

$$\begin{bmatrix} PSBR_t \\ BD_t \end{bmatrix} = \begin{bmatrix} \alpha_{01} \\ \alpha_{02} \end{bmatrix} + \begin{bmatrix} \alpha_{11} & \beta_{11} \\ \alpha_{12} & \beta_{12} \end{bmatrix} \begin{bmatrix} PSBR_{t-1} \\ BD_{t-1} \end{bmatrix} + P_t \begin{bmatrix} \gamma_{11} \\ \gamma_{12} \end{bmatrix} + P_t \begin{bmatrix} \lambda_{11}^P & \theta_{11}^P \\ \lambda_{12}^P & \theta_{12}^P \end{bmatrix} \begin{bmatrix} PSBR_{t-1} \\ BD_{t-1} \end{bmatrix} + \begin{bmatrix} \eta_{1t} \\ \eta_{2t} \end{bmatrix}$$

My use of interaction terms in Specification 2 is due to Ellis and Thoma (1991). These terms are designated to handle the asymmetric effects when the consolidated budget deficit exceeds its value estimated by (Eq. 4-1). I estimate the VAR model and obtain the impulse response functions using a Monte Carlo procedure with 500 replications, which are presented in Figure 4-3.

Figure 4-3 suggests that a one-standard-deviation negative shock to the total public budget deficit, namely a movement of PSBR in surplus direction, increases the consolidated budget deficit. However, the total public budget deficit decreases after a one-standard-deviation negative shock to the consolidated budget deficit. Both relationships are statistically significant. In comparison with the results presented in Figure 4-2, it is observed that the response of the consolidated budget to total public budget becomes significant. The response of the total public budget to the consolidated budget remains significant. Furthermore, the directions of change

do not differ between Figure 4-2 and Figure 4-3.[38] The difference between the response coefficients in the two figures is sizable.

4.3.3. An Expansion in the Consolidated Budget

In the last stage of my analysis, in order to control for the observations at which the actual consolidated budget deficit figure is smaller than the figure estimated with (Eq. 4-1), I replace P_t with N_t in Specification 2. Then, I can present my last model as described by the following VAR setup:

Specification 3:

$$\begin{bmatrix} PSBR_t \\ BD_t \end{bmatrix} = \begin{bmatrix} \alpha_{01} \\ \alpha_{02} \end{bmatrix} + \begin{bmatrix} \alpha_{11} & \beta_{11} \\ \alpha_{12} & \beta_{12} \end{bmatrix} \begin{bmatrix} PSBR_{t-1} \\ BD_{t-1} \end{bmatrix} + N_t \begin{bmatrix} \gamma_{11} \\ \gamma_{12} \end{bmatrix} + N_t \begin{bmatrix} \lambda_{11}^N & \theta_{11}^N \\ \lambda_{12}^N & \theta_{12}^N \end{bmatrix} \begin{bmatrix} PSBR_{t-1} \\ BD_{t-1} \end{bmatrix} + \begin{bmatrix} \eta_{1t} \\ \eta_{2t} \end{bmatrix}$$

Having controlled for the observations at which the consolidated budget deficit falls short of its value estimated by (Eq. 4-1), I can figure out the relationship between the consolidated budget deficit and the total public budget deficit for the case of the expansion of the consolidated budget. This is again through a Monte Carlo procedure with 500 replications upon the estimates of the model described by Specification 3. The impulse responses for my last model are provided in Figure 4-4, which suggests that a one-standard-deviation positive shock to the total public budget deficit induces a decrease of the consolidated budget deficit; yet, this relationship is not statistically significant. When I introduce a one-standard-deviation positive shock to the consolidated budget deficit, it is observed that the total public sector borrowing requirement increases in a statistically significant manner.

[38] The impulse response coefficients are plotted with the reversed sign in Figure 4-3 for better visualization and understanding. The reader can interpret the plotted response coefficients upon one-standard-deviation negative shocks to the variables of concern.

In general, a contraction of the consolidated budget is expected to induce an expansion of the off-budget activities, hence an expansion of the total public budget. However, an expansion of the consolidated budget is not expected to cause a contraction of the total public budget despite an expected fall in the off-budget expenses. When I interpret my findings in comparison to these conjectures, I can say that the consolidated budget and the total public budget moves together whenever the innovation is introduced to the first one; and they move in opposite directions if the innovation is introduced to the total public budget, in all three cases that I have analyzed. Then, it is clear that the information content of the budget deficit statistics of Turkey is not empty. However, the conclusions driven by the budget deficit statistics might be misleading while assessing whether the fiscal policy in action is expansionary or contractionary.

4.3.4. Further Remarks

I have presented my basic findings in the previous subsections. In this subsection, I elaborate on the structure of budget statistics in Turkey, as well as the general attitudes of public decision-making entities toward budgetary operations. Turkish Constitution requires all state expenditures to have an official record in the budget owing to the parliamentary characteristic of the Republic of Turkey. In other words, all decision-making bodies must be accountable for their responsibilities. However, Financial Report of the Turkish Court of Accounts (2000) introduces and employs a new term "off-record"[39] budget to denote the operations, which, in fact, do

[39] The reader will distinguish my use of the terms on-budget versus off-budget from the Court of Account's use of the terms on-record versus off-record budget. While I distinguish between central government budget and the remaining part of public budget, the Court of Accounts puts the emphasis whether a given public expense has a record in the budget amended by the Turkish Grand National Assembly or not.

not relate to the official budget although they actually must be. These operations are actually related to several public expenses, but they are recorded in a way that hides them from the auditing function of the Turkish Grand National Assembly.

According to the Treasury Operations Report of the Turkish Court of Accounts (2001), off-record budget expenses have three major negative implications for the economy. First, actual budget deficit is under-reported. This hides crucial information regarding the central government activities. Moreover, the importance and power of impact of the budget decreases. Second, while reporting the sources and uses of national budget, part of the newly created debt is hidden. Finally, since off-record budget is not in reach of the audit power of the Turkish Grand National Assembly, effective monitoring of public expenses becomes nearly impossible and accountability of decision makers is not well-established.

To shed some light on the actual budgetary position and financing activities, the Turkish Court of Accounts employs a different measure in assessing the Public Sector Borrowing Requirement, which is called "Net Debt Revenue". Net Debt Revenue (*NDR*) is defined as the total amount of newly created debt minus all debt repayments by the Treasury in a given year. In this way, the Court monitors the actual path of public debt creation process instead of taking into account the reported *PSBR* figures. Given the definition of *NDR*, whenever there is a difference between *NDR* and *PSBR*, the quantity *NDR-PSBR* shows the off-record public expenses. *NDR* series has stronger local trends than the reported *PSBR* series has, i.e. it has higher variation yet a smaller number of turning points as depicted by Figure 4-1.

The definition of *NDR* as proposed by the Turkish Court of Accounts has a couple of drawbacks, as well. For example, *NDR* is sensitive to the maturity structure of the public debt. The reader may try to construct an imaginary series

assuming, ceteris paribus, that the maturity of the public debt increases over time. In such a case, *NDR* will understate the actual picture. Furthermore, as far as the data generating process underlying the *NDR* series is considered, it is apparent that *NDR* series is associated with two error terms, namely the ones belonging to the *PSBR* series and to series of the off-record expenses. However, for sake of completeness, I regenerated my previous exercise using the *NDR*[40] series instead of the *PSBR*, yet the estimates were far from being statistically significant though having the similar impulses as before. The final experiment of ours, in which I used *NDR-PSBR* instead of *PSBR* did not result in statistically significant findings, either. The lack of significance in these two exercises is probably due to the more complicated data generating processes, reminding us the *Type II error*, e.g. not rejecting the null hypothesis when it is false.

4.5. Conclusion

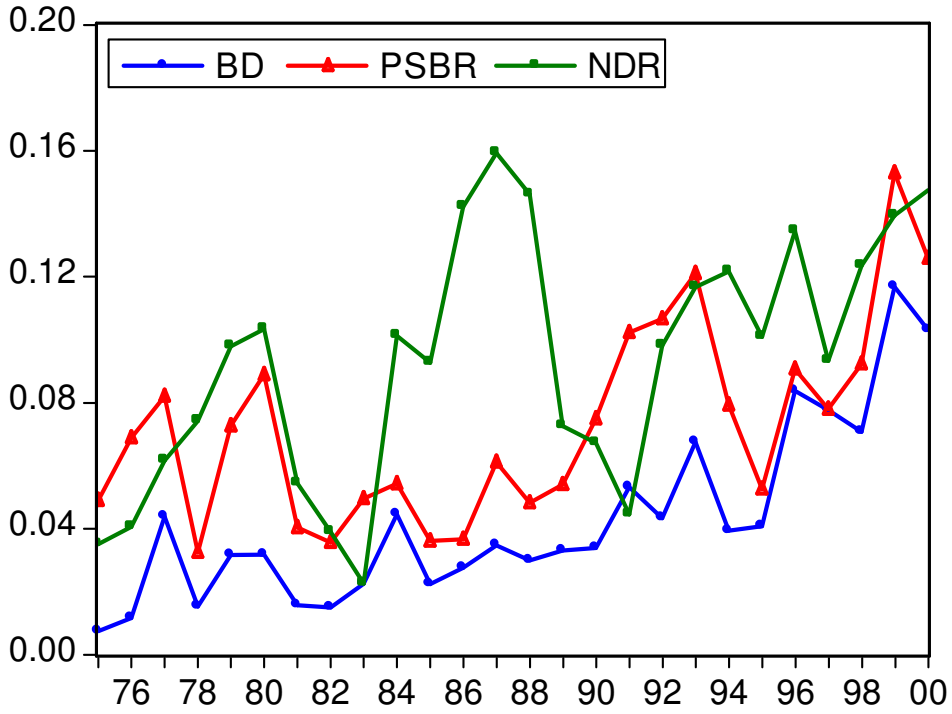
In this essay, I elaborated on the question of whether the size of the budget deficit is an appropriate and adequate measure of the stance of fiscal policy in Turkey by analyzing the relationship between the consolidated budget deficit and the total public budget deficit due to Joulfaian and Marlow (1991). Having observed the opposite findings by Metin (1998) and Ozmen and Koru (2000)[41] regarding the relationship between inflation and budget deficit in Turkey, I raised the question of whether the consolidated budget deficit and the total public budget deficit behave similarly, yet the paper does not argue about who the winner of the dispute is.

[40] Nominal Net Debt Revenue data was compiled from the Financial Report (2000) and the Treasury Operations Report (2000) of the Turkish Court of Accounts. Then, *NDR* is computed as the ratio of nominal net debt revenue to the gross domestic product.

[41] Ozmen and Koru (2000) do not find the positive association between inflation and budget deficit for Turkey that is revealed by Metin(1998). Recall that the former performs analysis employing the consolidated budget deficit while the latter uses the public sector borrowing requirement.

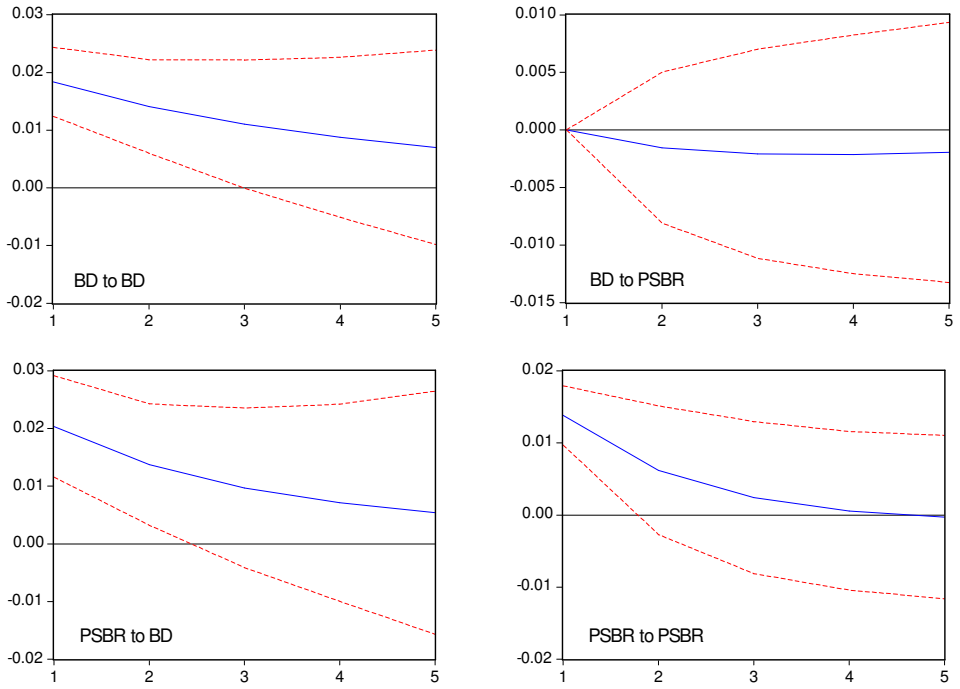
In my analysis, using VAR specifications, the relationship between the consolidated budget deficit and the total public budget deficit in Turkey was figured out for the period of 1975-2000. The analysis was performed for three cases; namely for the overall sample, controlling for the observations with a contraction in the consolidated budget and controlling for the observations with an expansion in the consolidated budget. In the first case, total public budget deficit responds positively to a positive innovation to the consolidated budget. In either of the second and third cases the directions of change of the total public budget and the consolidated budget are the same. These three cases provide us with enough evidence to conclude that the consolidated budget deficit statistics have some informational value; yet the provided information may be misleading for assessing the fiscal stance of the government. Therefore, there apparently exists a need to find a more appropriate and adequate measure.

Figure 4-1:Consolidated Budget Deficit, Public Sector Borrowing Requirement and Net Debt Revenue: 1975-2001



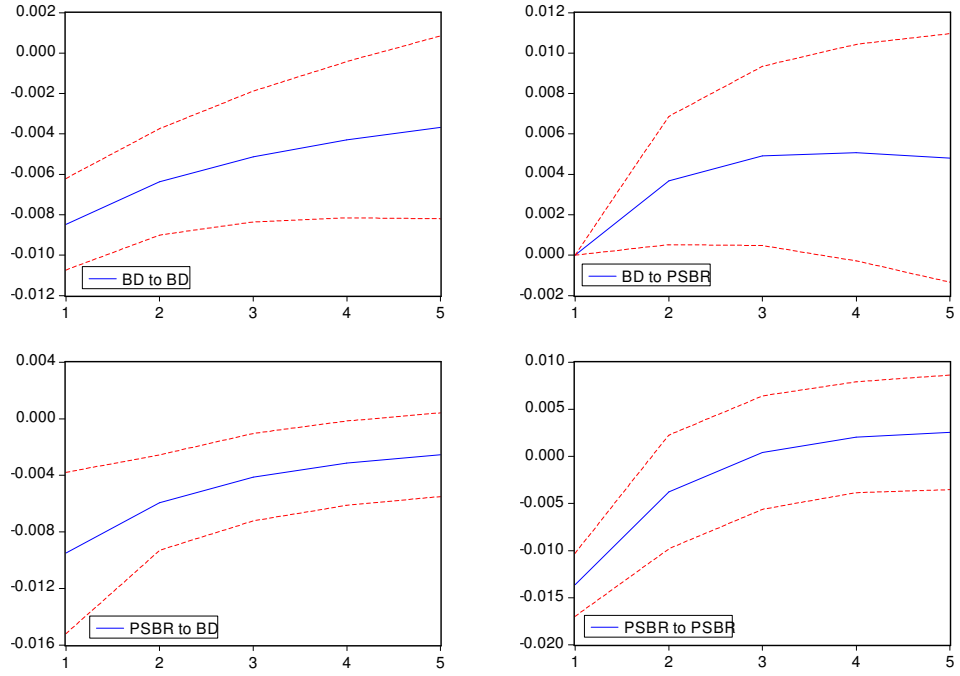
This figure shows the time paths of the Consolidated Budget Deficit (*BD*), the Public Sector Borrowing Requirement (*PSBR*) and the Net Debt Revenue (*NDR*) from 1975 to 2000. The variables are defined as proportions of the Gross Domestic Product (*GDP*). A rough association between the variables is what an initial look yields. This may point out the missing substitution between the on-budget and off-budget activities. Ertugrul and Selcuk (2001) can be visited for the behaviours of my variables of interest in retrospect.

Figure 4-2: Impulse Responses: Symmetric Effects



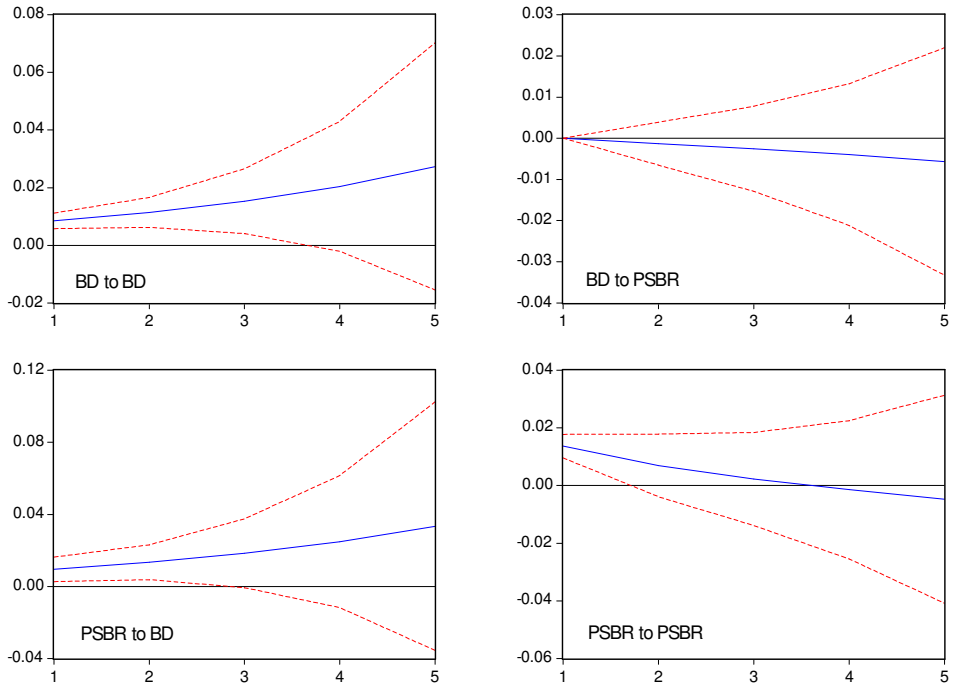
The impulse responses are displayed in the four panels of the figure. In each panel, the horizontal axis shows the time periods and the magnitudes of the response coefficients are given on the vertical axis. The impulse responses are for positive one-standard-deviation innovations in the affecting variable. "*BD to PSBR*" should read "response of *BD* to a one-standard-deviation positive innovation in *PSBR*". The dashed curves are the 90% confidence bounds.

Figure 4-3: Impulse Responses: Contraction in the Consolidated Budget



The impulse responses are displayed in the four panels of the figure. In each panel, the horizontal axis shows the time periods and the magnitudes of the response coefficients are given on the vertical axis. The impulse responses are for negative one-standard-deviation innovations in the affecting variable. "*BD to PSBR*" should read "response of *BD* to a one-standard-deviation negative innovation in *PSBR*". The dashed curves are the 90% confidence bounds.

Figure 4-4: Impulse Responses: Expansion in the Consolidated Budget



The impulse responses are displayed in the four panels of the figure. In each panel, the horizontal axis shows the time periods and the magnitudes of the response coefficients are given on the vertical axis. The impulse responses are for positive one-standard-deviation innovations in the affecting variable. "*BD to PSBR*" should read "response of *BD* to a one-standard-deviation positive innovation in *PSBR*". The dashed curves are the 90% confidence bounds.

CHAPTER 5

LONG LIVE FENERBAHCE: PRODUCTION BOOSTING EFFECTS OF FOOTBALL

5.1. Introduction

The connection between Turkish industrial production performance and the success of a popular Turkish football team, namely Fenerbahce, is the central theme of this article. The success of Fenerbahce is interpreted as a proxy for the workers' mood/morale. Performing a transfer function analysis on my data set, I reveal a positive feedback from Fenerbahce's success to economic performance such that the monthly industrial growth rate increases by 0.26% with the number of games won by Fenerbahce in European cups, regardless of where the game is played. On the other hand, the evidence of the effects of Fenerbahce's domestic games on industrial performance is not statistically significant. Based on my findings, it can be argued that there is a psychological/social link between the success of a top rank Turkish team and the performance of workers in industry.

The main claim of this study is that when people's favorite team is successful then they get in a better mood and become more productive. Since I do not have a

direct measure of "mood", I employ the success of a popular football team as an indicator of people's "mood". I also provide an array of possible theoretical explanations for my hypothesis and propose a transmission mechanism that defines the process that links football success to workers' productivity. More specifically, Fenerbahce's success is expected to affect the industrial production growth positively and in a statistically significant manner. The validity of this hypothesis is tested under different setups to check for the robustness of my statistical assessment.

At the very beginning, I should admit that my choice of Fenerbahce as the object of analysis does not represent any subjective preferences. This choice is basically motivated by the general perception of the team by the Turkish society often uses the phrase "Fenerbahce Republic". That is, the team is a stylized example/symbol of a long-lived sports institution and supporters' strong loyalty to it.[42]

The next section presents my proposed mechanism, which links productivity to football success in an attempt to guide readers through the article. This is followed by a discussion of the relevant literature. Then, the structure of the Turkish football industry is described. Finally, estimations and commentary on results are presented as separate sections, in that order.

5.2. Proposed Relationship between Football Success and Productivity

The mechanism is triggered by some temporary innovations to social cohesion among the supporters of a team. Football success, in this regard, is an innovation that boosts the morale and self-esteem of the fans of a team. This will

[42] As a part of robustness tests, I repeated the analysis for the other two big teams in Turkey (Beşiktaş and Galatasaray), the basic conclusions were robust.

elevate the individuals' morale and self-esteem. In this way, there will be a positive affect, then this higher self-esteem will lead to higher production due to better social behavior and more efficient decision making. In the next section, where I discuss the related lines of the literature, I also extend each component of my proposed mechanism.

5.3. Literature and the Background Material

This section briefly reviews different lines of earlier literature, which lend support to my proposed mechanism. It should be stressed that these lines of literature are neither overlapping nor are they mutually exclusive in their respective scopes; and this is basically how they fit into the proposed mechanism.

5.3.1. Economics of Sports

The economics of sports have introduced an important volume of research. Much of these efforts are directed toward investigating the public financing of sports facilities. This basically involves how much the building of new sports facilities or the spending of fans who come for sport events contribute to an economy (one may look at Siegfried and Zimbalist, 2000, for an extensive review of the literature). Only two studies led us to think that productivity increases following the success of football is the channel to affect production even if none-of them state it quite like that. To be specific, Coates and Humphreys (2002) investigate the determinants of real income in cities with professional sports teams and report evidence that the home city of the winner of the Super Bowl has higher real per capita income. Although it is only statistically mentioned (not explicitly elaborated on), another likely mechanism how championship affects real income in the home city of the

champion, might work to increase the productivity of labor. Similarly, Pollard (2002) addresses the linkage between growth performance and the World Cup success of selected countries and demonstrates a positive relationship, without mentioning a possible reason for it.

There are other studies examining the relationships between success in sports and economic performance. Ashton, Gerrard and Hudson (2003) reveal a strong association between the performance of the England's football team and subsequent daily changes in the FTSE 100 index. They mention a possible 'feel good' factor to explain why the stock market reacts to the performance of the national football team. Watson (2001) demonstrates that the Super Bowl has proved to be right 83% of the time in predicting an increase in the stock market. Similarly, in Haugen and Hervik (2002), ups and downs of the London Stock Exchange map the disasters and triumphs of the English football team.

None of these studies measure the exact mechanism through which sporting success affects production. However, all of them highlight the observation that sporting success has certain effects on economic variables. Consequently, one might attribute such effects to a psychological/social angle of productivity.

5.3.2. Identity, Social Cohesion and Spectating Behavior

Iso-Ahola and Hatfield (1985) draw the following main conclusions when they examine the spectator behavior: First, growing in a sports culture makes it likely that individuals will become sports consumers who are drawn most powerfully towards contests between equal but successful teams. Second, fans personalize victory and bask in reflected glory. Finally, external attribution biases psychologically insulate spectators from the pain of defeat, and internal biases make

winning that much sweeter. Based on these, I can attribute a great deal of importance to the role of sport events in re-establishing and maintaining the self-esteem and morale of the spectators.

The term 'social cohesion' is often used to describe a positive characteristic of a society that deals with the relationships among members of that society. It is synonymous with 'social fabric', implying a supporting structure for the groups within a society. In other words, it is the bonding effect of that web of social relationships through which individuals are attached to and help each other in a society, knowingly or inadvertently, to achieve their full potential (Stanley, 1997, p.2).

It should be stressed that spectating behavior and football performance should not be thought as major sources of identity and pride; but as complementary ones. For an average citizen, football-related material is almost always accessible and consumable. More importantly, the consumption of football by a spectator mostly requires a gathering of people, although that gathering makes them an aggregate rather than a group. Moreover, once I accept the function of football as a pride maintainer, I can say that this aggregate becomes more closely attached each time they are engaged in a football event. In line with the above arguments, Kennedy (2001, p. 282) argues that in many cases in professional sports the community of spectators is a thoroughly commodified cohesion. As he suggests, the state or commercial sponsors, and the broadcasting media, contribute to the lack of cohesion or lack of community that spectators otherwise feel in their everyday lives.

Social identification can be defined as the perception of belonging to a group and a sense of openness with the group (see, Ashfort and Mael, 2001). Tolman (1943) argues that with identification, agents feel at one with the group. The

successes/failures of a group become the agent's successes/failures; the groups' prestige/humiliation becomes the agent's prestige/humiliation. Identification also enhances self-esteem, provides meaning and purpose in life and raises aspirations (see for example, Ibarra, 1999). Being a fan of a football team is a specific form of social identification. Fanship is an association in which a great deal of emotional significance is derived from membership. Schafer (1969) argues that fans of a team value their team as an extension of their personal sense of self. Therefore, they value their team's success as their own success. Success in football provides a reference point in agents' behavior to maximize their individual potential. Seeing what others are capable of may provide motivation to strive and achieve (e.g., Ibarra, 1999). Heider's (1958) balance formulation suggests that a fan of a team who evaluates a team positively will also evaluate the associated fan positively. Therefore, this increases the agent's self-esteem in the eyes of others. Sloan (1979) measured fans' moods before and after a game. He found that agents report greater happiness and lower anger or discouragement after a victory, and the opposite is true after a loss. Schwarz et al. (1987) reported that German men were more satisfied with their lives after a victory of the German national team in the 1982 Soccer World Championship but the opposite was true after a defeat. Hirt (1992) found that one's favorite team's winning/losing does affect the fan's mood or self-esteem. After a win, agents estimated their own abilities to perform various tasks to be higher than subjects whose team lost. Moreover, game outcome affects agents' estimates of their own future performance.

Certain characteristics of football success can be an important dimension in the success-productivity relationship, especially when I reconsider the case in a domestic versus international perspective. Once I accept the aforementioned

relationship, I should accept it for all teams in a domestic league. In this case, the success of a given team within a domestic league will improve the morale of its supporters while reducing that of the supporters of other teams, possibly implying a crowding out of morale innovations; and hence a crowding out of productivity outcomes. On the other hand, when a team plays abroad against a foreign rival, it is quite likely that the domestic non-supporters of the team will support it on that occasion. Therefore, winning against a foreign rival will increase the morale of society more than winning against a domestic rival.

Another reason why wins against foreign rivals stimulate the production is that national pride could be enhancing self-esteem and mood for a sports fan even more. States usually have at least one national football team to represent them in international competitions and their national football associations represent them in the FIFA (Fédération Internationale de Football Association), (Duke and Crolley, 1996; p.4). Anderson (1983) treats nations as imagined communities combining both objective and subjective attributes. Tomlinson (1994) suggests that nations attain their fullest expression in either of two ways: war or sport. Consequently, football captures the notion of an imagined community. The national identity is confirmed, when eleven players are representing it in a match against that of another nation. Therefore, general motivation and pride of a nation can be enhanced through football matches.

The contribution of sports to nationalism can be marked as important even in the era of globalization. Wong and Trumper (2002) examine the cases of two global celebrity athletes and conclude that they serve as national culture icons for the formation and reaffirmation of national identities in their countries of birth, despite their transnational nature.

5.3.3. Mood and Productivity

Positive mood has been associated with various behaviors that may enhance performance; these are greater support behavior, enhanced creativity, more efficient decision making, greater cooperation, the use of more successful negotiation strategies and fewer absences (see, for example, Baron, 1990; Forgas, 1998; Staw and Barsade, 1993 George, 1989). George (1991) associates positive mood with sales-related prosocial behavior, but negative mood is associated with lower performance (Monk, 1990).

Even if there is extensive literature on the relationship between mood and performance, this does not mean that the causation is from mood to performance. It might very well be the case that performance affects mood (see, Wright, Cropanzano and Meyer, 2004). However, Baumeister, Campbell, Krueger, and Vohs (2003) associate the mood with achieving more goals, more satisfaction with progress toward goals, more behavioral pursuit of goals. Their research suggests high self-esteem people use better self-regulation strategies than low self-esteem people to achieve their respective tasks.

On the other hand, Parkinson, Totterdell, Briner and Reynolds (1996) argue that mood affects a range of processes including perception, reasoning, memory and behavior, all of which may be involved with performance. Totterdell (1999) found that cricket players' subjective and objective performances are related to their happiness, energy, enthusiasm, focus and confidence during the match. In particular, players perform better when they are happy, focused, energetic, enthusiastic and confident. As regards how mood affects performance, Matthews (1992) elaborated on two channels on this transmission (1) the facilitating effects of energetic mood on

information processing efficiency, (2) the facilitating effects of hedonic tone (pleasantness of mood) on the processing of mood-congruent information.

The model of George and Brief (1996) proposes that moods (both positive and negative) are related to performance. They argue that moods can influence both the distal (i.e. related to behavior choice or effort level) and the proximal (i.e. related to the actual task-specific behavior itself) aspects of motivation. For distal motivation, moods affect the various cognitive mechanisms associated with how one determines "appropriate" expectancy, instrumentality and valence levels.

Moods, especially positive moods, may lead to proximal motivation (actual task-specific behaviors) through their ability to stimulate employee self-motivating behavior. Alternatively, even if their potential effects are not as easily observed and are not direct.

To sum up the discussion of this sub-section, this theory of psychology and the associated empirical research provide us with support as to how the positive/optimistic psychological state of individuals is correlated with job performance. In the spirit of the discussion of this section, Fenerbahce's success, owing to the wide popularity of the team, significantly adds to fans' self-esteem and mood, consequently improving job performance and productivity due to a better decision making process and the enhancement of social cohesion, although it might be temporary.

5.3.4. Summary

On the whole, the literature that has been surveyed provides us with theoretical support as to the productivity enhancing effects of "football success". Briefly, spectating behavior transforms the football success into an elevated level of

morale. This initial boost augments social cohesion and individual's self-perception. Then, through the self-esteem/mood channel, people tend to cooperate more, have more efficient decision making processes and demonstrate a higher level of productivity. From a technical point of view, I am not equipped to measure any of these variables except football success and productivity. My proposed mechanism introduces a plausible attempt to explain the connection between sporting success and productivity, which has not been addressed in detail in earlier literature on sports economics.

5.4. Turkish Football Industry and Social Aspects of Football in Turkey

The Turkish National Football League (NFL) was established in 1959. The number of teams, varying between 12 and 20, was finally fixed at 18 after the 1994-95 season. Currently, all the teams play each other during the season and the winning team receives 3 points, ties get 1 point and the losing team gets no points. At the end of each season, the team having the highest overall score wins the championship.

The teams to play in the Turkish Cup are determined by the Turkish Football Federation on the basis of their previous performance in the Turkish Cup and in the NFL. The number of teams that play in the Turkish Cup changes every year. Unlike the NFL, the Turkish Cup uses the process of elimination.

Teams that represent Turkey in European tournaments are determined by games played among themselves. The first two teams in the NFL participate in the Champions League. The winner of the Turkish Cup and the third, fourth and fifth teams participate in the UEFA Cup (Union of European Football Associations). The participants in the Cup Winners Cup (CWC) are the winners of each nation's Cups.

Certain characteristics of the Turkish football industry distinguish it from its counterpart in the US. First, the experience of sports franchises is not customary. There is no franchise market in which urban administrations demand the existence of professional sports teams in their territories. Rather, I observe an already settled structure (i.e. teams do not move from one city to another) and all sports teams are partially subsidized by the budget of the Ministry of Youth and Sports. Second, the teams established in Istanbul dominate the countrywide football industry. Finally, the construction of new stadiums is rare. Owing to these characteristics, my study also differs from studies in the earlier literature of Sports Economics since I deal with overall industrial performance rather than the well-being of individual cities.

A quick glance at football in Turkey will reveal that the football industry has developed rapidly during the last three decades. At this point, it is important to note that the evidence on the importance of football in Turkey is anecdotal rather than being in the form of full-fledged academic studies. I can base my discussion of the issue on two studies: In the first one, Sert (2000), similar to Iso-Ahola and Hatfield (1985), reports that football has turned out to be a lifestyle in Turkey. He argues that football has an almost perfect association with the more general term 'sports' in Turkey. Furthermore, the term football instantly calls forth the well-established football teams of Istanbul, one of which is Fenerbahce. The mass media has played the most important role in cultivating the rapid emergence of this football culture, especially through primetime TV broadcasts. Weekly TV broadcast schedules are quite focused on football -related material. For instance, it is possible to find more than one football magazine issued regularly. Football, in general, turns out to be the most commonly shared public concern. Given the high inclination of people towards avoiding daily politics and activist political concerns especially after the 1980s, I can

argue that the daily morale of Turkish society is being fed by the success of football teams, resulting in a football-addicted society. Concerning football as a marketable mass-media commodity, Miller (1999) can be visited for the *televisualization* of sport and *sportification* of television, the process of sports teams becoming media entities.

5.5. Model and Estimation Method

5.5.1. Variable Definitions

Industrial performance is measured by using g^Y, the monthly rate of growth of the industrial production index, which is computed as the logarithmic difference of the seasonally adjusted industrial production index, an official statistic compiled and published by the State Institute of Statistics of Turkey. It is computed on the basis of the survey data gathered from 913 firms with regard to 403 manufactured staple commodities. The base year of the index is 1997 and it summarizes nearly 73% of the total industrial establishments in Turkey.

For each month *t*, my notational convention is as follows (Table 5-1 provides the full list of success variables): I denote the number of games won, tied, or lost with *W*, *T*, and *L*, respectively. A subscript of *h* refers to games played at Fenerbahce home and *d* stands for the games played away, namely when it plays as guest. Absence of a subscript indicates that I aggregate data regardless of the home field. The superscript *All* is for all games; *Turkey* is for the games played in Turkey with Turkish teams regardless of the type of the tournament; *Europe* is for the games played in European tournaments; *Season* is for the games played in national-season; and *Non-season* stands for domestic games played outside national-season. If there is

no superscript, then this denotes all games regardless of the type of the tournament and whether the game is played abroad or not. The actual game data is converted into the success variables simply by counting the number of wins, losses and ties for each month in prospective classification. The only exception is that a game actually played in month t is recorded for month $t+1$ if the first workday after the game belongs to month $t+1$.

A final component of my specification concerns the shocks to the economy: Turkey had experienced a devastating financial crisis in April of 1994, which adversely affected the real sector as well as the financial sector of the Turkish economy. In order to provide sufficient statistical control for this crisis, which decreased the industrial growth rate considerably, dummy variables denoted shortly by D_t are employed. In particular, the 3rd, 4th, and 5th months of 1994 were controlled by using a dummy variable for each, D_{94-3}, D_{94-4}, and D_{94-5}, respectively.

5.5.2. Econometric Specification and Estimation Method

It is assumed that industrial production growth, g^Y, follows an autoregressive path; hence, it is regressed against its lags up to the fifth order and the success variables of Fenerbahce. The inclusion of lags of the monthly rate of change in industrial production allows us to account for the dynamics of the original industrial production growth series. The optimal lag length for the growth of industrial production is determined by using the Final Prediction Error (FPE) criterion. FPE criterion chooses the optimal lag length such that the residual terms in each time

period are not autocorrelated.[43] In this way, the variance-covariance matrix of the estimated relationship is consistently estimated and the estimated parameters are unbiased and efficient.

The part of variation not explained by the autoregressive model for g^Y is attributed to Fenerbahce by using the variables Z_{jt} as shown in (Eq. 5-1):

$$\text{(Eq. 5-1)} \quad g_t^Y = \alpha_0 + \sum_{i=1}^{5} \alpha_i g_{t-i}^Y + \sum_{j=1}^{J} \gamma_j Z_{jt} + \delta D_t + \varepsilon_t$$

In terms of (Eq. 5-1), the values of α_k, $k = 0,...,5$, and γ_j are the parameters to be estimated. The set of variables Z_j are the success variables for Fenerbahce and their lags are not included in the analysis, having observed that they were not statistically significant in the preliminary analysis, which is not reported in the article. The coefficient of D_t captures and controls for the effects of financial crises on industrial production. The ε_t's are the *i.i.d.* error terms.

The success variables in the ten model specifications considered in this study can be demonstrated explicitly as follows:

$Z = [W, T, L]$ (Specification 1)

$Z = [W^{Turkey}, T^{Turkey}, L^{Turkey}]$ (Specification 2)

$Z = [W^{Europe}, T^{Europe}, L^{Europe}]$ (Specification 3)

$Z = [W^{Non-season}, T^{Non-season}, L^{Non-season}]$ (Specification 4)

$Z = [W^{Season}, T^{Season}, L^{Season}]$ (Specification 5)

$Z = [W_h, W_d, T_h, T_d, L_h, L_d]$ (Specification 6)

[43] Bayesian Information Criteria suggests the lag order to be 2. As a robustness test, I repeat the analysis with 2 lags. The results were robust. However, in order to save space, these results are not reported here.

$$Z = [W_h^{Turkey}, W_d^{Turkey}, T_h^{Turkey}, T_d^{Turkey}, L_h^{Turkey}, L_d^{Turkey}] \quad \text{(Specification 7)}$$

$$Z = [W_h^{Europe}, W_d^{Europe}, T_h^{Europe}, T_d^{Europe}, L_h^{Europe}, L_d^{Europe}] \quad \text{(Specification 8)}$$

$$Z = [W_h^{Non-season}, W_d^{Non-season}, T_h^{Non-season}, T_d^{Non-season}, L_h^{Non-season}, L_d^{Non-season}] \quad \text{(Specification 9)}$$

$$Z = [W_h^{Season}, W_d^{Season}, T_h^{Season}, T_d^{Season}, L_h^{Season}, L_d^{Season}] \quad \text{(Specification 10)}$$

The models presented in (Eq. 5-1) and the Specifications 1 to 10 are estimated using the Ordinary Least Squares technique. The coefficients γ_j are of my interest in (Eq. 5-1). Using econometric terminology, these coefficients correspond to the transfer function that I estimate, which is the statistically estimated relationship that explains how an exogenous movement is transferred to an autoregressive endogenous variable. The variable g_t^Y is assumed to follow an autoregressive process, which is interrupted by Z_{jt} in each period. The coefficient γ_j of the variable Z_{jt} is tested under the null hypothesis $(H_0 : \gamma_j = 0)$. This type of specification is often used in the literature. For instance, McCallum (1978), Alesina and Sachs (1988), Ito and Park (1988), and Heckelman and Berument (1998) employ similar transfer function specifications in their analyses of political business cycles. Enders (2004, Chapter 5) can be accessed for an adequate discussion of the transfer function analysis. In recent literature, Ergun (2000) also used the transfer function analysis to investigate various Turkish macroeconomic variable aggregates, including industrial production. In this case, I study the effects of Fenerbahce's success on Turkish industrial performance. My work falls in the class of transfer function analyses by the definition of Z_{jt}.

One may suspect a two-way statistical connection between morale and productivity, suggesting simultaneity bias; my treatment of the variables of interest

allows us to avoid such bias since it is unlikely that industrial production will affect the success of Fenerbahce. In that sense, I do not have a simultaneity bias issue and the likelihood of having an accidentally significant statistical relationship is minimized at the design stage. Charemza and Deadman (1992, Chapter 6) can be seen for a discussion of the simultaneity bias.

5.5.3. Data

Data on industrial production reported by the State Institute of Statistics of Turkey were compiled from the electronic data delivery system of the Central Bank of the Republic of Turkey (It can be reached at http://tcmbf40.tcmb.gov.tr/cbt.html). Historical game records of the football performance of Fenerbahce in international cups as well as in domestic games were compiled from Tanrikulu (2002) and the official website of the UEFA. (UEFA data are accessible at http://www.uefa.com). The study period is from 1986:8 to 2002:5 and data is compiled or computed at monthly frequencies.

5.6. Results and Commentary

5.6.1. Estimation Results

I present the model estimates in Table 5-2 and Table 5-3. The specifications of Table 5-2 hide the home-versus-away field information. In the specifications presented in Table 5-3, I distinguish between the home- and away games so as to find out whether the field is an important factor in translating the success of the team into workers' morale. The crisis dummies and the lags of the dependent variable are common to both tables, as well as the sum of squared residuals and coefficients of

determination reported at the end of the estimation. A quick glance at the tables shows the negative impact of the April 1994 financial crisis. In all ten specifications, the estimates of the dummy variables are significantly negative. The level of significance is 5% throughout the study unless otherwise noted.

Specification 1 of Table 5-2 provides us with statistically significant evidence that Fenerbahce's total number of wins affects industrial production positively. The magnitude of the corresponding coefficient estimate is 0.046. Fenerbahce's ties and losses also seem to affect the dependent variable, yet they are not statistically significant.[44] Therefore, Fenerbahce's success is transformed into increased productivity.

Specification 2 and Specification 3 are designated to test whether the findings of Specification 1 stay the same when I separate games as domestic versus the international. When a team plays against foreign rivals, the effect on morale of a win is augmented by the enhancement of national identity; whereas, when it plays against a domestic rival, the effects might offset each other. Moreover, as the domestic rival loses, there is a possible canceling out effect when the fans of rival team have bad moods, and the low productivity of those fans could cancel out the high productivity of Fenerbahce fans. In my statistical setup, Specification 2 and Specification 3 are used to address these arguments.

Specification 2 suggests that the wins of Fenerbahce against its domestic rivals have no statistically significant impact on productivity. As depicted by Specification 3, the effects on industrial production of Fenerbahce's wins for games played in Europe turn out to be positive and statistically significant. The magnitude of the positive transfer from the number of wins to the monthly rate of industrial

[44] The level of significance is at the 5% level, unless otherwise mentioned.

production growth is about 0.25%. Fenerbahce's total impact will be proportional to the number of wins in a given month. That is, when Fenerbahce wins twice as many games in a given month, the feedback to the industrial production is doubled in magnitude. Specification 3 also shows significant evidence that industrial production is adversely affected by Fenerbahce's ties and losses in European games, meaning that the coefficient estimates have the expected signs though they are not statistically significant.

As might be predicted, the importance of each game is not the same. For example, the results of non-season games have no relationship to the eventual ranking for championship. These games are usually played before the season starts, in order to increase and enhance team cooperation. In that sense, non-season games may have importance since they possess a kind of signaling effect on supporters. Specifications 4 and 5, in Table 5-2, report the corresponding estimates. Specification 4 is especially important since it demonstrates that Fenerbahce's wins in domestic non-season games have a statistically significant positive impact on industrial production, the coefficient estimate having a magnitude of about 0.12, annually compounding to nearly 1.5%. Fenerbahce's losses in these games also positively affect the industrial production in a statistically significant manner with a coefficient of 0.079. The games that are classified as Non-season are the ones played between the popular football teams before the opening of the season. Therefore, this finding possibly reflects the initial boosting effects of the approaching new season. Moreover, as these are not crucial games for the new season, being the winner or loser does not matter considerably. Finally, in Specification 5 I observe that season games statistically do not matter for the case of monthly growth in the industrial production.

Specifications 1-5, above, suggest that Fenerbahce's wins have significant positive effects on productivity, especially when they are realized in European tournaments/cups or in the non-season games. In order to deepen my understanding, I classified the game results further with respect to the venue of each match. It is clear that the likelihood of winning a game at home or away is not the same. Generally, it is more difficult to win at the rival's field, compared to the home field. Owing to this observation, I can expect wins at the rival's field to boost productivity further when compared to wins at home. Consequently, in the specifications presented in Table 5-3, I further distinguish between games played at Fenerbahce's home and away. In fact, Table 5-3 is the replicated version of Table 5-2 after I distinguish between home versus away games.

In Specification 6, there is no statistically significant evidence that winning either at home or away has explanatory power for industrial growth. The same evidence is also valid for the ties and losses of Fenerbahce's games played at home or away. Specification 7 and Specification 8 decompose the games into the opposing team. If the opponent is another Turkish team, the estimation of Specification 7 does not reveal any statistically significant evidence that score and location of the game have explanatory power for industrial production. The estimates in Specification 8 are both interesting and important. First, regardless of whether the game is played at home or away, Fenerbahce's winning is associated with increased industrial production. This increase is slightly higher if the game is played away; both of the estimates are statistically significant. The increase in the monthly growth rate of industrial production due to Fenerbahce's winning is around 0.26%. As a matter of fact, since I measure the success of Fenerbahce by the number of games won in a given month, the total growth impact of Fenerbahce is doubled when the number of

wins doubles. Second, ties in games played away decrease the monthly rate of industrial production growth, but this evidence is not statistically significant. On the other hand, ties for Fenerbahce home games decrease the industrial production significantly. Losses do not change the industrial production in a statistically significant manner.

Specifications 9 and 10 are intended to measure the effects of non-season and season games separately. Specification 9 in Table 5-3 suggests that Fenerbahce's wins in domestic non-season games have a positive impact on industrial production. In Specification 10, it can be seen that there is no statistically significant evidence that season games affect industrial production.

It may seem interesting that the season games won by Fenerbahce have no statistically significant effect whereas the games won in European cups have positive feedback on industrial performance. As mentioned before, a possible cause for this difference is the exclusion of other football teams from my sample, such that whenever Fenerbahce wins in national football season, some of the workers are induced to produce more with higher morale, while for the non-supporters of Fenerbahce it has the opposite effect. There are no such offsetting effects regarding the games played by Fenerbahce in European cups since it is a matter of national pride, identification and solidarity within the highly football-oriented Turkish society, as discussed by Sert (2000) and Bora and Erdogan (1993).

Possible sensitivity of the results to my choice of Fenerbahce is an important point. For instance, the success of Fenerbahce in the national football season, though not totally in a zero-sum fashion, means the failure of another team in any given week of the national season fixture. Thus, one may expect the industrial production boosting effects due to different football teams to offset each other. This is especially

relevant when I consider the competition among the top-ranked teams for the championship. Even if these top-ranked teams do not play against each other in a given week, the success of one indicates increasing difficulty in the competition for the other one, keeping in mind that the national-season champion is determined on the basis of cumulative season points. However, the success of Fenerbahce in games played abroad may induce higher productivity for the corresponding month. This is due mainly to the general tendency of Turkish people to relate *foreign games* to *national pride* and *identification*, as was previously mentioned.

In the above spirit, the performances of two other major football teams of Turkey, namely Besiktas and Galatasaray, are also examined as a robustness exercise. Their results also support my theory with regard to football performance and national identification, i.e. in the cases of both Besiktas and Galatasaray, games won in the European games affect growth performance. The estimates of the specifications for Besiktas and Galatasaray are not provided in the chapter in order to save space, but are available from the authors upon request.

Specifically, in the case of Besiktas, the findings are almost the same as those for Fenerbahce, except that the wins of Besiktas in domestic games matter as well. The case of Galatasaray also resembles the one of the Fenerbahce with the minor difference that in European games, the number of wins on an unbiased field increases the growth rate. As a matter of fact, Galatasaray's success on an unbiased field in European cups is of remarkable importance since the matches of UEFA Cup after the quarterfinals are played on unbiased fields, as required by UEFA rules.

All in all, the results obtained for the other two top-ranked teams are parallel to those obtained for Fenerbahce. It is necessary to note that there are significant effects in the domestic games only in the case of Besiktas. Overall, the effects in the

European games are significant for all three teams, the UEFA Cup having the strongest relationship in the case of Galatasaray, supporting my claim that there is a connection between non-domestic games and the national identification and pride, which improves the morale of Turkish society.

5.6.2. Conclusion

Owing to the development of the football industry and the mass media in Turkey, I use the success of Fenerbahce, the most popular Turkish football team, as a proxy for the morale of workers in Turkey. In a transfer function analysis framework, I measure how workers' morale affects industrial performance and find positive feedback from workers' morale on industrial growth. The magnitude of this positive feedback is a 0.26% increase in the monthly rate of industrial growth for the games won by Fenerbahce in European cups. However, similar feedback is not observed for domestic games in a statistically significant manner.

Table 5-1: List of Success Variables

W_h : wins at home field
W_d : wins in opponent's field
T_h : ties at home field
T_d : ties in opponent's field
L_h : losses at home field
L_d : losses in opponent's field
W_h^{Turkey} : wins at home field, in the games played in NFL
W_d^{Turkey} : wins in opponent's field, in the games played in NFL
T_h^{Turkey} : ties at home field, in the games played in NFL
T_d^{Turkey} : ties in opponent's field, in the games played in NFL
L_h^{Turkey} : losses at home field, in the games played in NFL
L_d^{Turkey} : losses in opponent's field, in the games played in NFL
W_h^{Europe} : wins at home field, in the European cup games
W_d^{Europe} : wins in opponent's field, in the European cup games
T_h^{Europe} : ties at home field, in the European cup games
T_d^{Europe} : ties in opponent's field, in the European cup games
L_h^{Europe} : losses at home field, in the European cup games
L_d^{Europe} : losses in opponent's field, in the European cup games
$W_h^{Non-season}$: wins at home field, in the non-season games
$W_d^{Non-season}$: wins in opponent's field, in the non-season games
$T_h^{Non-season}$: ties at home field, in the non-season games
$T_d^{Non-season}$: ties in opponent's field, in the non-season games
$L_h^{Non-season}$: losses at home field, in the non-season games
$L_d^{Non-season}$: losses in opponent's field, in the non-season games

Table 5-1: List of Success Variables (continued)

W_h^{Season} : wins at home field, in the season games
W_d^{Season} : wins in opponent's field, in the season games
T_h^{Season} : ties at home field, in the season games
T_d^{Season} : ties in opponent's field, in the season games
L_h^{Season} : losses at home field, in the season games
L_d^{Season} : losses in opponent's field, in the season games
W : wins
T : ties
L : losses
W^{Turkey} : wins in NFL
T^{Turkey} : ties in NFL
L^{Turkey} : losses in NFL
W^{Europe} : wins in European cup games
T^{Europe} : ties in European cup games
L^{Europe} : losses in European cup games
$W^{Non-season}$: wins in the non-season games
$T^{Non-season}$: wins in the non-season games
$L^{Non-season}$: wins in the non-season games
W^{Season} : wins in the season games
T^{Season} : wins in the season games
L^{Season} : wins in the season games.

Table 5-2: Estimates of the Transfer Function Specifications (1 to 5)

	SPECIFICATIONS				
Explanatory Variables	1	2	3	4	5
Constant	0.198*	0.237*	0.311*	0.28*	0.262*
	(2.451)	(3.125)	(6.009)	(3.586)	(4.599)
D_{94-3}	-0.586*	-0.598*	-0.578*	-0.587*	-0.526*
	(-7.542)	(-7.523)	(-7.065)	(-7.061)	(-6.342)
D_{94-4}	-0.646*	-0.623*	-0.579*	-0.621*	-0.517*
	(-6.326)	(-6.090)	(-5.599)	(-5.817)	(-5.013)
D_{94-5}	-1.524*	-1.476*	-1.428*	-1.484*	-1.451*
	(-15.733)	(-14.309)	(-13.989)	(-14.218)	(-14.376)
W	0.046*				
	(2.141)				
T	0.013				
	(0.347)				
L	0.044				
	(1.236)				
W^{Turkey}		0.032			
		(1.392)			
T^{Turkey}		0.022			
		(0.543)			
L^{Turkey}		0.035			
		(0.767)			
W^{Europe}			0.251*		
			(3.769)		
T^{Europe}			-0.055		
			(-0.515)		
L^{Europe}			-0.036		
			(-0.678)		
$W^{Non-season}$				0.117*	
				(3.065)	
$T^{Non-season}$				0.029	
				(0.385)	
$L^{Non-season}$				0.079*	
				(2.037)	

Table 5-2: Estimates of the Transfer Function Specifications (1 to 5, continued)

	SPECIFICATIONS				
Explanatory Variables	1	2	3	4	5
W^{Season}					0.026
					(1.067)
T^{Season}					0.006
					(0.142)
L^{Season}					0.01
					(0.197)
g^{Y}_{-1}	0.288*	0.298*	0.302*	0.307*	0.306*
	(3.613)	(3.726)	(3.701)	(3.919)	(3.746)
g^{Y}_{-2}	0.277*	0.281*	0.298*	0.305*	0.283*
	(3.609)	(3.638)	(3.800)	(3.841)	(3.575)
g^{Y}_{-3}	0.012	0.000	0.019	0.006	0.001
	(0.144)	0.000	(0.205)	(0.069)	(0.013)
g^{Y}_{-4}	-0.049	-0.053	-0.065	-0.068	-0.054
	(-0.639)	(-0.688)	(-0.845)	(-0.879)	(-0.708)
g^{Y}_{-5}	0.193*	0.200*	0.178*	0.18*	0.189*
	(2.895)	(2.950)	(2.709)	(2.751)	(2.781)
SSR	34.6	35.12	34.67	34.08	35.47
R^2	0.88	0.87	0.88	0.88	0.87
$\overline{R^2}$	0.55	0.54	0.55	0.56	0.54

Note: t-statistics are reported in parentheses under the corresponding estimated parameters. (*) denotes significance at the 5% level.

Table 5-3: Estimates of the Transfer Function Specifications (6 to 10)

	SPECIFICATIONS				
Explanatory Variables	6	7	8	9	10
Constant	0.238*	0.257*	0.309*	0.277*	0.300*
	(3.162)	(3.264)	(5.979)	(5.209)	(3.755)
D_{94-3}	-0.695*	-0.691*	-0.581*	-0.526*	-0.699*
	(-6.466)	(-6.424)	(-7.081)	(-6.338)	(-5.847)
D_{94-4}	-0.604*	-0.595*	-0.576*	-0.499*	-0.595*
	(-5.536)	(-5.294)	(-5.538)	(-4.792)	(-5.239)
D_{94-5}	-1.503*	-1.482*	-1.425*	-1.397*	-1.491*
	(-14.123)	(-13.462)	(-13.854)	(-13.524)	(-13.268)
W_h	0.036				
	(0.864)				
W_d	0.065				
	(1.570)				
T_h	0.081				
	(1.226)				
T_d	-0.035				
	(-0.620)				
L_h	0.050				
	(0.960)				
L_d	0.003				
	(0.056)				
W_h^{Turkey}		0.021			
		(0.494)			
W_d^{Turkey}		0.058			
		(1.340)			
T_h^{Turkey}		0.082			
		(1.230)			
T_d^{Turkey}		-0.035			
		(-0.596)			
L_h^{Turkey}		0.050			
		(0.824)			
L_d^{Turkey}		0.016			
		(0.235)			

Table 5-3: Estimates of the Transfer Function Specifications (6 to 10, continued)

	SPECIFICATIONS				
Explanatory Variables	6	7	8	9	10
W_h^{Europe}			0.257*		
			(2.148)		
W_d^{Europe}			0.264*		
			(2.001)		
T_h^{Europe}			-0.282*		
			(-2.077)		
T_d^{Europe}			-0.026		
			(-0.194)		
L_h^{Europe}			0.017		
			(0.148)		
L_d^{Europe}			-0.090		
			(-1.177)		
$W_h^{Non-season}$				0.178*	
				(1.936)	
$W_d^{Non-season}$				0.089	
				(0.814)	
$T_h^{Non-season}$				0.144	
				(1.218)	
$T_d^{Non-season}$				0.161	
				(1.485)	
$L_h^{Non-season}$				0.105	
				(1.139)	
$L_d^{Non-season}$				0.049	
				(0.559)	
W_h^{Season}					0.011
					(0.251)
W_d^{Season}					0.057
					(1.299)
T_h^{Season}					0.083
					(1.146)
T_d^{Season}					-0.055
					(-0.902)

Table 5-3: Estimates of the Transfer Function Specifications (6 to 10, continued)

	SPECIFICATIONS				
Explanatory Variables	6	7	8	9	10
L_h^{Season}					0.020
					(0.282)
L_d^{Season}					-0.007
					(-0.109)
g_{-1}^{Y}	0.262*	0.275*	0.302*	0.281*	0.279*
	(3.178)	(3.346)	(3.708)	(3.607)	(3.329)
g_{-2}^{Y}	0.298*	0.296*	0.300*	0.318*	0.304*
	(3.964)	(3.972)	(3.788)	(4.027)	(4.000)
g_{-3}^{Y}	-0.002	-0.009	0.019	-0.018	-0.007
	(-0.021)	(-0.108)	(0.209)	(-0.213)	(-0.079)
g_{-4}^{Y}	-0.064	-0.063	-0.069	-0.072	-0.066
	(-0.842)	(-0.827)	(-0.892)	(-0.909)	(-0.879)
g_{-5}^{Y}	0.207*	0.206*	0.179*	0.206*	0.195*
	(3.072)	(3.040)	(2.729)	(3.161)	(2.892)
SSR	34.21	34.58	34.58	33.63	34.79
R^2	0.88	0.88	0.88	0.88	0.88
$\overline{R^2}$	0.56	0.55	0.55	0.56	0.55

Note: t-statistics are reported in parentheses under the corresponding estimated parameters. (*) denotes significance at the 5% level.

CHAPTER 6

CONCLUSION

In this dissertation, I have covered the problems offered by four areas of investigation and through four essays. The basic finding of the first essay (Chapter 2) was a statistically significant negative relationship between treasury auction maturity and interest rates, indicating a negatively sloped yield curve – a finding which is especially valid for the pre-2001 sample. This finding lent empirical support to Alesina et al. (1990) article. Changes in the slope of the estimated yield curve in the post-2001 sub-sample are also reported in Chapter 2, having also noted that the post-2001 period is characterized by higher overall stability of the economy.

The second essay (Chapter 3) revealed that an increase in the USD value of the Euro appreciates the real exchange rate, decreases inflation and increases output. This empirical finding is important: The case of Turkey with regard to changes in USD-Euro parity establishes a benchmark example for similar *emerging market economies* by demonstrating the extent of the exposure of a small-open economy to the relative movements of two big currencies.

Chapter 4 (Essay 3) assesses the relationship between on-budget and off-budget public expenditures. This relationship is especially interesting for economies

like Turkey, in which the ratio of the consolidated budget to the PSBR changes from year to year and does not exhibit a stable pattern. My major result is that the PSBR increases in response to a positive innovation to the consolidated budget deficit. In other words, even when the policy-makers induce an expansion of the consolidated budget, it is still possible for the off-budget items to increase. One another important point that needs to be highlighted is that a decrease in PSBR deficit is actually associated with an increase in budget deficit. This might be due to increased efforts in the past to limit off-consolidated budget deficit, so that total (PSBR) deficit decreases, but I put partly these decreased items to the consolidated budget. This suggests that even if a tight fiscal policy is adopted, the consolidated budget deficit might indicate loose fiscal policy. Thus, it is worth to mention that the information provided by the consolidated budget deficit might be misleading for judging about the stance of the fiscal policy in Turkey.

The last essay (Chapter 5) examines the connection between Turkish industrial production performance and the success of a popular Turkish football team, namely Fenerbahce. The success of Fenerbahce is interpreted as a proxy for the workers' mood/morale. Performing a transfer function analysis on my data set, I reveal a positive feedback from Fenerbahce's success to economic performance such that the monthly industrial growth rate increases with the number of games won by Fenerbahce in European cups, regardless of where the game is played. On the other hand, the evidence of the effects of Fenerbahce's domestic games on industrial performance is not statistically significant.

The main claim of Chapter 5 is that when people's favorite team is successful then they get in a better mood and become more productive. Since we do not have a direct measure of "mood", I employ the success of a popular football team as an

indicator of people's "mood". I also provide an array of possible theoretical explanations for my hypothesis and propose a transmission mechanism that defines the process that links football success to workers' productivity. In fact, the proxy of mood in Chapter 5 (i.e. the football team) can be replaced with another social indicator, if such an indicator exists. For instance, psychological effects of the performance/standing of a political party could be analyzed if such data existed. In this way, the theory of Chapter 5 can be well extended to cover wider issues pertaining to social mood or morale.

BIBLIOGRAPHY

Alesina, A. and J. Sachs, 1988. Political parties and the business cycle in the United States. Journal of Money Credit and Banking, 20 (1), 63-82.

Alesina, A., A. Prati, and G. Tabellini, 1990. "Public confidence and debt management: A model and a case study of Italy" In: Draghi, M., Dornbusch, R. (Eds.), Public Debt Management: Theory and History. Cambridge University Press, Cambridge.

Alesina, A., M. Broek, A. Prati, and G. Tabellini, 1992. "Default risk on government debt in OECD countries", Economic Policy 15, 428-463.

Anderson, B. 1983. Imagined Communities: Reflections on The Origin and Spread of Nationalism, London:Verso.

Ashfort, B.E. and F.A. Mael, 2001. Identification in work, war, sports, and religion: Contrasting the benefits and risks. Journal for the Theory of Social Behavior 31(2), 197-222.

Ashton, J.K., B. Gerrard, and R. Hudson, 2003. Economic impact of national sporting success: Evidence from the London stock exchange. Applied Economics Letters 10, 783-785.

Aydin, S., 2004. "Faiz oranları oynaklığının modellenmesinde koşullu değişen varyansın rolü" (in Turkish) [The role of autoregressive conditional heteroskedasticity in modeling the volatility of interest rates], Central Bank of the Republic of Turkey, mimeo.

Baron, R.A. 1990. Environmentally-induced positive affect: Its Impact on self-efficacy, task performance, negotiation and conflict. Journal of Applied Social Psychology 20, 368-384.

Barro, R., 1995. "Optimal debt management". National Bureau of Economic Research, Working Paper 5327.

Baumeister, R.F., J.D. Campbell,. J.I. Krueger, and K.D. Vohs, 2003 Does high self-esteem cause better performance, interpersonal success, happiness, or healthier lifestyles?, Psychological Science in the Public Interest 4(1).

Berument, H. and A. Gunay, 2003. "Exchange rate risk and interest rate: a case study for Turkey", Open Economies Review, 2003, 14(1):19-27.

Berument, H. and K. Malatyali 2001. "Determinants of interest rates in Turkey", Russian and East European Finance and Trade 37(1):5-16.

Berument, H. and M. Pasaogullari. 2003. "Effects of the real exchange rate on output and inflation: Evidence from Turkey", Developing Economies 41(4), 401-35.

Berument, H. and N. Dincer. 2005. "Denomination composition of trade and trade balance: Evidence from Turkey", Applied Economics 37, 1177-91.

Berument, H. and R.T. Froyen, 2005. "Monetary policy and long term interest rates: evidence from weekly data", Journal of Macroeconomics (forthcoming).

Bora, T. and N. Erdogan, 1993. Dur tarih, vur Turkiye: Turk milletinin milli sporu olarak futbol, [Eng: History stops, Turkey hits: Football as the national game of the Turkish nation], in Futbol ve Kulturu [Eng: Football and Its Culture], Horak, R., W. Reiter and T. Bora (eds.), Istanbul: Iletisim Publishing.

Calvo, G., 1988. "Servicing the public debt: The role of expectations", American Economic Review 78 (4), 647-661.

Calvo, G.A., and P.E. Guidotti, 1990a. "Credibility and nominal debt", IMF Staff Papers 37 (3), 612-635.

Calvo, G.A., and P.E. Guidotti, 1990b. "Indexation and maturity of government bonds" In: Draghi, M., Dornbusch, R. (Eds.), Public Debt Management: Theory and History. Cambridge University Press, Cambridge.

Calvo, G.A., and P.E. Guidotti, 1992. "Optimal maturity of nominal government debt: An infinite-horizon model", International Economic Review, Vol. 33, No. 4, 895-919.

Central Bank of the Republic of Turkey, 2003. Monetary Policy Report, October.

Central Bank of the Republic of Turkey, 2004. Annual Report 2003.

Central Bank of the Republic of Turkey, 2005. Annual Report 2004.

Charemza, W. W. and D.F. Deadman, 1992. New Directions in Econometric Practice: General to Specific Modeling, Cointegration and Vector Autoregression Edward Elgar Publishing Limited.

Coates, D. and B.R. Humphreys, 2002. The economic impact of postseason play in professional sports. Journal of Sports Economics, 3 (3), 291-9.

Cook, T., T. Hahn, 1989. "The effect of changes in the federal funds rate target on market interest rates in the 1970s", Journal of Monetary Economics 24, 331-351.

Cushman, D. and T. Zha, 1997. "Modifying monetary policy in a small open economy under flexible exchange rates", Journal of Monetary Economics 39(3),433-48.

Drudi, F., and R. Giordano, 2000. "Default risk and optimal debt management", Journal of Banking and Finance 24, 861-891.

Duke, V. and L. Crolley, 1996. Football, Nationality and the State, Addison Wesley Longman Limited, New York.

Easterly, W, 1999. "When is fiscal adjustment an illusion", Economic Policy: A European Forum, 0(28), 55-76.

Ellis, C.J. and M.A. Thoma, 1991. "Causality in Political Business Cycles", Contemporary Policy Issues, Vol.IX, Issue 2, 39-49.

Enders, W. 2004. Applied Econometric Time Series. (2nd Ed.) New York : John Wiley and Sons Inc.

Ergun, M. 2000. Electoral political-business cycles in emerging markets: Evidence from Turkey. Russian and East European Finance and Trade, 36 (6), 6-32.

Ertugrul, A. and F. Selcuk., 2001. "A brief account of the Turkish economy, 1980-2000", Russian and East European Finance and Trade, 37, 6-28.

Fischer, S. and W. Easterly, 1990. "The economics of the government budget constraint", World Bank Research Observer, 5(2), 127-42.

Forgas, J.P. 1998. On feeling good and getting your way: Mood effects on negotiator cognition and bargaining strategies. Journal of Personality and Social Psychology 74, 565-577.

George, J.M. 1989. Mood and absence. Journal of Applied Psychology 74, 317-324.

George, J.M. 1991 State or trait: Effects of positive mood on prosocial behaviors at work. Journal of Applied Psychology 76, 299-307.

George, J.M. and A.P. Brief, 1996. Motivational agendas in the workplace: The effects of feelings on focus of attention and work motivation. In B.M. Staw and L.L. Cummings (Eds.), Research in Organizational Behavior (Vol. 18, pp.75-109). Greenwich, CT: JAI Press.

Giavazzi, F., and M. Pagano, 1990. "Confidence crises and public debt management" In: Draghi, M., Dornbusch, R. (Eds.), Public Debt Management: Theory and History. Cambridge University Press, Cambridge.

Gordon, D.B., and E.M. Leeper. 1994. "The dynamic impacts of monetary policy: An exercise in tentative identification", Journal of Political Economy 102,

Grabbe, J.O. 1996, International Financial Markets, Third Edition, Prentice-Hall:New York.

Hamilton, J.D., 1994. Time Series Analysis. Princeton University Press, Princeton, New Jersey.

Haugen, K.K. and A. Hervik, 2002, Estimating the value of the Premier League or the worlds most profitable investment project, Applied Economics Letters 9, 117-120.

Heckelman J.C. and H. Berument 1998. Political business cycles and endogenous elections. Southern Economic Journal, 64 (4), 987-1000.

Heider, F. 1958. The Psychology of Interpersonal Relations. New York: Wiley.

Hirt, E.R., D. Zillman, G.A. Erickson, and C. Kennedy, 1992, Costs and benefits of allegiance: Changes in fans' self-ascribed competencies after team victory versus defeat, Journal of Personality and Social Psychology, 63(5), 724-738.

Ibarra, H. 1999. Provisional selves: Experimenting with image and identity in professional adaptation. Administrative Science Quarterly 44, 764-791.

International Monetary Fund, 2001, World Economic Outlook, May.

International Monetary Fund, 2002. World Economic Outlook, April.

Iso-Ahola, A. and B. Hatfield, 1985, Psychology of Sports: A Social Psychological Approach, Dubuque, IA: Wm C. Brown.

Ito, T. and J.H. Park, 1988. Political business cycles in the parliamentary system. Economics Letters, 27 (3), 233-8.

Jarque, C.M. and A.K. Bera 1987, "A test for normality of observations and regression residuals", International Statistical Review 55:163-72.

Joulfaian, D. and M.L. Marlow, 1991. "The relationship between on-budget and off-budget government", Economics Letters, 35, 307-310.

Kamin, R. 1996. "Exchange rates and inflation in exchange rate-based stabilizations: an empirical examination", International Finance Discussion Paper No:554, Board of Governors of the Federal Reserve System", Washington DC.

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.

Kennedy, D. 2001. Sports and shows: Spectators in contemporary culture, Theatre Research International 26, 277-284.

Ljung, G. and G. Box 1978, "On a measure of lack of fit in time series models", Biometrika 67:297-303.

Matthews, G. 1992. Mood. In A.P. Smith and D.M. Jones (Eds.) Handbook of Human Performance, vol 3: State and trait, pp.161-193. London: Harcourt Brace Jovanovich.

McCallum, B.T. 1978. The political business cycle: An empirical test. Southern Economic Journal, 44 (3), 504-15.

Metin, K., 1998. "The relationship between inflation and the budget deficit in Turkey", Journal of Business and Economic Statistics, 16, 412-422.

Miller, T. 1999. Televisualization. Journal of Sport and Social Issues, 23 (2), 123-5.

Missale, A., and O.J. Blanchard, 1994. "The debt burden and debt maturity", American Economic Review, Volume 84, Issue 1, 309-319.

Monk, T.H. 1990 Shiftworker performance. In A.J. Scott (ed.), Occupational Medicine Shiftwork, pp. 183-198. Philadelphia: Hanley & Belfus.

Osterwald-Lenum, M. 1992 "A note with quantiles of the asymptotic distribution of the maximum likelihood cointegration rank test statistics," Oxford Bulletin of Economics and Statistics, 54, 461–472.

Ozmen, E. and A. Tekin Koru, 2000. "Budget deficits, money growth and inflation: The Turkish evidence", Middle East Technical University, Economic Research Center, Working Paper.

Parkinson, B., P. Totterdell, R.B. Briner, and S. Reynolds, 1996. Changing Moods: The

Polackova, H., 1998. "Government contingent liabilities: A hidden risk to fiscal stability", World Bank Policy Research Working Papers.

Pollard, P. S. 2002. Grooowwwth!. International Economic Trends, Annual Edition. July 2002.

Psychology of Mood and Mood Regulation. London: Longman.

Schafer, W.E. 1969. Some sources and consequences of interscholastic athletics. In G.S. Kenyon (Ed.), Sociology of Sport. Chicago: Athletic Institute.

Schwarz, N., F. Strack, D. Kammer, and D. Wagner, 1987. Soccer, rooms, and the quality of your life: Mood effects on judgments of satisfaction with life in general and with specific domains. European Journal of Social Psychology 17, 69-79.

Sert, M. 2000. The Winner is The One Who Records a Goal: A Sociological Look at Football. (Gol Atan Galip: Futbola Sosyolojik Bir Bakis). Istanbul: Bağlam Publishing.

Siegfried, J. and A. Zimbalist, 2000. The economics of sports facilities and their communities. Journal of Economic Perspectives 14 (3), 95-114.

Sims, C.A. 1972. "Money, income, and causality" The American Economic Review 62(4): 540-52.

Sims, C.A. 1986. "Are forecasting models usable for policy analysis?" Quarterly Review of the Federal Reserve Bank of Minneapolis, 10(1), 2-16.

Sims, C.A., and T. Zha. 1998. "Does monetary policy generate recessions?: Using less aggregated price data to identify monetary policy", Federal Reserve Bank of Atlanta, Working Paper, 98-12.

Sims, C.A., and T. Zha. 1999. "Error bands for impulse responses", Econometrica 67, 1113-55.

Sims, C.A., J.H. Stock, and M.W. Watson. 1990. "Inference in linear time series models with some unit roots", Econometrica 58, 113-44.

Sloan, L.R. 1979. The function and impact of sports for fans: A review of theory and contemporary research. In J.H. Goldstein (Ed.), Sports, Games and Play :Social and Psychological Viewpoints. Hillsdale, NJ: Erlbaum, pp. 219-262.

Spatafora, N., 2003, "How concerned should developing countries be about G-3 exchange rate volatility, World Economic Outlook, Chapter II, 92-111.

Stanley, D. 1997. The economic consequences of social cohesion, Heritage Canada: SRFA-302, Nov. 16, 1997.

Staw, B.M. and S.G. Barsade, 1993. Affect and managerial performance: A test of the sadder-but-wiser vs. happier-and-smarter hypotheses. Administrative Science Quarterly 38, 304-331.

Tanrikulu, A. 2002. History of Fenerbahce: Legends, Heroes, and Facts (Fenerbahce Tarihi: Efsaneleriyle, Kahramanlariyla, Rakamlariyla) (2nd ed.) Istanbul: Yapı Kredi Publishing.

Tobin, J., 1965. "Money and economic growth" Econometrica 33 (4), 671-684.

Tolman, E.C. 1943. Identification and post-war world. Journal of Abnormal and Social Psychology 38, 141-148.

Tomlinson, A. 1994. FIFA and the World Cup, in J. Sugden and A. Tomlinson (eds) Hosts and Champions, Aldershot: Arena.

Totterdell, P. 1999. Mood scores: Mood and performance in professional cricketers. British Journal of Psychology 90, 317-332.

Turkish Court of Accounts. Financial Report, 2000, Ankara, Turkey.

Turkish Court of Accounts. Treasury Operations Report, 2000, Ankara, Turkey.

Turkish Court of Accounts. Treasury Operations Report, 2001, Ankara, Turkey.

Watson, N. 2001. The amazing predictive power of pigskin. Fortune, 144, 156-156.

Wong, L.L. and R. Trumper, 2002. Global celebrity athletes and nationalism. Journal of Sport and Social Issues, 26(2), 168-194.

Wright, T.A., R. Cropanzano, and D.G. Meyer, 2004. State and trait correlates of job performance: A tale of two perspectives. Journal of Business and Psychology 18(3), 365-383.

Zha, T. 1999. "Block recursion and structural vector autoregressions", Journal of Econometrics 90, 291-316.

APPENDICES

Appendix 1: Alesina, Prati &Tabellini (1990) and Calvo&Guidotti (1992) Models

Alesina, Prati and Tabellini (1990)

Here, I presented a formal model that reveals a negative relationship between the treasury auction maturity and interest rates. In order to do that I employ an infinite horizon model, which is based on maximizing a representative individual's lifetime utility function and minimizing the loss function of the government, based on that of Alesina et al. (1990). In this model, a small economy is inhabited by an infinitely-lived individual who maximizes her lifetime utility:

$$\text{(A1.1)}\quad U = \sum_{t=0}^{\infty} \beta^t u(c_t); \quad 1 > \beta > 0$$

where c_t denotes consumption at time t and $u(.)$ is a regular concave utility function. In each period, the individual is endowed with one unit of non-storable

output and she pays a distortionary tax τ_t to the government. The consumer's disposable income is given by $F(\tau_t)$ which is expressed as:

(A1.2) $F(\tau_t) = 1 - \tau_t - f(\tau_t)$

where $f(.)$ shows the distortion of tax with $f(0) = 0$, $f'(.) > 0$, and $f''(.) > 0$. The convexity of $f(.)$ allows us to capture the tax-smoothing behavior.

Consumers have access to perfect international capital markets in which they can borrow and lend at a risk-free interest rate equal to their discount factor, $1/\beta$. I denote those external tax-free assets held as of the beginning of period t with ψ_t.

There exist short-term and long-term debts with designated maturities of 1-period and 2-periods, respectively. The utility maximizing individual has the following budget constraint:

(A1.3) $c_t + \beta\psi_{t+1} + {}_t q_{t+1}\, {}_t b_{t+1} + {}_t q_{t+2}\, {}_t b_{t+2} \le F(\tau_t) + \psi_t - D(\theta_t) + {}_{t-1} b_t (1-\theta_t) + {}_{t-2} b_t (1-\theta_t)$

where ${}_i b_j$ denotes debt issued in period i and maturing in period j and ${}_i q_j$ is the corresponding market price. $D(\theta_t)$ and θ_t are the cost of repudiation and the fraction of the debt repudiated at time t, respectively. The default parameter, θ_t, is assumed to be the same for both types of debt maturing at time t. Alesina et al (1990) assume that the cost of default is such that $D(\theta_t) = 0$ if $\theta_t = 0$ or $\theta_{t-i} = 1$, and $i > 0$, $D(\theta_t) = \alpha$ otherwise.[45]

[45] The timing of the events in the auction process is as follows: First, the government determines the maturity of the borrowings (one- versus two-period). Then it announces the prices at which it is willing to sell the debt, and the maximum amounts for sale for each maturity. Later, on the basis of these prices, the private sector chooses how much debt to buy. Finally, the government chooses the combination of τ_t and θ_t that satisfies the government budget constraint, given the amount of debt outstanding and the debt just sold. The following should hold at an equilibrium: First, in each period and for all sequences of previous aggregate histories, the prices are optimal for the government given the private sector reaction to the announced prices. Second, the private sector portfolio decision is optimal, given the prices and the expected future equilibrium outcomes. Third, the choices of τ_t and

The government's budget constraint is given by:

(A1.4) $_{t-1}b_t(1-\theta_t)+_{t-2}b_t(1-\theta_t)\leq\tau_t+_t b_{t+1\,t}q_{t+1}+_t b_{t+2\,t}q_{t+2}$

and the no arbitrage condition is expressed as:

(A1.5) $_t q_{t+1}=\beta(1-\theta^e_{t+1})_t q_{t+2}=\beta^2(1-\theta^e_{t+2})$

where the superscript e is used to denote private expectations.

If the government does not default in the absence of a confidence crisis, the discounted present value of the debt as of the beginning of period 0 is given by:

(A1.6) $b\equiv_{-1}b_0+_{-2}b_0+\beta_{-1}b_1$

and the optimal tax rate becomes:

(A1.7) $\tau_t=(1-\beta)b\equiv\tau^*;\quad t=0,1,...$

The government, in the absence of a crisis, will not repudiate if:

(A1.8) $\alpha\geq\frac{1}{1-\beta}f[(1-\beta)b]\equiv\underline{\alpha}$

Inequality (A1.8) implies that the government will not repudiate if the cost of repudiation, α, is larger than the tax distortions needed for servicing the debt, $\underline{\alpha}$.

Now, consider a confidence crisis in period t. If the private expectations $\theta^e_{t+i};i>0$, do not depend on the aggregate history of the game in previous periods and if $\theta^e_{t+i}=1$ for $i>0$, then in period t the government can either default or it can repay the debt. In the first case, consumption is

(A1.9) $c_t=(1-\beta)\psi_0+1-\alpha(1-\beta)\equiv c^d$

whereas in the latter case, taxes have to be as follows:

(A1.10) $\tau_t=_{t-1}b_t+_{t-2}b_t$

θ_t are optimal for the government, given the private current investment decision and the effect of the current policy on the expected future equilibrium outcomes.

(A1.11) $\tau_{t+1} = {}_{t-1}b_{t+1}$

(A1.12) $\tau_s = 0; s > t+1$

If the government chooses to repay, consumption from t onwards (c^R) is:

(A1.13) $c_s^R = 1 + \psi_t(1-\beta) - (1-\beta)[f({}_{t-1}b_t + {}_{t-2}b_t) + \beta f({}_{t-1}b_{t+1})]; s \geq t$

Comparing the consumption figures in the two cases, I can say that the government chooses to repay if and only if:

(A1.14) $\alpha \geq [f({}_{t-1}b_t + {}_{t-2}b_t) + \beta f({}_{t-1}b_{t+1})] \equiv \overline{\alpha}_t$

It should be clear that $\overline{\alpha}_t$ is the counterpart of $\underline{\alpha}$ in the case of a confidence crisis.

It can be shown that, since no debt is repaid between periods 0 and t, $\overline{\alpha}_t > \underline{\alpha}$ for all t. Hence, if $\overline{\alpha}_t > \alpha \geq \underline{\alpha}$, then there exists an equilibrium in which a confidence crisis occurs in period t or earlier. Thus, $\overline{\alpha}_t$ depends on the maturity structure of the public debt.

A consequent proposition in Alesina et al (1990) demonstrates that equilibrium with a confidence crisis is less likely to occur if (1) only long-term debt is issued and (2) the same amount of debt matures in each period. This is shown by minimizing $\overline{\alpha}_t$ by the choice of three borrowing variables, ${}_{t-2}b_t$, ${}_{t-1}b_t$ and ${}_{t-1}b_{t+1}$, subject to a constant net present value of debt, which is given by:

(A1.15) ${}_{t-1}b_t + {}_{t-2}b_t + \beta_{t-1}b_{t+1} \equiv b; t = 0,1,...$

The first order conditions of this minimization problem imply:

(A1.16) ${}_{t-1}b_t + {}_{t-2}b_t = {}_{t-1}b_{t+1}$

Since the maximal element $\overline{\alpha}^*$ is minimized when all the elements of the sequence $\overline{\alpha}_t$ are minimized and since this happens when Equation A1.16 holds for all t, combining Equation A1.15 and Equation A1.16 obtains ${}_{t-1}b_t = 0$ and

$_{t-2}b_t = _{t-1}b_{t+1}$ for all t. In other words, only the two period (i.e. long maturity) debt must be issued and an equal amount of debt should mature in each period.

If the maturity shortens, by using Equation A1.14 and Equation A1.15, $\overline{\alpha}_t$ increases. In other words, the cost of tax distortions becomes higher, thus the fraction of the repudiated debt increases. When θ_t increases, by using the no arbitrage condition given by Equation A1.5, it is apparent that bond price q_t decreases. This reduction in bond price corresponds to an increase in the real interest rate on the bond. In a nutshell, Alesina et al (1990) suggest that there is a negative linkage between the maturity of debt and the yield of bonds, the latter being the dependent variable, when $\alpha \geq \overline{\alpha}_t$. [A]

Another important point in Alesina et al (1990) concerns the risk premium. Supposing that $\theta^e_{t+1} > 0$ in every period t with a known probability, the problem is re-treated and it is concluded that until a confidence crisis occurs, the government has to pay a risk premium on its liability to compensate for the default risk. Since $\overline{\alpha}_t$ is lower, the risk premium can be reduced by lengthening and balancing the maturity structure of government debt. [B]

Therefore, results [A] and [B] together imply a drop in the real yield on bonds as maturity lengthens and which has been empirically assessed using the Turkish data in Section 3.

Calvo and Guidotti (1992)

Calvo and Guidotti (1992) also states a negative linkage between the maturity of debt and the real return on bonds. However, real yield is designated as an exogenous variable in their model framework.

Calvo and Guidotti (1992) used the following government loss function L_t at time t:

$$L_t = \sum_{s=t}^{\infty} \beta^{s-t} [V(x_s) + H(\pi_s)] \tag{A1.17}$$

where I denote the discount factor and tax revenue with β and x_s respectively, and $\pi_s = P_s / P_{s-1}$ stands for the inflation factor. $V(.)$ and $H(.)$ are strictly convex functions where $V'(0)$ and $H'(1)$ are equal to zero; that is, no taxes and zero inflation achieve zero loss. I define the sum of all debt obligations that mature in period τ and that have been issued before time t as:

$$Z_t(\tau) = \sum_{s=0}^{t-1} P_s b_{s\tau} I_{s\tau} \tag{A1.18}$$

where $b_{s\tau}$ stands for the real value in period s of government bonds issued in period s with maturity in period τ. $I_{s\tau}$ stands for the one plus interest rate of those bonds issued in period s with maturity τ and P_s is the price level in period s.

Then, the government in period t is subject to the following budget constraint:

$$x_t + b_t^f = \frac{Z_t(t)}{P_t} + g_t \tag{A1.19}$$

In this Equation b_t^f is the sum of all bonds issued at t i.e. $b_t^f = \sum_{s=t+1}^{\infty} b_{ts}$ and g_t is for government expenditure.

Now by substituting $Z_t(t)$ into (A1.19) I get:

(A1.20) $$x_t + b_t^f = \sum_{s=0}^{t-1} b_{st} r^{t-s} + g_t$$

I assume that agents are rational and bonds are pure assets in their portfolios. Hence, the Fisher Equation holds in equilibrium. In other words,

(A1.21) $$I_{st} = r^{t-s} \pi_{s+1} \pi_{s+2} ... \pi_t; \quad s \le t-1$$

Normalizing P_0 to unity so that $P_t = \pi_t \pi_{t-1} ... \pi_1$, and substituting R^{t-s} from the Fisher Equation, (A1.20) is rewritten as follows:

(A1.22) $$x_t + b_t^f = \sum_{s=0}^{t-1} \frac{b_{st} I_{st}}{\pi_{s+1} \pi_{s+2} ... \pi_t} + g_t$$

Now in order to minimize the government loss function, I write the first order condition as:

(A1.23) $$V'(x_t) \frac{\partial x_t}{\partial \pi_t} + H'(\pi_t) = 0$$

In order to obtain $\partial x_t / \partial \pi_t$, I take the derivative of budget constraint (A1.20) with respect to π_t.

(A1.24) $$\frac{\partial x_t}{\partial \pi_t} = -\sum_{s=0}^{t-1} \frac{b_{st} I_{st}}{\pi_{s+1} \pi_{s+2} ... \pi_{t-1} \pi_t^2} - \frac{\partial b_t^f}{\partial \pi_t}$$

and from the budget constraint of the government for the period τ where $\tau > t$, taking the total differential of this budget constraint, I can get $\partial b_t^f / \partial \pi_t$. After using the Fisher Equation and making the necessary calculations, I get the final equality as follows:

(A1.25) $$V'(x_t)\omega_t = H'(\pi_t)\pi_t$$

Clearly ω_t represents the total value of government debt as of period t; that is, in terms of period t prices. Therefore, ω_t stands for:

(A1.26) $$\omega_t = \sum_{s=0}^{t-1}\left[\sum_{\tau=s}^{\infty} b_s\tau\right] r^{t-s}$$

Given a positive total debt and tax revenue at period t, Equation (A1.25) shows that along an equilibrium path, inflation will be positively associated with tax revenue. Moreover the relationship between tax and inflation depends on the value of outstanding debt. Then rewriting the budget constraint, the debt accumulation Equation of $t+1$ with respect to t becomes:

(A1.27) $$\omega_{t+1} = r(\omega_t + g_t - x_t)$$

Following Calvo (1988), I move one step ahead and assume, for simplicity, that Equation (A1.25) is invertible. Then, at the equilibrium, π_t can be expressed as a function of taxes and the total government debt:

(A1.28) $$\pi_t = \Pi(x_t, \omega_t)$$

Plugging this definition into the government loss function, I have

(A1.29) $$L_t = \sum_{s=t}^{\infty} \beta^{s-t}[V(x_s) + H(\Pi(x_s, \omega_s))]$$

A crucial assumption for this minimization problem is that the government in period t can control the future debt accumulation since I use the Fisher Equation and the interest rate factor is predetermined by the government. In many countries, the value of the past government debt obligations at each time point is regarded as a predetermined variable, recalling for the time inconsistency problem, which is overcome by redefining the debt accumulation Equation.

(A1.30) $$\omega_{t,i} = \sum_{s=0}^{i-1}\left[\sum_{\tau=t}^{\infty} b_{s\tau}\frac{I_{st}}{\pi_{s+1}\pi_{s+2}...\pi_t}r^{s-\tau}\right]R^{t-s} + \sum_{s=i}^{t-1}\left[\sum_{\tau=t}^{\infty} b_{s\tau}\right]r^{s-\tau}$$

is the value of the total government debt obligations at period t from the perspective of the government at time i $(<t)$. In the first term, I do not use the Fisher Equation since it is the debt issued before period i. However, on the right hand side, I internalize the Fisher Equation. In this case, the debt accumulation Equation takes the following form:

(A1.31) $$\omega_{t+1,i} = r(\omega_{t,i} + g_t - x_t)$$

Observe that in equilibrium, since Fisher Equation holds again, I have $\omega_{t,i} = \omega_t$. Now the debt accumulation is independent of the government of that period and the preceding Equation boils down to Equation (A1.27).

Consider the government's minimization problem at $t=1$, in which the government chooses inflation and tax sequences to minimize L_t.

For simplicity, I rewrite the loss function as:

(A1.32) $$V(x_1) + H(\pi_1) + \beta\sum_{t=2}^{\infty}\beta^{t-2}C(x_t, \omega_{t,1})$$

Then, the government minimizes Equation (A1.32) subject to the flow constraint for $i=1$ given by Equation (A1.31) and the total government debt obligation $\omega_{t,1}$, with the transversality condition given by $\lim_{t\to\infty} R^{-t}\omega_{t,1} = 0$.

For the interior optimum, the first order condition for the government at $t=1$ is:

(A1.33) $$V'(x_1)\omega_1 = H'(\pi_1)\pi_1$$

Then writing the Euler Equation I get

(A1.34) $$\beta^t r[C_x(x_{t+1},\omega_{t+1})+C_\omega(x_{t+1},\omega_{t+1})]+rV'(x_1)\frac{\partial\omega_{1,1}}{\partial\pi_{t+1}}[\Pi_x(x_{t+1},\omega_{t+1})+\Pi_\omega(x_{t+1},\omega_{t+1})]$$
$$=\beta_{t-1}C_x(x_t,\omega_t)+C_\omega(x_t,\omega_t)+V'(x_1)\frac{\partial\omega_{1,1}}{\partial\pi_t}\Pi_x(x_t,\omega_t)$$

where $\omega_{1,1}$ is given by:

(A1.35) $$\omega_{1,1}=\sum_{s=1}^{\infty}\frac{b_{0s}I_{0s}}{\pi_1\pi_2...\pi_s}r^{1-s}$$

then rewriting the previous Equation I get:

(A1.36)

$$\frac{r}{\pi_{t+1}}[\Pi_x(x_{t+1},\omega_{t+1})+\Pi_\omega(x_{t+1},\omega_{t+1})]\sum_{\tau=t+1}^{\infty}b_{0\tau}=\frac{1}{\pi_t}[\Pi_x(x_t,\omega_t)]\sum_{\tau=t}^{\infty}b_{0\tau}$$

Finally I are left with:

(A1.37) $$\frac{\sum_{\tau=t+1}^{\infty}b_{0\tau}}{\sum_{\tau=t}^{\infty}b_{0\tau}}=\frac{\Pi_x(t)\pi_{t+1}}{r\pi_t\Pi_x(x_{t+1},\omega_{t+1})+\Pi_\omega(x_{t+1},\omega_{t+1})}$$

Equation (A1.37) indicates that the ratio of the total real value of longer-term bonds to the total value of bonds is a decreasing function of the real interest rate r. This suggests a reciprocal relationship between the newly issued debt at time $t+1$ (auction maturity) and the real interest rate.

Appendix 2: An Illustrative Model

In this appendix, I elaborate on the structural framework employed by Kamin and Rogers (2000) so as to capture the effects of USD-Euro parity on economic performance. In my model, total GDP (Y) is composed of two components, which are the domestic demand (DD) and net exports (NX) as given in Equation A2.1:

(A2.1) $Y = DD + NX$

In Equation A2.2, net exports is related positively to the real exchange rate, RER (defined such that an increase indicates real depreciation of currency), negatively to output (Y) and negatively to USD-Euro parity ($Parity$), defined as the number of Euros per USD:

(A2.2) $NX = a_{21}RER - a_{22}Y - a_{23}Parity$

In Equation A2.3, domestic demand is affected by real interest rate (r), fiscal deficit ($FISCDEF$), the real stock bank credits ($RCREDIT$), the nominal interest rate (i), the inflation rate (π), the real exchange rate (RER) and the real wage (RW). As real exchange rate affects net exports positively, additional effects on aggregate demand are assumed to be negative:

(A2.3) $DD = -a_{31}r + a_{32}FISCDEF + a_{33}RCREDIT - a_{34}i - a_{35}\pi - a_{36}RER + a_{37}RW - a_{38}Parity$

In Equation A2.4, the supply of bank credit is explained by the bank's main sources of funds, namely the real domestic money (RM), and foreign borrowing proxied by private capital flows (KA):

(A2.4) $RCREDIT = a_{41}RM + a_{42}KA$

Equation A2.5 depicts the standard money demand function:

(A2.5) $RM = a_{51}Y - a_{52}i$

The central bank's reaction function is supposed to have the following form where it includes inflation (π), output (Y), and capital flows (KA).

(A2.6) $i = a_{61}\pi + a_{62}Y - a_{63}KA$

Equation A2.7 presents the CPI inflation rate as in Kamin (1996). It is determined by real exchange rate (RER), output (Y) and the rate of nominal exchange rate depreciation (E').

(A2.7) $\pi = a_{71}RER + a_{72}Y + a_{73}E'$

Equation A2.8 is the interest parity condition. Net capital flows (KA) is determined by the nominal interest rate (i), the rate of nominal exchange rate (E'), and the US interest rate (i^{US}).

(A2.8) $KA = a_{81}i - a_{82}E' - a_{83}i^{US}$

In Equation A2.9, exchange rate depreciation is defined as a function of domestic inflation (π), foreign inflation (π^{US}), and real exchange rate (RER).

(A2.9) $E' = a_{91}\pi - a_{92}\pi^{US} + a_{93}RER$

In Equation A2.10, balance of payments pressures drive the real exchange rate:

(A2.10) $RER = -a_{101}NX - a_{102}KA$

The non-interest fiscal deficit ($FISCDEF$) declines in response to an increase 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 its fiscal policies.

(A2.11) $FISCDEF = -a_{111}Y + a_{112}KA - a_{113}\pi$

Real wages (RW) depend positively on output (Y) but negatively on inflation (π) following the contractionary devaluation hypothesis.

(A2.12) $RW = a_{121}Y - a_{122}\pi$

By substituting the endogenous variables, the 12-Equation system reduces to a three-Equation system that I call the core model:

(A2.13) $\pi = a'_{11}RER - a'_{12}Y - a'_{13}\pi^{US}$

(A2.14) $RER = a'_{21}Y - a'_{22}\pi - a'_{23}i^{US} - a'_{24}\pi^{US} - a'_{25}Parity$

(A2.15) $Y = -a'_{31}r + a'_{32}\pi^{US} + a'_{33}\pi - a'_{34}i^{US} - a'_{35}RER + a'_{36}Parity$

The coefficients in Equations A2.13, A2.14 and A2.15 are not straightforward; i.e. they are complicated combinations of the coefficients of my illustrative model. Thus, I have written my *prior view* as to the signs of those coefficients whenever they are ambiguous; where each a_{ij} in Equations A2.13-A2.15 is positive and the signs in front show the direction of the relationship. Having focused on the signs of $Parity$ in Equations A2.14 and A2.15, I can say that its sign is negative in Equation A2.14 and positive in Equation A2.15. This prior view is due to two points. First, as USD-Euro parity increases, there occurs an increase in the terms of trade, namely in the price of exportables over the price of importables. Since the real trade flows will not be affected in the short-term, net exports improve, as does the output. Second, an increase in $Parity$ has recently caused a relative appreciation of the Turkish lira against the USD and since I measure the real exchange rate as the WPI deflated TL value of the USD, I can expect $Parity$ to inversely affect RER.

As a final remark, I should note that $Parity$ does not appear in Equation A2.13, yet it affects inflation indirectly through its effects on the RER and Y, as mentioned above.