

**THE TWIN DEFICITS HYPOTHESIS:
AN EMPIRICAL INVESTIGATION**

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ABSTRACT

THE TWIN DEFICITS HYPOTHESIS: AN EMPIRICAL INVESTIGATION

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This study investigates the validity of the twin deficits hypothesis for the Turkish quarterly data over the 1988:1-2005:2 periods. To this end, we consider a VAR variable space containing budget deficits, current account deficits, real output, real interest rates and real exchange rates and employ cointegration, equilibrium/error correction mechanism techniques along with Granger-non-causality tests and impulse response analyses. The empirical results from decompositions of the budget and current account deficits into their cyclical and structural components suggest that both CAD and BD are counter-cyclical. The twin deficit hypothesis, consistent with the conventional Mundell-Flemming framework, postulates that current account and budget deficits move together in the long run and the causality runs from the former to the latter. The results from Engle-Granger and Johansen cointegration procedures support either the twin divergence or the Ricardian equivalence postulations but not the twin deficits hypothesis. Current account deficits and budget deficits are also found to be jointly endogenous. The short-run impacts of budget deficits on current account deficits are found to be mainly through the real exchange rate and real interest rate channels.

Keywords: *twin deficits, budget deficits, current account deficits, error correction models, cointegration, and granger causality, Turkey.*

ÖZ

İKİZ AÇIKLAR HİPOTEZİ: AMPİRİK BİR ÇALIŞMA

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Çalışma, 1988:1 - 2005:2 dönemi Türkiye verileriyle ikiz açıklar hipotezinin geçerliliğini araştırmaktadır. Bu çerçevede; bütçe açıkları, cari açık, ulusal gelir, reel faiz oranları ve reel kur oranını içeren VAR modeli oluşturularak, Granger nedensellik testi ile devam eden ECM modeli ve etki-tepki analizlerini yürüttük. Bütçe açıkları ve cari açıkların periyodik ve yapısal bileşenlerinin ayrıştırılmasıyla elde edilen sonuçlara göre, her iki değişkenin de periyodik hareketin tersine hareket ettikleri sonucuna ulaşılmıştır. İkiz açıklar hipotezi, geleneksel Mundell-Flemming görüşleri ile paralel olarak cari açıklar ile bütçe açıklarının uzun dönemde birlikte hareket ettiklerini ve nedenselliğin önceki veriden sonrakine doğru aktığını varsaymaktadır. Çalışmada yürütülen Engle-Granger ve Johansen bütünleşme testlerinin bulguları, ikiz açıkların ters yönlü hareket ettiği varsayımı ve/veya Ricardian eşitliği varsayımlarını destekliyor görünürken, ikiz açıklar hipotezini desteklememiştir. Ayrıca, cari açıklar ve bütçe açıkları, içsel değişkenler olarak bulunmuştur. Bütçe açıklarının cari açıklar üzerindeki kısa süreli etkisinin ise özellikle reel kur ve reel faiz oranları sayesinde olduğu gözlenmiştir.

Anahtar kelimeler: ikiz açıklar, cari açıklar, bütçe açığı, eş-bütünleşme, Granger nedenselliği, Türkiye

To My Parents

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CHAPTER 1

INTRODUCTION

The relationship between current account deficits (CAD) and budget deficits (BD) are now at the center of international macroeconomics literature especially with the recent experience of large imbalances of a number of countries including the U.S. By definition, CAD is the sum of public and private sectors' investment-saving gaps. In the absence of a private sector investment-saving gap, the CAD and public sector investment-saving gap (public sector deficits, GD) will be perfectly correlated. The twin deficits hypothesis, on the other hand, postulates that, the CAD and GD move together, at least in the long-run. This study aims to test the validity of the twin deficits hypothesis for Turkey using the quarterly data from 1988Q1 to 2005Q2. Turkey, with highly volatile CAD leading two financial crisis and substantially large BD during the sample period, appears to be a natural candidate for investigating this issue.

There is a growing body of empirical literature testing the validity of the twin deficits for a number of developed and developing countries. As the CAD is the sum of public and private sector deficits (investment-saving gaps), in the absence of a private sector deficits adjustment, an increase in the BD may be expected to move the CAD in the same direction. However, this simple accounting ignores some important adjustment mechanisms and relationships between CAD and BD. Theoretically, there may be at least four different relationships between CAD and BD. In the Mundell-Flemming model based on the conventional Keynesian framework, budget deficits generate current account deficits. In this twin deficits framework, increases in budget deficits in an open economy tend to increase the domestic interest rate inducing a capital inflow and causing a real exchange rate appreciation.

The real appreciation of the domestic currency, in turn, deteriorates the current account deficits, and consequently BD causes CAD. However, under certain situations, the causality may be from CAD to BD rather than the reverse. High current account deficits leading to a financial crisis may lead to higher budget deficits due to the fiscal cost of the crisis and contingent liabilities (Burnside, 2004). The substantial increase in the BD in Turkey after the 2001 financial crisis appears to be consistent with this postulation (Özatay and Sak, 2002 and Koğar and Özmen, 2006). Furthermore, there may be a bi-directional causality between CAD and BD. Under the Ricardian Equivalence Hypothesis (REH) based on the Permanent-Income-Life Cycle Hypothesis, on the other hand, there is indeed no relationship between CAD and BD (Seater, 1993 and Mark, 1999). An increase in the public sector deficits will not affect the private sector lifetime budget constraint and the real wealth of the consumer. Consequently, the equilibrium levels of current account, interest rates, investment and consumption will not be affected by the changes in the level of budget deficits. This is consistent with the Barro's Debt Neutrality Hypothesis suggesting that an increase in the budget deficit might be offset by an increase in the private saving with no fall in aggregate national saving as taken place in the late 1970's in the USA (Barro, 1988). Accordingly, there need to be no crowding out of either the current account balance or investment (Frankel, 2004).

The empirical evidence on the twin deficits hypothesis, the bulk of which is based on the US data, provides mixed results. The conventional Keynesian twin deficits proposition is supported by Roubini (1988), Abell (1990), Normandin (1999), Vamvaukas (1999) and Roubini and Setser (2005) whilst the results by Miller and Rusek (1989), Enders and Lee (1990) and Kim (1995) are consistent with the REH hypothesis. Bussiere, Fratzscher and Müller (2005), on the other hand, find that current account and budget balances tend to move in opposite directions in the recent US data due to the anticipated productivity gains leading higher capital inflows. In the same vein,

the results by Kim and Roubini (2003) suggests that these deficits may be diverging rather than being twins when the impacts of cyclical fluctuations of output and interest rate increases due to a fiscal expansion are also taken into account. Recently, Corsetti and Müller (2006) note that the response of some relevant macroeconomic variables to budget developments has important implications for twin deficits. Corsetti and Müller (2006) show that the likelihood and magnitude of twin deficits increases with the degree of openness of an economy, and decreases with the persistence of fiscal shocks.

Compared to those for industrial countries, the number of empirical studies investigating the twin deficits hypothesis is rather limited for developing countries. The recent exceptions include Islam (1998) for Brazil, Kouassi *et al.* (2004) and Gruber and Kamin (2005) for a number of developed and developing countries, Akbostancı and Tunç (2001) for Turkey and Kim and Kim (2006) for Korea. The results by Akbostancı and Tunç (2001) suggest that there is a long-run relationship between budget deficits and trade deficits in Turkey and thus the Ricardian equivalence hypothesis is not supported by the Turkish data. Our study differs from Akbostancı and Tunç (2001) in the sense that we consider the financial openness of the Turkish economy and thus considers CAD instead of trade deficits. We also aim to employ some other time-series procedures to investigate the validity of the twin deficits hypothesis for the Turkish data.

The plan of the rest of the study is as follows. In Chapter 2, we provide a brief review of the theoretical and empirical literature on the twin deficits hypothesis. Chapter 3 is devoted to a brief discussion of the evolution of the current account and budget deficits in Turkey during the last two decades and an empirical investigation of the twin deficits hypothesis. In this chapter, we consider a variable system containing budget and current account deficits along with interest rates, real income and exchange rates and employ both vector autoregression (VAR), Johansen cointegration and error correction

mechanism (ECM) modeling procedures to investigate the dynamics of the relationships between the two deficits for the Turkish quarterly data over the period 1988-2005. Finally, Chapter 4 concludes.

CHAPTER 2

THE TWIN DEFICITS HYPOTHESIS: A BRIEF REVIEW OF THE LITERATURE

2.1. CURRENT ACCOUNT AND BUDGET DEFICITS

The national income identity

$$Y_t \equiv C_t + I_t + G_t + CA_t \quad (1)$$

provides the basic starting point to investigate the twin deficits hypothesis. In (1), the national income, Y_t is the sum of C_t consumption, I_t is the investment, the G_t is the government spending and the CA_t is the capital account balances, including exports minus imports added net foreign assets; borrowing requirement from abroad or lending capacity. In addition to goods and services balance, the current account includes also income received from abroad or paid abroad and unilateral transfers called net foreign assets. For simplicity, here we assume that unilateral transfers and net income from abroad are not large items in the current account. Although it is worth mentioning here, that if country has substantially large foreign debt and thus high debt servicing payments, its income paid abroad is a large negative item.

Subtracting $(C_t + T_t)$, (T_t = Government tax revenues net of transfer payments), from both sides of (1) and rearranging gives:

$$S_t^P = I_t + S_t^G + CA_t \quad (2)$$

where $S_t^P = (Y_t - T_t) - C_t$ is private sector savings, $S_t^G = (T_t - G_t)$ is government savings. Note that,

$$I_t = I_t^G + I_t^P,$$

therefore, (2) can be rearranged as

$$(S_t^P - I_t^P) + (S_t^G - I_t^G) = CA_t. \quad (3)$$

or,

$$(S_t - I_t) = CA_t, \quad (4)$$

where $S_t = S_t^P + S_t^G$.

The identities given by (3) and (4) simply say that domestic public and private sector deficits can be feasible only if they can be financed by capital inflows (and/or by changes in reserves). Consequently, the current account balance shows the size and direction of international borrowing. When a country imports more than its exports, it has CA_t deficit, which is financed by foreign borrowing. Such borrowing may be done by government (credits from the other governments, the international institutions or from private lenders) or by the private sector of the economy. Private firms may borrow by selling equity, land or physical assets. So, a country with current account deficit must be increasing its net foreign debt (or running down its net foreign wealth) by the amount of the deficit. A country with CA_t deficit is importing present consumption and investment (if investment goods are imported) and exporting future consumption and investment spending.

The identities presented so far simply say that domestic deficits (or current account deficits, CAD) can be sustainable as long as they can be financed capital inflows. In a financially open economy, domestic savings become a fund to finance investments not necessarily in the country. Similarly, domestic investments are *not* bounded by the level of domestic savings. That is, in a perfectly mobile capital world, domestic investment and

saving rates tend to diverge from each other. In such a world, savings seek out its most productive uses worldwide, at the same time, domestic investment is not limited by national saving because a global pool of funds is available to finance it (Feldstein and Horioka, 1980 and Özmen and Parmaksız, 2003). The sustainability of CAD is closely related with the exchange rate regime (Özmen, 2005). Under a perfectly flexible exchange rate regime, exchange rates adjust to CAD. However, under an exchange rate targeting regime, the sustainability of CAD may become a major policy concern as the central bank is committed to defend the announced fixed rate to accommodate the CAD dynamics.

The accounting identity (3) shows that current account deficits (CAD) is the sum of the private ($I_t^P - S_t^P$) and public ($I_t^G - S_t^G$) investment-saving gaps. In the absence of a private sector investment-saving gap, the CAD and public sector investment-saving gap (public sector deficits, GD) will be perfectly correlated¹. However, this simple accounting ignores some important adjustment mechanisms and relationships between CAD and BD. Theoretically, there may be at least four different relationships between CAD and BD. The twin deficits hypothesis, postulates that, the CAD and GD move together with the causality running from GD to CAD, at least in the long-run. This basic transmission mechanism can be explained by the conventional *Keynesian income-expenditure* approach. Accordingly, a rise in the government expenditure will increase domestic income that induces imports causing a deficit in the current account balance. This is the effect of government sector deficit on the external sector deficit causing twin deficits.

¹As Eichengreen (2004) notes, this makes sense to speak of "Twin Deficits", since a reduction in public saving, i.e., an increase in the budget deficit, should *ceteris paribus* lead to a reduction of net savings of the economy, i.e., the current account. Eichengreen (2004) also notes "*The IMF has just issued another polite but sober analysis of America's twin deficits. It is too bad that there was no similarly sober discussion of this problem in the recent U.S. presidential debates. The public sector budget deficit, now running at nearly 5 percent of GDP, is at the root of America's external imbalance.*"

The Mundell-Fleming model based on the conventional Keynesian framework, on the other hand, considers also the presence of international capital mobility for a small open economy. The main assumption is that capital flows move faster than trade flows because international investors arbitrage differences in interest rates across countries to take advantage of unrealized profit opportunities. In this twin deficits framework, increases in budget deficits in an open economy tend to increase the domestic interest rate inducing a capital inflow and causing a real exchange rate appreciation. The real appreciation of the domestic currency, in turn, deteriorates the current account deficits, and consequently BD causes CAD.

However, under certain situations, the causality may be running from CAD to BD rather than the reverse. High current account deficits leading to a financial crisis may lead to higher budget deficits due to the fiscal cost of the crisis and contingent liabilities (Burnside, 2004). The substantial increase in the BD in Turkey after the 2001 financial crisis appears to be consistent with this postulation (Özatay and Sak, 2002 and Koğar and Özmen, 2006). Furthermore, there may be a bi-directional causality between CAD and BD. Under the Ricardian Equivalence Hypothesis (REH) based on the Permanent-Income-Life Cycle Hypothesis, on the other hand, there is indeed no relationship between CAD and BD (Seater, 1993 and Mark, 1999). An increase in the public sector deficits will not affect the private sector lifetime budget constraint and the real wealth of the consumer. Consequently, the equilibrium levels of current account, interest rates, investment and consumption will not be affected by the changes in the level of budget deficits. This is consistent with the Barro's Debt Neutrality Hypothesis suggesting that an increase in the budget deficit might be offset by an increase in the private saving with no fall in aggregate national saving as taken place in the late 1970's in the USA. Accordingly, there need to be no crowding out of either the current account balance or investment (Frankel, 2004).

2.2. THE EMPIRICAL EVIDENCE ON THE TWIN DEFICITS

The real world is more complex than to those basic accounting identities already presented and to identify the circumstances in which the twin deficit hypothesis may hold one has to look at the channels by which government deficit influences the economy. Thus far, the empirical studies relied on the real country data are important to analyze twin deficit relation. There is a growing body of empirical literature testing the validity of the twin deficits for a number of developed and developing countries. The empirical evidence, the bulk of which is based on the US data, however, provides mixed results. It is often maintained that, a fiscal expansion would lead a worsening of the current account and an appreciation of the real exchange rate. As Frankel (2004) notes, in the context of the Mundell-Flemming framework, in open economies with high capital mobility, fiscal expansion may be expected to lead to or reflecting a current account deficit rather than crowding out the domestic investment as closed-economy models. The “twin deficits” experience of the US in the mid-1980s is often interpreted as consistent with the Mundell-Flemming framework.

The empirical studies supporting the conventional Keynesian twin deficits proposition for the US data include Roubini (1988), Abell (1990), Normandin (1999), Vamvaukas (1999) and Roubini and Setser (2005). However, the literature appears to offer widely divergent estimates, and there is even disagreement about the sign of the effect of a fiscal deficit on the trade balance. For example, Erceg, Guerrieri, and Gust (2004) indicated the findings of different articles as Roubini (1988) and Normandin (1999) suggesting that government budget deficits induced a fairly substantial deterioration in the trade deficit, with the latter estimating that a one dollar increase in the fiscal deficit of the United States resulted in an increase in the external deficit between \$0.22 and \$0.98. Furthermore, Roubini and Setser (2005) indicated that the deterioration of the US trade deficit even after the

dollar started to fall significantly in 2003 can be explained in part by the continued large US fiscal deficit. Therefore, as long as the US fiscal deficit remains large and US private savings remains low, real depreciation in the dollar will lead to a reduction in the trade imbalance only if there is a fall in private consumption (increase in private savings) or a fall in private investment from higher real interest rates. According to the writers, in 2004, the fiscal deficit stayed constant as a share of GDP, but real interest rates remained low and private savings fell and private investment rose. Consequently, the private savings-investment gap grew, and the overall current account deficit continued to widen.

Leachman and Francis (2002), considers the US the post-World War II data and finds that fiscal and foreign sector variables exhibit multi-cointegration for the data prior to 1974. These results do not rule out short-run correlations between government deficits and external deficits. However, they do preclude the possibility that the twin deficit phenomenon describes a long-run structural relationship in the post-World War II, Bretton Woods era. In the more recent period, 1974 forward, neither system exhibits evidence of a cointegration except for some weak fiscal and trade deficits. The results from the error correction models of the Leachman and Francis (2002) suggest that causality runs from internal to external deficits in the dynamic adjustment process supporting the notion that more recently fiscal deficit may have contributed to external deficit. In combination with the results from the early sub-period, the evidence indicates that to the extent the twin deficit relationship exists, it is time specific and weak.

Bussiere, Fratzscher and Müller (2005) argues that, the post-1990s experience of the US provides provide a counterexample for the twin deficits relationship contrasting with the record levels of the current account and the budget deficits in the 1980s. According to Bussiere, Fratzscher and Müller (2005), during the last decade the current account and budget balance were moving in opposite directions and by now, an alternative interpretation

of these developments has been put forward, stressing the importance of the anticipated productivity gains in the U.S. The higher anticipated productivity gains since the mid 1990s triggered both substantially large capital inflows and high consumption expenditure and investment. Bussiere, Fratzscher and Müller (2005), concludes that the fiscal deficits only have a small effect on the current account. Based on structural VAR analysis, Kim and Roubini (2003) reports that only the expansionary fiscal shocks tend to improve the current account.

The joint developments of the current account and of the budget deficits in the U.S. over the past 30 years do not appear to provide a coherent picture. Specifically, three different observations came out indicated in the studies investigated. First, in the mid 1980s, both the current account and the budget deficit reached higher levels. From an accounting perspective it could be explained by "twin deficits", since a reduction in public saving, i.e., an increase in the budget deficit, should *ceteris paribus* lead to a reduction of net savings of the economy, i.e., the current account. Second, by contrast, the 1990s provide a counterexample for the twin deficits relationship. In particular towards the end of the decade, current account and budget balance were moving in opposite directions. After 90s, as Bussiere, Fratzscher and Müller (2005) followed; an alternative interpretation of these developments has been put forward, stressing the importance of the anticipated productivity gains in the U.S. since the mid- 1990s, which triggered both huge capital inflows and high consumption expenditure and investment, both reflected in the sizeable trade deficit. Finally, the past three years a strong deterioration in the U.S. fiscal position together with a continuous reduction in the current account position is observed; new record levels of both deficits are expected and brought the twin deficits relationship back on the agenda in US.

Bussiere, Fratzscher and Müller (2005) develops a comprehensive framework to analyze the role of the government budget balance and of productivity shocks in the determination of the current account. Accordingly,

this framework yielded a parsimonious reduced form equation where changes in the real current account are defined as a function of global and country specific shocks, changes in the government (primary, cyclically adjusted) budget balance and lagged investment. Bussiere, Fratzscher and Müller (2005) estimates the model for 21 OECD countries and finds that the effect of the budget balance on the current account is very small (less than 10%), whereas the impact of productivity shocks is comparatively much larger. The study notes also that the estimation results correspond to an average over a long time horizon and the response of the current account to a reduction in the budget deficit could be higher due to specific factors (in particular, due to the composition of the fiscal adjustment). The results by Bussiere, Fratzscher and Müller (2005) imply that either there is no causal relationship through which government deficits are an important driving force behind current account developments, or alternatively, at least that this relationship is not sufficiently stable across countries and over time. Understanding better the precise nature of this relationship, and possibly its variability over time is an issue they leave for future research. In particular, a natural extension of the model is to better distinguish between adjustments in the budget deficit that come from a change in government spending or in taxes.

As noted by Kim and Roubini (2003) and elsewhere, the relevance of the twin deficits relationship provides also an indirect evidence of the *Ricardian Equivalence* proposition in an international context. According to the *Ricardian Equivalence Hypothesis* (REH), there is no relationship between government sector deficits and the external sector deficits. And thus they are not twins. This hypothesis can be regarded as an extension of Permanent-Income-Life Cycle Hypothesis including fiscal budget variants. (Mark, 1999) An increase in the budget balances will not affect the lifetime budget constraint and the real wealth of the consumer, therefore the equilibrium levels of current account, interest rates, investment and consumption will not be affected by the changes in the level of budget deficits

(Akboſtancı and Tunç, 2001). If Ricardian Equivalence holds, then reducing the lump-sum taxes and ensuring the fiscal deficit would not affect the current account. On the other hand, a transitory change in government spending for example increase, will affect both balances to behave accordingly. Kim and Roubini (2003) also claimed that a permanent increase in government spending would have no effect on the current account. But its effects on the budget balances will be dependent to the extra finance of the spending. Consequently, the twin deficit phenomenon is dependent to the nature and the persistence of the fiscal shock. The Ricardian Equivalence Hypothesis is closely related to *Barro's Debt Neutrality Hypothesis*, which postulates that an increase in the budget deficit might be offset by an increase in the private saving with no fall in aggregate national saving. Accordingly, there need to be no crowding out of either the current account balance or investment. (Frankel, 2004). The empirical studies supporting the Ricardian Equivalence Hypothesis include Miller and Rusek (1989), Enders and Lee (1990), Kim (1995), Erceg, Guerrieri, and Gust (2004) and Gruber and Kamin (2005).

Erceg, Guerrieri, and Gust (2004) investigates the effects of fiscal shocks (a rise in government consumption and a reduction in the labor income tax rate) on the trade balance in the United States by using an open economy dynamic general equilibrium (DGE) model (SIGMA) to assess the quantitative effects of two alternative fiscal shocks on the trade balance. Their results, consistent with the REH, suggest that changes in fiscal policy have fairly small effects on the U.S. trade balance, irrespective of whether the source is a spending increase or tax cut. Most of the pressure on the external balance due to expansionary fiscal policy is offset by a combination of higher output, and/or a fall in private consumption and investment. The results by Gruber and Kamin (2005) also suggest that the expansion of budget deficits does not appear to explain current account deficits, at least for the 1997-2003 period in the US. Gruber and Kamin (2005) finds that, not only is the estimated pass-through of the fiscal balance to the current account quite

small, at about 0.1, but the average budget balance during this period was relatively positive by international standards. Eventually, the coefficient on the fiscal balance variable is quite low and not significantly different from zero. According to Gruber and Kamin (2005), output growth has a significant negative effect on the current account balance.

Kim and Roubini (2003) consider a variable system containing budget deficits, current account deficits and real exchange rates and employs a data based Vector Autoregression (VAR) analysis that allows dynamic interactions among variables, and that employs minimal identifying restrictions which do not depend much on a specific theoretical model. The results by Kim and Roubini (2003) suggest that there appears to be “*twin divergence*” instead of twin deficits in the recent US data as when the fiscal accounts worsen, the current account improves and vice versa. Accordingly, an expansionary fiscal policy shock (or a government budget deficit shock) improves the current account and depreciates the real exchange rate for the flexible exchange rate regime period. The private saving rises and the investment falls contribute to the current account improvement while the nominal exchange rate depreciation is mainly responsible for the real exchange rate appreciation. The twin divergence of fiscal and current account balances is also explained by the prevalence of output shocks rather than fiscal shocks.

Kim and Roubini (2003) suggests that the lack of positive correlation between budget deficits and current account deficits or the presence of the twin divergence may be explained by many factors including cyclical fluctuations of output and interest rate increases due to a fiscal expansion. Cyclical fluctuations of output as during economic recessions (booms) output falls (rises) and the fiscal balance worsens (improves); at the same time during such recessions (booms), the current account improves as the fall in output leads to a fall in investment that is sharper than any change in private and national savings. Thus, the current account will improve (worsen) as the fiscal balance worsens (improves). Consequently, “twin divergence” rather

that twin deficits may be observed during such recessions (booms). Furthermore, a fiscal expansion may lead to an increase in real interest rate crowding out private investment while at the same time stimulating private savings. Therefore, a worsening of the fiscal balance may not worsen the current account dollar per dollar if the increase in real interest rates reduces investment and increases private savings.

Recently, Corsetti and Müller (2006) focus on the international transmission of fiscal policy shocks via terms of trade changes and show that the relevance of twin deficits increases with the degree of openness of an economy, and decreases with the persistence of fiscal shocks. Based on a VAR model estimated for Australia, Canada, the UK and the US, Corsetti and Müller (2006) find that in less open countries the external impact of shocks to either government spending or budget deficits is limited, while private investment responds to substantially. Consequently, twin deficit effects may be small in relatively closed economies.

Compared to those for industrial countries, the number of empirical studies investigating the twin deficits hypothesis is rather limited for developing countries. The recent exceptions include Islam (1998) for Brazil, Kouassi *et al.* (2004) and Gruber and Kamin (2005) for a number of developed and developing countries, Akbostancı and Tunç (2001) for Turkey and Kim and Kim (2006) for Korea. The results by Akbostancı and Tunç (2001) suggest that there is a long-run relationship between budget deficits and trade deficits in Turkey and thus the Ricardian equivalence hypothesis is not supported by the Turkish data.

To summarize, the empirical literature provide mixed and often conflicting results for the validity of the twin deficits hypothesis. The results appear to be crucially depending on many factors including the variable spaces considered, country and the time span of the data and estimation techniques. Although, economic theory provides ample explanations between the possible interrelationships between current account and budget deficits

their validity appears to be an empirical issue. In the following chapter of this study, we attempt to investigate this empirical issue for the Turkish data.

CHAPTER 3

THE TWIN DEFICITS HYPOTHESIS AND THE TURKISH DATA: AN EMPIRICAL INVESTIGATION

3.1. BUDGET AND CURRENT ACCOUNT DEFICITS IN TURKEY

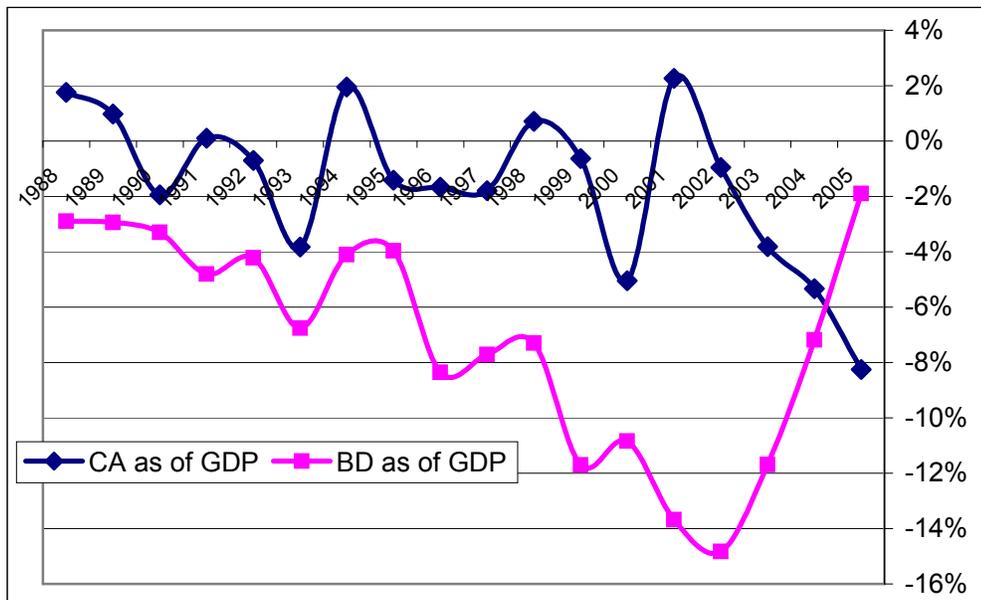
In Turkey, substantially high current account and budget deficits are often blamed as the basic sources of macroeconomic instability leading to two financial crises during the post-1990 period. Figure 1 plots the evolution of current account (CA) and budget balances (BD) during 1988-2005 in Turkey. During the 1988-2001 periods, the current account deficits approached to around 4 % (as a percent of GDP) only in 1993 and 2000 and such a level appeared to be unsustainable as experienced by the financial crisis of 1994 and 2001². The inability of the Turkish economy to sustain relatively modest levels of CAD can be explained by the main source generating it: public sector deficits. From Figure 1, it may be inferred that the current account and budget deficits tend to move together until the 2001 financial crisis. This may lend a support to the twin deficits hypothesis. After the 2001 crisis, however, current account deficits tend to increase reaching around a level of 8 % of GDP by 2005 whilst budget deficits tend to decrease due to the substantial fiscal contraction of the post-crisis stabilization programme. The post-2001 crisis evidence, *ceteris paribus*, may be interpreted as lending a support to the “twin divergence” postulation by Kim and Roubini (2003).

The recent evolving of the budget and current account deficits in Turkey appears to be similar with those observed in the U.S. However, one

² See Özatay (2000) for the 1994 financial crisis in Turkey. See Özatay and Sak (2002), Akyüz and Boratav (2003) and Koğar and Özmen (2006) and references cited therein for the 2001 crisis.

should be extremely cautious in comparing the sustainability dynamics and adjustment mechanisms of current account deficits in the US and a developing country like Turkey as developing countries often suffer from “original sin” of the international financial system. That is, developing countries cannot borrow in their own currency from international financial markets as shown by Eichengreen, Hausmann and Panizza (2003). Along with original sin, the sources of CAD and the prevailing exchange rate regime, the ability of a country to sustain CAD may not be invariant to macroeconomic stance and institutional structure as recently argued by Özmen (2005). According to Özmen (2005) better governance and institutions increase whilst the “original sin” decreases the ability of countries to sustain higher levels of CAD. Furthermore, flexible exchange rate regimes and openness to international trade is found to put a discipline on CAD by providing the necessary adjustment mechanisms.

Figure 3.1
Budget and Current Account Deficits in Turkey (% of GDP)



Sources: CBRT and IMF-IFS

The substantially high levels of budget deficits are often blamed as the basic sources of macroeconomic instability in Turkey leading to two financial crises during the post-1990 period. After the financial liberalization attempts of the 1980s, budget deficits have been financed solely by new debt creation and the mode of the domestic debt finance has been often through the domestic banking system. Foreign debt and borrowing in foreign exchange even domestically made Turkey vulnerable to the consequences of “original sin” as its revenues have been basically in domestic currency. Because of this (domestic and international) original sin, Turkey has become dependent to the movements of “interest rates”, “exchange rates” and the “inflation rates” because of the borrowing and financing requirements. Boratav, Türel and Yeldan (1996, p.11), explains the government policy responses for the debt financing situation as in the following:

Policy makers’ response to increased public deficits was an unwillingness to reduce transfer spending and undertake serious tax reform...No effort in the direction of reforming direct taxation took place. This left the vicious circle of deficit financing via borrowing resulting in debt financing as a major component of the public expenditures as the preferred alternative of the policy makers with adverse consequences.

Although there appears to be many studies on the links between Turkish budget deficits and the inflation (Özatay, 1997 and Tekin-Koru and Özmen, 2003), current account deficits and exchange rates (Keyder, 2003a,b; Togan and Ersel, 2004) and sustainability of the current account deficits (Boratav, Türel and Yeldan, 1996; Akyüz, 2004), the investigation of the twin deficits hypothesis may be interpreted as surprisingly ignored with Akbostancı and Tunç (2001) providing an exception. Akbostancı and Tunç (2001) consider Turkish quarterly data for the 1987-2001 periods and investigate the relationship between government budget deficits and trade deficits employing the Johansen cointegration methodology. The paper also estimates an error correction model that enables them to search the relationship between the internal and external deficits both in the short-run

and in the long-run. The results by Akbostancı and Tunç (2001) suggest that there is a long-run relationship between the two deficits and in the short-run worsening of the budget balance worsens the trade balance. Consequently, the results support the validity of the twin deficit hypothesis supporting the view that Ricardian equivalence hypothesis is not valid for the Turkish data during the sample period. Akbostancı and Tunç (2001) consider trade balance rather than current account balance. However, given the substantially high levels of financial flows including interest payments on foreign debt and workers remittances, it may be better to consider current account deficits for a financially open economy like Turkey. Therefore, we prefer to consider current account deficits instead of trade deficits in investigating the validity of the twin deficit hypothesis for the Turkish data.

Uygur (2003) indicates the crowding out effect of the Turkish government debt to the private investments through the finance channel of private saving. In the same vein, Uygur (2004), claims that the rise in the debt in terms of foreign currency will worsen the current account deficit and this current account deficit is also seen as a result of increased consumption of foreign goods so the decreasing private saving in Turkey. Akbostancı (2001), on the other hand, suggests that in the long run the only determinant of the current account balance is the real exchange rate, based on the Turkish data of 1987-2000. Boratav, Türel and Yeldan (1996) explains another relationship between the two deficits, and while they are studying the decomposition analysis of the private and public saving gaps, deficit financing via borrowing policies. Major components of the government expenditures are the borrowings, as the preferred alternative of the policy makers; the determining factor in tax efforts was essentially the change in tax rates rather than the distributional shifts, they continued.

3.2 THE TWIN DEFICITS HYPOTHESIS AND THE TURKISH DATA: EMPIRICAL RESULTS

In this section we proceed with the empirical investigation of the twin deficits hypothesis for the Turkish data over the quarterly sample period 1988Q1 to 2005Q2. As already discussed in the earlier sections of this study, the vast and growing empirical literature the bulk of which is for the US data provide mixed often conflicting results for the validity of the twin deficits hypothesis. Although, economic theory provides ample explanations between the possible interrelationships between current account and budget deficits their validity appears to be an empirical issue. The empirical studies often consider a bivariate system containing only budget and current account deficits in investigating the twin deficits hypothesis. However, as argued by Kim and Roubini, (2003) this may be a restricted choice as the dynamics and the relationship between the two deficits may not be invariant to the evolution of some related macroeconomic variables including real exchange rates, real interest rates and real output. Consequently, following Kim and Roubini, (2003), we consider also an extended variable space containing budget and current account deficits along with interest rates, real income and exchange rates in our empirical analysis for the Turkish data.

Following the recent literature including Alkswani (2000), Vyshnyak (2000), Normandin (1999), Akbostancı and Tunç, (2001), Kim and Roubini (2003), Erceg, Guerrieri, and Gust (2004), Gruber and Kamin (2005) and Bussiere, Fratzscher and Müller (2005) we investigate the twin deficits hypothesis by employing a Vector Autoregression (VAR) base cointegration and error-correction mechanism (ECM) methodology. To this end we consider a VAR variable space containing CAD, BD, RIR, RER, RGDP where CAD is current account balance as a percent of GDP, BD is the budget deficits as a percent of GDP, RER is the log of real exchange rate, RGDP is the log of real GDP and RIR is the 3 months' time deposits representing the

real interest rate. The quarterly sample period 1988:1-2005:2 and the data for RER, BD and GDP are from the Central Bank of Turkey Electronic Database whilst the data for RER and CAD are from the IMF International Financial Statistics.

In the following subsection, we present some preliminary data analysis for the variables considered in this study. Kim and Roubini (2003) suggest that, the relationship between current account and budget deficits may not be invariant to their cyclical properties. Therefore, in section 3.2.1 we investigate the twin deficits hypothesis by also differentiating the “cyclical” and “non-cyclical or structural” components of budget and current account deficits. The results for the integration and cointegration properties of the data along with the VAR and ECM analyses are presented in section 3.2.2.

3.2.1. PRELIMINARY DATA ANALYSIS AND THE CYCLICAL FACTORS

As already discussed, we consider CAD (current account balance as a percent of GDP), BD (budget deficits as a percent of GDP), RER (log of real exchange rate), RGDP (log of real GDP) and RIR (real interest rate) to investigate the twin deficits hypothesis for the Turkish quarterly data over 1988:1-2005:2. Table 3.2.1.1 presents the simple correlation coefficients between the variables over the sample period. From the table, it may be inferred that the correlation between the budget and current account deficits is positive but not high. Budget deficits appear to be negatively correlated with real exchange rates whilst not correlated with real interest rates. Current account deficits, on the other hand, tend to decrease with a real exchange rate depreciation (an increase in the real exchange rates) and increase with real interest rates, which might be plausible with the competitiveness and capital inflow impacts, respectively.

TABLE 3.2.1.1. Correlation Matrix of the Variables

	BD_t	CAD_t	RER_t	RIR_t
BD_t	1.00	0.16	-0.27	0.003
CAD_t	0.16	1.00	-0.62	0.47
RER_t	-0.27	-0.62	1.00	-0.58
RIR_t	0.003	0.47	-0.58	1.00

According to Kim and Roubini (2003), the relationship between current account and budget deficits may not be invariant to their cyclical properties. Kim and Roubini (2003, p. 14) notes that: *“One reason that the current account and the government saving do not have a positive relation may be due to the cyclical nature of the government saving and the current account”*.

Following Kim and Roubini (2003), we estimate a set of simple regressions to differentiate the “cyclical” and “non-cyclical or structural” components of budget and current account deficits. First, I regress the budget deficit on the log of $RGDP_t$ to reveal the output effect. And secondly, investigate the regression of budget deficit on the Hodrick-Prescott filtered of the log of real GDP_t ($GDPC_t$) where the Hodrick-Prescott Filter is a smoothing method that is widely used among macroeconomists to obtain a smooth estimate of the long-term trend component of a series. The aim is to differentiate the “cyclical” and “non-cyclical or structural” components of the government budget deficit as in the following.

$$BD_t = a_1 + b_1 RGDP_t + e_{1,t} \quad (4)$$

$$BD_t = a_2 + b_2 GDPC_t + e_{2,t} \quad (5)$$

where BD_t is the budget deficit (% of GDP) – the negative of government saving. To construct $GDPC_t$, I use the method of H-P filtered output. The fitted values of the budget deficit in the regressions are regarded as the cyclical components of the government budget deficit while the residuals are regarded as the structural components. Next, I regress the current account on the structural budget deficit constructed from the fourth and the fifth regressions and cyclical output.

$$CAD_t = c_1 + d_1 \hat{e}_{1,t} + f_1 RGDP_t + w_{1,t} \quad (6)$$

$$CAD_t = c_2 + d_2 \hat{e}_{2,t} + f_2 GDPC_t + w_{2,t} \quad (7)$$

where CAD_t is the current account (% of GDP_t) and $\hat{e}_{1,t}$ and $\hat{e}_{2,t}$ are the fitted values of the residuals in the regressions (4 and 5), respectively, or the non-cyclical, structural budget deficit. In these regressions, the relationship between the budget and the current accounts can be examined after controlling the output effects and the cyclical nature of the two deficits:

$$BD_t = 29.64 - 2.14 \text{ RGDP}_t, \quad \hat{\epsilon}_{1,t}$$

(0.43) (-0.53)

$R^2 = 0.04, \quad F = 0.29, \text{ DW} = 1.23$

$$CAD_t = 5.73 + 0.09 \hat{\epsilon}_{1,t} - 0.41 \text{ RGDP}_t$$

(0.13) (1.29) (-0.17)

$R^2 = 0.02, \quad F = 0.85, \text{ DW} = 0.88$

and

$$BD_t = 17.2^{**} - 8.1E-07^{**} \text{ GDPC}_t, \quad \hat{\epsilon}_{2,t}$$

(2.65) (-3.78)

$R^2 = 0.174, \quad F = 1.43, \text{ DW} = 1.42$

$$CAD_t = 0.005 \hat{\epsilon}_{2,t} - 4.79 \text{ E} - 08^{**} \text{ GDPC}_t$$

(0.06) (-3.5)

$R^2 = 0.12, \quad F = 4.98, \text{ DW} = 1.07$

The numbers in parentheses are t-statistics and (**) imply that the estimated coefficient is significant at 5% level.

The preliminary regression results show that budget deficits are significantly counter-cyclical and therefore decreases with an increase in real output and H-P filtered output. Additionally, the regressions indicate that the current account deficits are also counter-cyclical; and an increase in cyclical output also decreases the current account deficit. (The H-P filtered output coefficient, f_2 , is significantly different from zero, however the real output's coefficient, f_1 , is not statistically significantly different from "0".) Therefore, we can infer that cyclical fluctuations are likely to generate a positive evolving effect on the government budget deficit and the current account deficit. The relation between the components of the budget deficits and current account deficits is

also positive but statistically insignificant. Also the below table, Table 3.2.1.2, gives the relations of $\hat{e}_{1,t}$ and $\hat{e}_{2,t}$ with the budget deficit and the current account deficit. It is clear that $\hat{e}_{1,t}$ explains BD_t better than the $\hat{e}_{2,t}$, *non-cyclical components of BD_t*) and as the results suggest that even after controlling the output effect and the cyclical components on budget deficit, it is seen that budget deficit and the current account deficit is positively related, which is consistent with the twin deficits hypothesis.

TABLE 3.2.1.2. Correlation Matrix of the Deficits and their Cyclical Components

	$\hat{e}_{1,t}$	$\hat{e}_{2,t}$
CAD _t	0.156	0.008
BD _t	0.998	0.909

As explained in Kim and Roubini (2003), the non-cyclically adjusted balance should be even less strongly correlated with the current account than the cyclically adjusted one due to the effect of business cycle fluctuations. Usually, the current account is generally found to be counter-cyclical: for instance, during a boom, investment rises strongly, which has a negative effect on the current account, as already noted in Bussiere, Fratzscher and Müller (2005), whereas the unadjusted fiscal balance is procyclical. The results indeed show that the point estimate of the unadjusted fiscal balance is lower than when the cyclically adjusted balance is used. However, the coefficient is not significant at any usual confidence level, so it is not possible, on the basis of this result, to speak of "Twin Divergence" as Kim and Roubini (2003) stated. (Bussiere, Fratzscher and Müller, 2005)

As for the current account deficits, we estimate the following simple regression equations in order to control the cyclical components of the real exchange rate relation with budget deficits:

$$RER_t = g_1 + h_1 \hat{e}_{1,t} + m_1 RGDP_t + u_{1,t} \quad (8)$$

$$RER_t = g_2 + h_2 \hat{e}_{2,t} + m_2 GDPC_t + u_{2,t} \quad (9)$$

RER_t gives the log of Real Exchange Rate where an increase indicates an appreciation of TL. The results of the OLS estimation are presented below (the numbers in parentheses are t-statistics and (**)) imply that the estimated coefficient is significant at 5% level):

$$RER_t = -1.27 + 0.34^{**} RGDP - 0.007^{**} \hat{e}_{1,t}$$

(0.79) (-3.72) (-2.5)

$$R^2 = 0.23, F = 1.02, DW = 0.55$$

$$RER_t = 3.79^{**} + 3.1 \text{ E-}08^{**} GDPC_t - 0.001 \hat{e}_{2,t}$$

(2.48) (6.22) (-0.52)

$$R^2 = 0.36, F = 1.95, DW = 0.40$$

The real output ($RGDP_t$) and the HP filtered output ($GDPC_t$) variables both tend to be positively related to the real exchange rate (RER_t). The budget deficit variable is pro-cyclical as indicated.

There appears to be negative relationship between budget deficit and the real exchange rate as indicated by the regression results and the correlation matrix presented by Table 3.2.1.3. below. However, the relationship is not statistically significant.

Table 3.2.1.3. Correlation Matrix of RER_t and BD_t and their Cyclical Components

	$\hat{e}_{1,t}$	$\hat{e}_{2,t}$
RER_t	-0.273	-0.051
BD_t	0.998	0.909

3.2.2. THE VAR AND ECM ANALYSES

The results from the preliminary data analyses suggest that budget deficits have a positive effect on the current account deficits and an increase in budget deficits also tend to depreciate the real exchange rate, contradictory to the most of the Keynesian theoretical view. Additionally, the results do not change significantly when the business cycle effects are controlled.

The preliminary data analyses although allowed us to extract non-cyclical, exogenous parts of the deficits (structural deficits) may be rather limited as only the contemporaneous information on cyclical output is used. Moreover, the method examines only the contemporaneous relation among variables, without considering their dynamic interactions. As a result, the previous analysis may be limited in discussing the full dynamic causal relationship regarding the effects of budget deficit changes on the current account deficits and the real exchange rates. Therefore, we consider a vector autoregression (VAR) model, which contains the information on the variables themselves, their interactions, and dynamic long run – short run relationships.

The recent empirical literature including Alkswani (2000), Vyshnyak (2000), Normandin (1999), Akbostancı and Tunç, (2001), Kim and Roubini (2003), Gruber and Kamin (2005) and Bussiere, Fratzscher and Müller (2005) often employs Vector Autoregression (VAR), cointegration and error-correction mechanism (ECM) techniques to investigate the twin deficits hypothesis. Following this literature, we consider a VAR variable space containing $\{BD_t, CAD_t, RGDP_t, RIR_t, RER_t\}$, where $RGDP_t$ is the log of real GDP_t, BD_t is the government budget deficit as a percent of GDP_t, CAD_t is the current account deficit as a percent of GDP_t, RIR_t is the log of the 3-month real time deposits' rate, and RER_t is the log of the real exchange rate (an increase is an appreciation) as already defined. The $RGDP_t$ variable proxies the general economic performance and is included to control the cyclical components of the two deficits. RIR_t is also an important macro variable especially in Turkey, where

there is an extensive borrowing requirement to finance the deficits and this variable may provide an important clue on the transmission of the fiscal policy, and that may be related to monetary policy actions. We first investigate the integration properties of the variables by employing augmented Dickey-Fuller (ADF) tests. The co-integration properties of the variables which are individually integrated of order one ($I(1)$) are then investigated by using both the Engle-Granger two step (Engle and Granger, 1987) and Johansen multivariate cointegration (Johansen and Juselius, 1990 and Johansen, 1995) techniques. We then proceed with an error correction mechanism modeling to investigate the long-run equilibrium conditions and short-run adjustment mechanisms. Finally we test for Granger non-causality and estimate impulse responses for the variables in a stationary VAR system.

The integration properties of the variables are investigated by conducting augmented Dickey-Fuller [ADF] tests with the lag length (k) selected to remove any manifest serial correlation. Table 3.2.2.1 reports the results of the Augmented Dickey-Fuller (ADF) unit root / stationarity test statistics. The optimum lag lengths for the ADF regression equations are chosen by the modified Akaike Information Criterion (AIC). The results suggest the non-rejection of the unit root null hypothesis for every variable except CAD_t and RER_t for all of the alternative specifications for the deterministic part. For CAD_t and RER_t the unit root null can be rejected only for the case when the deterministic part contains a trend term. As the trend term is found to be statistically insignificant in the ADF regressions for these equations, the results may be interpreted as supporting the non-stationarity of RER_t and CAD_t . Since the other variables are $I(1)$ and neither of them is $I(2)$ or higher, the necessary condition for a valid cointegration inference appears, not to be violated even by the ADF evidence. (Özmen and Gökcan, 2004).

Table 3.2.2.1. Augmented Dickey-Fuller Unit Root Tests

Variables		Specifications and t-Statistics Values		
		With Intercept	With Intercept & Trend	None
BD _t	Level	-1.74 (4)	-1.43 (4)	-0.68 (4)
	1st difference	-12.44* (0)	-12.39* (0)	-12.54* (0)
CAD _t	Level	-2.6 (3)	-4.99* (0)	-0.39(8)
	1st difference	-9.52* (0)	-9.46* (0)	-9.58* (0)
RGDP _t	Level	-0.78(8)	-2.06 (3)	1.14 (8)
	1st difference	-8.6*(0)	-8.59* (0)	-8.71* (0)
RER _t	Level	-1.3 (4)	-3.01** (0)	0.78 (0)
	1st difference	-8.18* (0)	-8.13* (0)	-8.15* (0)
RIR _t	Level	-0.83 (0)	0.31 (5)	-0.6 (0)
	1st difference	-7.79* (0)	-8.05* (0)	-7.81* (0)

Note: * and ** denote significance at the 1% and 5% levels, respectively using the MacKinnon critical values. The values in parentheses are the optimum lag lengths chosen by the AIC.

The results recorded in Table 3.2.2.1 suggest that each of the variables in the system can be interpreted as integrated of order 1, I (1). As all the variables are found to be integrated of order one, we proceed with the investigation of a cointegration relationship between them. To this end, we first employ Engle-Granger (EG) two-step estimation procedure. The Engel Granger (EG) static long run regression by Ordinary Least Squares (OLS) is estimated to test whether the residuals are stationary which would be sufficient enough to see the existence of co-integration among variables. The ADF test regression equations for the residuals contained no deterministic drift term and are estimated with the lag length chosen as 0 by the AIC and SIC. The residuals from these estimated equations appear to be stationary as suggested by the ADF tests for the corresponding residuals (ADF Residuals) reported by the table.

Table 3.2.2.2. Engle-Granger Cointegration Regressions Results

	BD_t	CAD_t
Constant	99.98	-43.91
<i>t-ratio</i>	(3.07)*	(2.60)*
CAD_t	0.046	-
<i>t-ratio</i>	(0.19)	-
BD_t	-	-0.01
<i>t-ratio</i>	-	(0.19)
RER_t	-18.33	-11.09
<i>t-ratio</i>	(-3.08)*	(-3.78)*
RIR_t	-4.99	1.84
<i>t-ratio</i>	(-2.41)*	(1.71)*
ADF(Residuals)	-5.8*	-5.7*
R²	0.16	0.41
Durbin Watson Statistics	1.36	1.44
Standard Error of Regression	5.24	2.66

* Significant at the 5 % level

Table 3.2.2.2 presents the results of Engle-Granger two-step cointegration regression results. The model results show that the budget account deficit has a weak and negative effect on the current deficit, which is indeed not statistically significant. Additionally, the current account also has a weak effect on the budget deficit, which is not significant between the periods of 1988-2005. This supports the view that budget and current account deficits are not twins in the long-run in a variable space containing also real exchange rates and real interest rates. An increase in the real exchange rates (a real appreciation) leads to lower current account and budget deficits in the long-run. This may not be a very controversial result if we consider the case that exports

use often imported inputs and the trade balance may also be determined by productivity differentials in the long-run. The decrease in budget deficits with a real exchange rate appreciation is consistent with the view that foreign currency denominated debt and debt service in terms of domestic real output decreases with an appreciation.

The results of the Johansen and Juselius (1990, 2000) and Johansen (1995) multivariate cointegration analysis for a bivariate system containing current account and budget deficits are presented by Table 3.2.2.3. The VAR lag length for the Johansen procedure is chosen as five, which is plausible for a quarterly data. This choice of the lag length is supported also by the AIC and SIC. The Johansen and Juselius (Johansen and Juselius, 2000) trace and maximum eigenvalue statistics suggest the rejection of the null hypothesis of no cointegration but not the null of at most one co integrating vector between the variables at the 5% level.

Table 3.2.2.3. The Johansen Method - Cointegration Test

Lags interval (in first differences): 1 to 5					
Hypothesized	Eigenvalue	Max-Eigen	Max Eigen 0.05	Trace	Trace Stat. 0.05
No. of CE(s)		Statistic	Critical Value	Statistic	Critical Value
None *	0,23	17,01	14,26	20,44	15,49
At most 1	0,05	3,43	3,81	3,43	3,81
<p><i>Trace test indicates 1 cointegrating eqn(s) at the 0.05 level</i> <i>* denotes rejection of the hypothesis at the 0.05 level</i> <i>MacKinnon-Haug-Michelis (1999) p-values</i></p>					

The cointegration vector normalized by CAD_t is:

$$CAD_t = 0.42 + 0.09 T - 0.32 BD_t$$

(2.36)

where T is the time trend and the value in parenthesis is the asymptotic t-ratio to test the statistical insignificance of the corresponding variable. This relation reveals that budget deficit changes negatively affect the current account deficit, which is indeed diverging from the twin deficits hypothesis. This result is consistent with Kim and Roubini (2003) suggesting that there appears to be “*twin divergence*” instead of twin deficits in the recent US data as when the fiscal accounts worsen, the current account improves and *vice versa*. According to Kim and Roubini (2003) the lack of a positive correlation between budget deficits and current account deficits or the presence of the twin divergence may be explained by many factors including cyclical fluctuations of output and interest rate increases due to a fiscal expansion.

We now proceed with the estimation of an error correction model for budget and current account deficits to investigate the adjustment mechanisms towards the long-run equilibrium represented by the cointegration relationship. As shown by the Granger representation theorem, cointegration implies an error correction mechanism or *vice versa*. The error correction mechanism shows the dynamics of short-run adjustments towards the long-run equilibrium. The estimation results for the error correction models are presented by Table 3.2.2.4. In the models, the error correction term represents one period-lagged deviations from the long-run equilibrium (cointegration) relationship. The VAR lag length for the error correction model is chosen as 5, which may be plausible for quarterly data. Furthermore, the results by the AIC and SIC both supported this choice of the lag length.

Table 3.2.2.4. Error Correction Estimates

		$\Delta(\text{CAD})_t$	$\Delta(\text{BD})_t$
C	<i>t-ratio</i>	0,53 [0,70]	-1,09 [-0,86]
$\Delta(\text{CAD}_{(t-1)})$	<i>t-ratio</i>	0,63 [2,87]	0,29 [0,80]
$\Delta(\text{CAD}_{(t-2)})$	<i>t-ratio</i>	0,47 [2,31]	0,55 [1,61]
$\Delta(\text{CAD}_{(t-3)})$	<i>t-ratio</i>	0,28 [1,59]	0,30 [1,02]
$\Delta(\text{CAD}_{(t-4)})$	<i>t-ratio</i>	0,58 [3,7]	0,53 [2,06]
$\Delta(\text{CAD}_{(t-5)})$	<i>t-ratio</i>	0,21 [1,34]	0,35 [1,34]
$\Delta(\text{BD}_{(t-1)})$	<i>t-ratio</i>	0,29 [2,83]	-0,26 [-1,52]
$\Delta(\text{BD}_{(t-2)})$	<i>t-ratio</i>	0,15 [1,45]	-0,25 [-1,45]
$\Delta(\text{BD}_{(t-3)})$	<i>t-ratio</i>	0,14 [1,47]	-0,25 [-1,55]
$\Delta(\text{BD}_{(t-4)})$	<i>t-ratio</i>	0,12 [1,34]	-0,24 [-1,63]
$\Delta(\text{BD}_{(t-5)})$	<i>t-ratio</i>	-0,047 [-0,63]	0,034 [0,27]
EC	<i>t-ratio</i>	- 1,12 [-4,58]	-1,38 [-3,37]
R²		0,52	0,61
Standard Error of Regression		2,59	4,56
F-statistic		4,62	6,74
Log Likelihood		-144	-177
Sum Sq Resids		344	970
Adjusted R-squared		0,40	0,52
Akaike AIC		4,92	5,96
Schwarz SIC		5,36	6,40

* Statistically Significant measurables at % 5 significance level.

The lagged error/equilibrium correction (EC) term is negative and statistically significant in both the current account deficit and budget deficit equations. This suggests that both of the deficits adjust to a deviation from the long-run equilibrium. Johansen and Juselius (1990, 2000) and Johansen (1995) show that testing the insignificance of the EC coefficient is a test for the weak

exogeneity null hypothesis for the error/equilibrium-correcting variable. The weak exogeneity null hypothesis thus can be rejected for both the CAD and BD variables suggesting that their long-run evolution is jointly determined. The joint endogeneity of BD and CAD may lead us to interpret the results from the Engle-Granger two step procedure with a caution as it maintains the weak exogeneity of BD for the evolution of the CAD and *vice versa*. The speeds of adjustment towards equilibrium appear to be fast (almost within the period) as suggested by the magnitude of the adjustment coefficients.

The empirical literature investigating the twin deficits hypothesis often tests for Granger non-causality between current account and budget deficits. The Granger non-causality approach allows determining the short-run or forecasting direction of the relations between the variables. It allows to test whether x causes y and how much of the current y can be explained by past values of y and then to see whether adding lagged values of x can improve the explanation. y is said to be Granger-caused by x if x helps in the prediction of y , or equivalently if the coefficients on the lagged x 's are statistically significant. It is worth noting that, the Granger non-causality tests based on stationary variables, ignores the long-run effects and the error correction mechanism. In this context, it gives the short-run foreseen causality between the variables.

Granger non-causality tests for a bivariate stationary system are based on the estimation of a VAR (k) of the form:

$$y_t = a_{10} + a_{11} y_{t-1} + \dots + a_{1k} y_{t-k} + b_{11} x_{t-1} + \dots + b_{1k} x_{t-k} + \hat{\epsilon}_{1,t}$$

$$x_t = a_{20} + a_{21} x_{t-1} + \dots + a_{2k} x_{t-k} + b_{21} y_{t-1} + \dots + b_{2k} y_{t-k} + \hat{\epsilon}_{2,t}$$

for all possible pairs of (x , y) series in the group. The reported F-statistics are the Wald statistics for the joint hypothesis:

$$b_{i1} = b_{i2} = \dots = b_{ik} = 0; i=1,2.$$

for each equation. The null hypothesis is that x does *not* Granger-cause y in the first regression and that y does *not* Granger-cause x in the second regression.

Table 3.2.2.5 reports the results of the Granger non-causality tests for a bivariate stationary system containing the first differences (Δ) of the I (1)

variables considered in this study. The VAR lag length is chosen as 5 as suggested by the AIC and SIC values. The results suggest that, the hypothesis of “CAD does not Granger Cause BD” can be rejected. However; budget deficit does not reveal a significant causation relation through the current account deficit. Accordingly, there appears to be a short-run causality from CAD to BD, but not the reverse.

The real interest rates cause current account deficits, budget deficits, real income and the real exchange rate. This may not be an unexpected result as real interest rates may be influential on CAD through its' impact on capital flows. Furthermore, higher interest rates increase debt service and thus budget deficits. Consistent with the uncovered interest parity hypothesis for a financially open economy, real interest rates also cause real exchange rates. As higher real interest rates decrease aggregate demand and economic activity through mainly on consumption and investment, RIR causes real income. The causality running from real interest rates to CAD can be explained through widening CAD via the real appreciation with higher RIR. The real exchange rate, on the other hand, does Granger cause real income, real interest rate, budget deficits and the current account deficits.

Table 3.2.2.5. Pairwise Granger Causality Tests

Sample: 1988Q1 2005Q2		
Pairwise Granger Causality Tests		
Lags: 5		
Null Hypothesis:	F-Statistic	Probability
Δ CAD does not Granger Cause Δ BD	3,15	0,02*
Δ BD does not Granger Cause Δ CAD	0,54	0,74
Δ RGDP does not Granger Cause Δ BD	2,91	0,02*
Δ BD does not Granger Cause Δ RGDP	1,94	0,1*
Δ RIR does not Granger Cause Δ BD	4,05	0*
Δ BD does not Granger Cause Δ RIR	1,05	0,4*
Δ RER does not Granger Cause Δ BD	1,71	0,15*
Δ BD does not Granger Cause Δ RER	1,60	0,18*
Δ RGDP does not Granger Cause Δ CAD	3,32	0,01*
Δ CAD does not Granger Cause Δ RGDP	0,92	0,48
Δ RIR does not Granger Cause Δ CAD	3,47	0,01*
Δ CAD does not Granger Cause Δ RIR	1,30	0,28*
Δ RER does not Granger Cause Δ CAD	3,86	0*
Δ CAD does not Granger Cause Δ RER	0,35	0,88
Δ RIR does not Granger Cause Δ RGDP	1,34	0,26*
Δ RGDP does not Granger Cause Δ RIR	0,34	0,89
Δ RER does not Granger Cause Δ RGDP	3,33	0,01*
Δ RGDP does not Granger Cause Δ RER	1,60	0,18*
Δ RER does not Granger Cause Δ RIR	1,12	0,36*
Δ RIR does not Granger Cause Δ RER	3,15	0,01*

* Hypothesis can statistically be rejected at the significance level of % 5.

In order to find the effects of the budget deficit shocks on the current account deficits, impulse responses analysis and the variance decompositions of the variables are analyzed and the results are given on the appendices part of A and on B, respectively. In Appendix A, the variance decompositions show the impulse responses of each variable to each structural shock over 5 years, with one standard error bands. The definitions of the structural shocks are denoted at the top of each column and the responding variables are denoted at the far left of each row. The first column shows the impulse responses of each variable to the government budget deficit shocks that are of our main interests. The same scale is applied to graphs in each row, to easily compare the size of each variable's responses under different structural shocks. The impulse responses of the government budget deficit shocks to each structural shock suggest that the empirical model takes account of the substantial endogeneity of the government budget deficit. The forecast error variance decompositions of the variables that is shown on Appendix B and impulse responses indicate that the budget deficit shocks have large effects on the real exchange rate and on the real interest rates. Although the effects of budget deficit shocks on the current account deficit fluctuations does not seem to be large, the budget deficit seems to effect the current account indirectly by the interest rate and exchange rate channels.

CHAPTER 4

CONCLUSION

In this study, we investigated the validity of the twin deficits hypothesis for the Turkish quarterly data over 1988:1-2005:2. To this end, we employed Engle-Granger two-step single-equation and Johansen-Juselius multivariate cointegration techniques for systems of $I(1)$ variables along with Granger non-causality tests and impulse responses procedures for some stationary variable systems. The VAR systems contained budget deficits, current account deficits, real interest rates, real income and real exchange rates. This study contained also some estimates of the cyclical and structural components of budget deficits and current account deficits and some other related key macroeconomic variables.

The twin deficits hypothesis, consistent with the conventional Mundell-Flemming framework, postulates that, the current account deficits (CAD) and budget deficits (BD) move together, at least in the long-run. In this set up, CAD is the endogenous variable adjusting to changes in BD which is maintained to be weakly exogenous for the long-run evolution of CAD. However, under certain situations, CAD and BD may be jointly endogenous. High CAD leading to a financial crisis, for example, may lead to higher budget deficits due to the fiscal cost of the crisis and contingent liabilities. Under the Ricardian Equivalence Hypothesis, on the other hand, there is indeed no relationship between CAD and BD. These two deficits may be diverging rather than being twins when the impacts of cyclical fluctuations of output and interest rate increases due to a fiscal expansion are also taken into account.

The empirical results from decompositions of the budget and current account deficits into their cyclical and structural components suggest that both CAD and BD are counter-cyclical. Consequently, cyclical fluctuations appear to

generate a positive evolving effect on both CAD and BD. The budget and current account deficits are found to be positively related only after controlling the output and cyclical effects. According to Kim and Roubini (2003), non-cyclically adjusted BD should be even less strongly correlated with CAD than the cyclically adjusted one due to the effect of business cycle fluctuations. Our results, however, show that the point estimate of the unadjusted budget balance is lower than when the cyclically adjusted balance is used. However, the coefficient is not significant at any usual confidence level, so does not lend a support to the “twin divergence” hypothesis by Kim and Roubini (2003) and Bussiere, Fratzscher and Müller (2005).

The results from the Engle-Granger two-step cointegration procedure suggested the presence of a cointegration relationship between budget deficits, current account deficits, real exchange rates and real interest rates for each of the equations when the dependent variable is specified as CAD or BD. The BD (CAD) variable is found to be statistically insignificant in the co integrating equations explaining CAD (BD). Consistent with the Ricardian Equivalence hypothesis this result does not support the twin deficits postulation. A real exchange rate appreciation leads to lower CAD and BD in the long run. This may not be a very controversial result if we consider the case that exports use often imported inputs and the trade balance may also be determined by productivity differentials in the long run. The decrease in budget deficits with a real exchange rate appreciation is consistent with the fact that a considerable part of the public debt in Turkey is denominated in foreign currency the real value of which decreases an appreciation. The results of the Johansen multivariate cointegration analysis for the current account and budget deficits, on the other hand, suggest that the deficits are cointegrated. The negative cointegration coefficient supports the “twin divergence” hypothesis rather than the “twin deficits” in the recent Turkish data. According to the ECM model estimation, the long-run evolution of budget and current account deficits is jointly determined, implying that they are both endogenous for the parameters of the

cointegration vector. The speed of adjustment to a deviation from the long-run equilibrium is very fast (almost within the period) for both CAD and BD and thus the cost of disequilibrium can be interpreted as significantly high. The short-run dynamics, however, reveals a different picture as both the ECM and Granger non-causality tests suggest that CAD causes BD but not the reverse. According to the impulse response and the forecast variance decompositions of the stationary variables, budget deficit shocks have relatively larger influence on all the variables, except the current account deficit.

Current account deficits, whilst not directly determined by budget deficits, are significantly influenced by real interest rates and real exchange rates. This may suggest that, budget deficits may be effective indirectly on current account deficits via the real exchange rate and real interest rate channels. This result is, indeed consistent with Kim and Roubini (2003) arguing that a permanent increase in government spending would have no effect on the current account and “twin deficits phenomenon is dependent to the nature and the persistence of the fiscal shock”.

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APPENDICES

APPENDIX A

VARIANCE DECOMPOSITIONS

Cholesky Ordering: BDGDP CAGDP LNRGDP LNRER LNRIR

Variance Decomposition of BDGDP:						
Period	S.E.	BDGDP	CAGDP	LNRGDP	LNRER	LNRIR
1	4	100	0	0	0	0
2	5	85	10	0,6	0,1	5
3	5	72	15	3	3	7
4	6	61	26	3	2	8
5	6	58	28	3	2	9
6	6	55	31	3	3	9
7	7	51	34	4	2	9
8	7	49	36	4	2	9
9	7	47	38	4	2	9
10	7	45	39	4	2	9
11	8	43	41	5	2	10
12	8	42	42	5	2	10
13	8	41	43	4	2	10
14	8	39	44	5	2	10
15	9	38	45	5	2	10

Variance Decomposition of CAGDP:						
Period	S.E.	BDGDP	CAGDP	LNRGDP	LNRER	LNRIR
1	2	3	97	0	0	0
2	4	1	74	0,82	17	7
3	4	2	68	5	18	7
4	5	3	67	6	17	7
5	5	3	68	5	17	6
6	5	3	68	5	18	6
7	6	3	66	6	19	6
8	6	3	66	6	18	6
9	6	3	67	6	18	6
10	7	3	67	5	19	6
11	7	3	66	6	19	6
12	7	3	67	6	19	6
13	8	3	67	6	19	6
14	8	2	67	6	19	6
15	8	2	66	6	19	6

APPENDIX A
VARIANCE DECOMPOSITIONS (Continued 1)

Variance Decomposition of LNRIR:						
Period	S.E.	BDGDP	CAGDP	LNRGDP	LNRER	LNRIR
1	0,17	0,45	9	4	5	80
2	0,25	0,28	9	3	7	81
3	0,31	0,44	9	2	5	84
4	0,35	0,38	8	2	4	85
5	0,39	0,34	8	1	4	87
6	0,43	0,29	8	1	3	87
7	0,46	0,26	8	1	3	88
8	0,49	0,23	8	0,93	3	88
9	0,52	0,21	8	0,89	3	88
10	0,54	0,19	8	0,82	3	89
11	0,57	0,18	8	0,76	3	89
12	0,60	0,16	8	0,73	3	89
13	0,62	0,15	8	0,71	2	89
14	0,64	0,14	8	0,67	2	89
15	0,66	0,14	8	0,64	2	89

Variance Decomposition of LNRGDP:						
Period	S.E.	BDGDP	CAGDP	LNRGDP	LNRER	LNRIR
1	0,10	2	0,17	98	0	0
2	0,12	1	0,12	98	0,66	0,19
3	0,13	2	5	89	0,70	4
4	0,14	1	8	83	1,28	6
5	0,16	1	6	87	0,92	5
6	0,17	0,96	5	87	2	5
7	0,18	0,97	7	84	2	6
8	0,18	0,92	8	82	2	7
9	0,20	0,77	7	84	2	7
10	0,21	0,76	6	84	2	7
11	0,21	0,75	7	82	2	7
12	0,22	0,72	8	82	2	8
13	0,23	0,64	7	83	2	8
14	0,23	0,64	7	83	2	8
15	0,24	0,63	7	82	2	8

APPENDIX A
VARIANCE DECOMPOSITIONS (Continued 2)

Variance Decomposition of LNRER:						
Period	S.E.	BDGDP	CAGDP	LNRGDP	LNRER	LNRIR
1	0,08	3	7	5	85	0
2	0,11	1	19	6	70	4
3	0,13	1	21	8	65	5
4	0,15	2	22	7	63	6
5	0,17	2	23	7	61	7
6	0,18	2	24	7	60	8
7	0,19	2	24	7	60	8
8	0,20	2	24	7	59	8
9	0,22	2	25	7	59	8
10	0,23	2	25	7	58	8
11	0,24	2	25	7	58	9
12	0,25	2	25	7	58	9
13	0,26	2	25	7	58	9
14	0,27	2	25	7	57	9
15	0,28	2	25	7	57	9

APPENDIX B

FIGURE B

IMPULSE RESPONSES

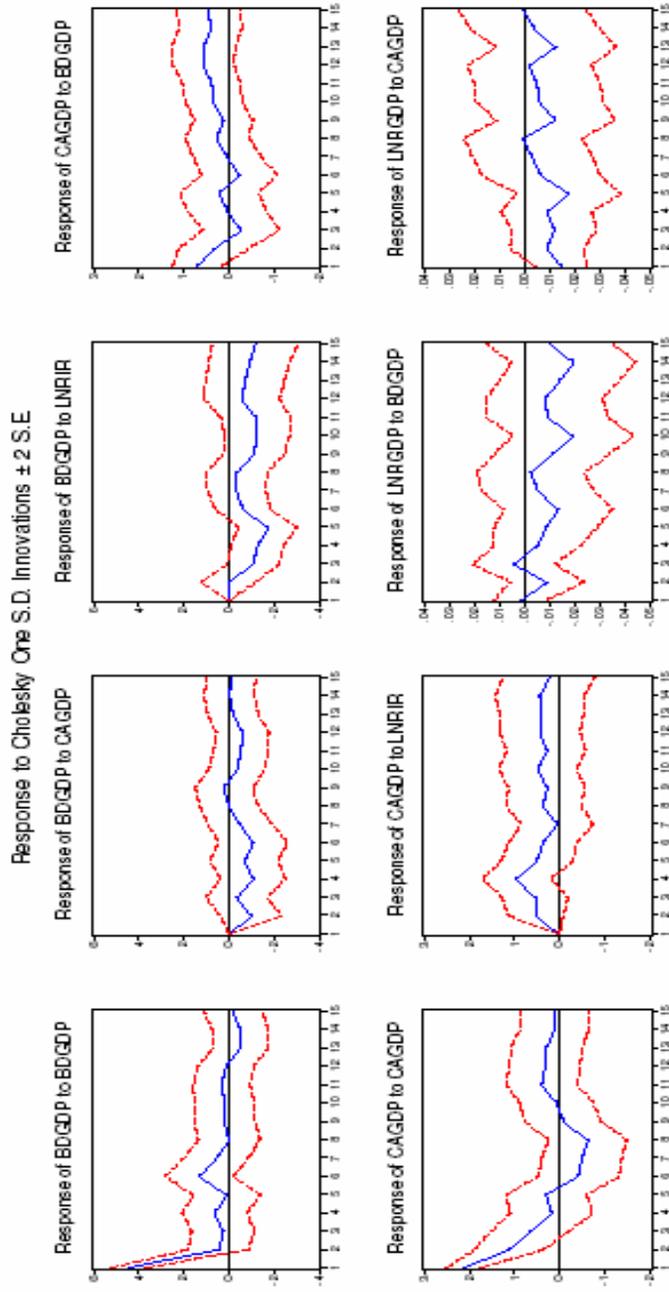


FIGURE B
IMPULSE RESPONSES (Continued)

