TITLE: TEST OF 'TWIN DEFICIT HYPOTHESIS' FOR TURKEY: AN ANALYSIS FOR 2001-2014

PERIOD

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PAGES: 211-228

ORIGINAL PDF URL: https://dergipark.org.tr/tr/download/article-file/279322

TEST OF 'TWIN DEFICIT HYPOTHESIS' FOR TURKEY: AN ANALYSIS FOR 2001-2014 PERIOD

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Abstract

Budget deficit and current deficit issues are critical macro-economic variables for most economies. Therefore, there has been a large number of academic work on this field. This study examines the causality relation between budget deficit, current deficit, exchange rate and interest rate in Turkey for 2001-2014 period. With respect to this, discussions on internal and external balance of economy and the definition of twin deficit hypothesis are given in section 1. Related empirical studies are summarized in section 2 and the work completed with econometric method and application sections. In empirical part of the work, we employ Toda Yamato causality test and we do not find any support for the twin deficit hypothesis. Our findings indicate that there is a unidirectional causality running from current deficit to budget deficit and a bi-directional causality between interest rate and budget deficit. We also find that there is a unidirectional causality running from exchange rate to budget deficit.

Keywords: Current Deficit, Budget Deficit, Twin Deficit, Toda Yamamoto Test.

Jel sınıflaması: H6, H62, F14

TÜRKİYE İÇİN 'İKİZ AÇIK HİPOTEZİNİN' TESTİ: 2001-2014 DÖNEMİ ANALİZİ

Özet

Bütçe açığı ve cari açık sorunu ekonomiler açısından önemli makro değişkenlerdir. Bu nedenle bu alana yönelik birçok çalışma yapılmaktadır. Bu çalışmada 2001-2014 döneminde Türkiye'deki bütçe açığı, cari açık, döviz kuru ve faiz oranı arasındaki nedensellik ilişkisi araştırılmıştır. Ampirik bölümde Toda Yamamoto nedensellik testi kullanmış ve ikiz açık hipotezini destekler sonuçlara ulaşılmamıştır. Elde edilen bulgular, cari açıktan bütçe açığına doğru tek yönlü, bütçe açığından faize ve faizlerden bütçe açığına doğru çift yönlü, reel efektif döviz kurundan bütçe açığına doğru tek yönlü nedensellik ilişkisi olduğunu göstermektedir.

Anahtar kelimeler: Cari Açık, Bütçe Açığı, İkiz Açık, Toda Yamamoto Testi.

JEL Classification: H6, H62, F14

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INTRODUCTION

Many developed and developing countries have faced with economic imbalances. When the main reasons of this imbalance are examined, 'current deficit' and 'budget deficit' are seen as the most important factors. Several empirical studies have been made on whether there is any relationship between these two deficits, and, if available, what is the direction of this relationship. The results obtained from these studies vary by economic policies, economic and political structure, methods applied and data sets used of countries.

Those who detected a meaningful relationship between budget deficit and current deficit define this status as '*twin deficit hypothesis*' In contrast, there are also studies which determine a relationship in direction of budget deficits from current deficits or a bi-directional relationship between variables. The studies which indicate that there is no relationship between the two deficits are based on the opinion called as *Ricardian equivalence hypothesis*.

The purpose of our study is to test the validity of twin deficit hypothesis for Turkey. For this purpose, the causality relationship between budget deficit, foreign trade deficit, exchange rate and interest rate during the period of 2001-2014 was examined. In the study composed of three parts, firstly 'economic balance' and 'twin deficit' definitions were discussed theoretically and the twin deficit problem in Turkey was mentioned. In second part, the literature review was given by examining studies previously done. And in the last part, the validity of twin deficit hypothesis in Turkey during the period of 2001-2014 was tried to be determined by using the Toda Yamamoto test.

INTERNAL AND EXTERNAL BALANCE IN THE ECONOMY: TWIN DEFICIT HYPOTHESIS

The economies are established on two bases; 'internal balance' and 'external balance'. The components of internal balance are stated as *'the private sector balance'* (I-S) composed of investment and saving and *'the public sector balance'* (T-G) composed of public incomes and expenses. The difference between the export and import is defined as 'external balance' (X-M). As shown in the equation number (1) below, it can be said that there is a macro-economic interrelation between the internal balance and external balance.

$$\textbf{(I - S)} \quad + \quad \textbf{(T - G)} \quad = \quad \textbf{(X - M)} \quad\quad (1)$$
$$\downarrow \quad\quad\quad\quad \downarrow \quad\quad\quad\quad \downarrow$$

PRIVATE SECTOR BALANCE   BUDGET BALANCE   EXTERNAL BALANCE

The relation in question anticipates that internal economic balance would have a 'deficit' and in this case the external balance (X-M) consisting the other side of the equation if mentioned private sector balance (I-S) and public sector balance (T-G) have a deficit. This equation also demonstrates three basic deficits for less developed countries; saving deficit, budget deficit and current deficit. It is not seen as possible to provide these three balances simultaneously in the outward-oriented economies (Tunçsiper and Sürekçi, 2011, p.104).

Before we examine twin deficit concept, it is necessary to define budget deficit and current deficit concepts firstly. Budget deficit is simply the case when public revenue cannot compensate public expenditure. As for current deficit, it represents the situation when total balance of current account in international balance of payments is negative or it is the case when the inflow of receipts obtained from current accounts is less than the outflow of receipts made for current accounts. However, in order to simplify the twin deficit hypothesis, as current deficit most often develops in consequence of deterioration in terms of trade, foreign trade balance and current balance concepts have become substitutable in economic literature (Bayrak ve Esen, 27-28).

If both budget balance and current balance have a deficit in an economy, this case it called '*twin deficit*' (Tang, 2013:9). 'Twin deficits hypothesis' becomes determinative on the economy politics of outward-oriented economies (Papadogonas and Stournaras, 2006, p.595). In case of these deficits, both

monetary and fiscal policy must be applied together. Thus, the solution of the macroeconomic problems like unemployment, inflation, high degree borrowing and exchange rates leading to twin deficits is possible and the decrease of deficits are can be provided with optimal use of monetary and financial policies (Klein, 2006, p.675).

In the economics literature, twin deficit theory is assessed as based on two different views; 'Keynesian theory' and 'Ricardian equivalence theorem'. Keynesian theory is a view arguing that the budget deficits cause to foreign trade deficits. According to theory of Keynes, the cases where the public expenses increase or taxes decrease (expansionary fiscal policy) cause to the current balance deteriorate (Dibooğlu, 1997, p.788). The expansionary fiscal policy firstly causes to the increase of the income by supporting the manufacturing and consumption and to foreign trade deficit thereby by increasing the demand for imported goods (Sever ve Demir, 2007: 48). Secondly, it leads to interests increase by deteriorating the domestic investment-saving balance and to the external balance deteriorate by raising the demand for imported goods in ways of income of foreign fund and of over valuation of domestic currency and by weakening the competitive power of exported goods.

The budget deficit problem arises because many developing countries have more expenses than their public incomes. In the Mundell-Fleming model based on General Theory of Keynes, in prospect of flexible and stable exchange rate, the domestic borrowing in place of foreign borrowing to finance the budget deficit causes to interest rates increase and thereby to short-term foreign capital inflows. While the increase of currency amount in the country leads to the currency value decrease, it causes to over valuation of domestic currency. This situation deteriorates the foreign trade balance by making the export relatively more expensive and the import cheaper. As a result, the budget deficit causes to the foreign trade deficit. Such expansionary fiscal policies especially in developing countries causes the other balances have deficits by deteriorating the budget balances. Due to these reasons, the external and internal balance does not take place simultaneously according to Saleh and Harvie (Saleh and Harvie 2005, p.220).

In consequence of budget deficits financed by domestic borrowing, the increasing interest rates cause to reduction of private sector investments (crowding out) and deteriorate the private sector investment-saving balance (I-S) (Kim and Roubini, 2003). However, if the foreign investment inflow becomes high, it provides less increase of interest and crowding-out effect at lower level by reducing the use of domestic savings to finance the budget deficits (Lau and Baharumshah, 2006, p.214).

The quality and component of increasing public expenses have an effect on the size of current deficits (Sever and Demir, 2007, p.49). For example, if the public expenses are mostly on imported goods, the current deficit rate rises. In the same time, it differs by whether the imported goods are investment or consumption goods. If the investment goods are imported, the countries can finance their debt by returning in future, but if the consumption goods are imported, this may cause to a higher public deficit as they would not provide any return in following years.

The Ricardian equivalence theorem argues that there is no relationship between the budget deficits and foreign trade deficits and they do not affect each other. According to Ricardo, no matter how fiscal policy is financed, it would not have an effect on level of income and on reel sector and thereby would not be effective. According to Ricardian equivalence theorem, as the budget deficits arising from tax deduction would result in tax boost in following periods, it would not have an effect on planned saving level. According to this theory, the individuals decide by taking into consideration their lifelong revenues in making economic decisions. Therefore, the raise of disposable earnings induced by tax deduction is not perceived as wealth effect (Marinheiro, 2001, p.3) and does not result with an increase in consumption. Because individuals with rational thinking know that the budget deficit would be compensated with the tax boost in after days. Therefore, they save the today's raise of disposable earnings in order to compensate the tax boost in after days. Thus, the more the tax deduction causing the budget deficit increases the today's saving, the lower it decreases the today's consumption (Boyes and Melvin, 2013, p.276). Thereby, the national saving does not affect the investment and interest rates (Yıldırım et al., 2012, p.451).

In addition to the Keynesian General Theory and Ricardian equivalence Theory mentioned above, there are also studies in direction of the fact that current deficits have a racket effect on budget deficits. This effect can be with same or opposite directions. If this effect is in opposite (negative) direction, the improvement in current deficit increases the budget deficit. This situation leads to the growth slow down during periods where current surplus is given in raw material and investment goods importing countries like Turkey and to the budget deficits arise to compensate this as a result of application of expansionary fiscal

policies (İyidoğan and Erkam, 2013, p.45). Summers (1988) calls these studies as *'Current Account Targeting'*. If the relationship between these two deficits is in the same (positive) direction, the increase in current accounts also increases the budget deficit. Baharumshah et al., (2005, p.8), argue that less developed countries having inadequate internal savings need the foreign capital and this situation causes to both current deficits and budget deficits by increasing the interest rates.

The causality relationship expected between budget deficit and current deficit are summarized visually in Table 1 according to different approaches. In the option A of Table, it is shown how the budget deficits affect indirectly the current account deficit by way of interest and exchange rate. This effect can be indirect and also direct. In this case, it is from the budget deficits to current deficits, and shown with dashed lines. In the option B, the Ricardian Equivalence Hypothesis is shown arguing that there is no relationship between the budget deficits and current deficits. The case where the current deficits affect the budget deficits is shown in option C. This case appropriate to the result of our study is called as 'current account targeting'. Finally, in the option D the possibility of bi-directional relationship between two deficits is described.

Table 1: The Relationship Between The Budget Deficit And Current Deficit

Keynes: Traditional view*	**B)The Ricardian Equivalence Hypothesis**
Interest Rates Budget Deficit Exchange Rate Current Deficit	Budget Deficit ……….. Current Deficit
C) Current Account Targeting Budget Deficit ⟵——— Current Deficit	**D) Bi-directional Causality** Budget Deficit ⟵——⟶ Current Deficit

Source: Baharumshah and Lau, 2005, p.29-30.

* It is shown how the budget deficits affect indirectly the current account deficit. This effect can be indirect   and also direct. The direct effect is from the budget deficits to current deficits, and shown with dashed lines.

I.I. The Budget Deficit in Turkey and Foreign Trade Balance

Regarding to the internal and external balance of Turkey from its foundation till to today, it has seen that the problems especially in external balance have shown an increasing trend in the recent period. Its main reason is the economic policies applied during the period from first years of the Republic to the Second World War. The monetary and fiscal policies followed in this period were based on balanced budget, fixed exchange rate and foreign trade balance principles and had accepted the development with internal savings as a key doctrine. As a result of this policy, the foreign trade balance had an 'external surplus' during the period of 1930-1946 except 1938 and the value of Turkish Lira had shown a quite stable trend (Kepenek, 2012:63-77).

Following the transition to the multiparty era, the liberal and populist economic policies applied in and after 1950 had led to the budget deficits and foreign trade deficits increase over time. (Kepenek, 2012: 95, 118). Even if the exports had risen rapidly over time with export led economy policies applied after 1980, the more increase in trend of imports compared to exports caused to the foreign trade balance breakdown and to external deficits ever becoming a chronic problem (Kepenek, 2012:213).

In the period after 1950, similar to foreign trade deficits, it is seen that budget deficits have shown an increase by years in Turkey. Some factors such as the increasing public expenses, the interest payments paid

for domestic and foreign debts and the compensation of state-owned enterprises by the government budget are placed among the main reasons of this increase. Following the 5th April Decisions accepted in 1994 and the 2001 financial crisis, the privatizations and financial reforms had gained speed in order to reduce the debt burden of public institutions on state and budget deficits. Otherwise, financial discipline had tried to be provided in public by turning back to balanced budget policies by 2004. However, even if the proportion of budget deficits in national income decreases in 2001-2006 despite these policies, it had shown again an increase in the following years. In addition to this, it can be said that the budget deficit had decreased in period of 2009-2014 compared to previous years. The main reason for this decrease is the earnings from privatizations (TÜRMOB ,2015 :85-96).

Table 2: 2002-2014 Turkish Economy Macroeconomic Variables

Year	Budget Deficit /GDP (%)	Current Deficit /GDP (%)	Public Net Debt Stock /GDP (%)	Private Sector Foreign External Debt /GSYH (%)	Household Debt Stock /GDP (%)
2002	-11,2	-0,3	69,2	18,7	2
2003	-8,8	-2,5	62,2	16,1	3
2004	-5,4	-3,7	56,6	16,4	5
2005	-1,5	-4,6	51,1	17,6	7
2006	-0,5	-6,1	45,5	23,0	9
2007	-1,6	-5,9	39,6	24,8	11
2008	-1,8	-5,7	40,0	25,4	12
2009	-5,5	-2,2	46,3	27,9	13
2010	-3,6	-6,2	43,1	26,1	15
2011	-1,3	-9,7	39,9	25,9	17
2012	-2,2	-6,0	37,6	29,0	18
2013	-1,2	-7,9	37,4	32,4	19
2014	-1,3	-5,7	34,9	34,4	19

Source: Eğilmez, 2015.

As seen on Table 2, there had been both budget deficit and current deficit during the period of 2002-2014 in Turkey. But the significance of these deficits in economy offers diversity. At the beginning of the 2000s, while the budget deficit was higher than current deficit; this situation had changed in following years. So long as the budget deficit had straightened, the current balance had deteriorated. Besides, it is seen that the debt structure has changed after the 2000s, and this situation has been in favour of private sector and household.

When we handle the variables mentioned above for Turkey, we see that all of factors such as the investment-saving balance (I-S) consisting of the internal and external economic balance, the balance of government income and expenses (T-G) and the foreign trade balance (X-M) had a 'deficit'. This case is so-called as 'triple deficit'. The triple deficit reveals in economies which try to grow over its potential even if its internal savings are inadequate and these economies becomes open to all kind of crisis (Eğilmez, 2013). Although the budget balance had more deficit in the part of triple balance consisting the internal balance

according to investment-saving balance before 2000, the budget deficit (T-G) have decreased gradually after 2000 and the saving balance (I-S) have started to increase instead of that.

It is possible to associate the situation with the 'high interest rate-low exchange rate' policies applied in related period. For the purposes of internal balance, the foreign savings have tried to be directed into the country through 'hot money' movements because of the inadequacy of domestic savings. However, as the low exchange rate had made the imports cheaper while it had decreased the competitiveness power of export goods, these policies had resulted with the gradual increase of deficits in external balance.

EMPIRICAL STUDIES MADE INSIDE AND OUTSIDE TURKEY

Many developed and developing countries have experienced the budget deficits and foreign trade imbalances. Therefore, the twin deficit subject has had a large study area in literature and many studies were made by different persons in different countries. These studies differ by political and economic policies applied in covered countries, data resources and methodology. The majority of these studies are summarized below.

II.I. Studies Made inside Turkey

'The limit test' was applied in the study covering the years 1998-2010 made by Bolat et al. (2011). In this study, it is revealed that no relationship was observed between budget deficit and current account deficit in long term, but a strong relationship was observed between the two variables in short term.

Another study examining the twin deficits in Turkey with limit test belongs to Aksu and Başar (2009). In the study made by using the data of period 1994-2008, a result confirming the Ricardian equivalence hypothesis was obtained. No important role of budget deficit was observed neither in long-term nor in short term.' Aksu and Başar (2009), in other study that they made, concluded that the foreign trade deficits affect the budget deficits.

In the study of Utkulu (2003), the twin deficit hypothesis was tested in basis of co integration and causality analysis. According to the findings of study, a bi-directional causality relationship was observed between budget deficits and foreign trade deficits in long term and a uni-directional relationship was observed in short term.

The study of Tunçsiper and Dilekçi (2011) covers the period of 1987-2007. In the study in which the VAR analysis was used, no relationship was observed between budget and foreign trade deficits.

A bi-directional causality relationship between budget and foreign trade deficits was observed in the study made by Yılmaz (2002) and where Granger causality analysis was applied.

Ata and Yücel (2002) examined the twin deficits of Turkey by applying co integration and causality tests for the 1975-2002 period. According to the results of this study, a long-term relationship was found between the current account deficit and budget deficit. In addition, they found a bi-directional causality relationship in different lag levels in the causality test results.

Zengin (2000) applied the VAR model for 1987-1999 period in his study and concluded that the budget deficits affect the foreign trade deficits and in the same time it is affected by foreign trade deficits.

In the study of Günaydın (2004), Toda Yamamoto causality test was applied and a uni-directional causality relationship from budget deficits to foreign trade deficits was determined between 1987-2003 periods.

Özçalık and Erataş (2014) analyzed the twin deficit hypothesis in emerging economies such as Poland, Greece, Ireland, Portugal, Spain and Turkey by using the panel data method. In the study covering the years 1995-2010, twin deficit hypothesis was not supported for the countries mentioned.

İyidoğan and Erkam (2013) investigated the validity of the twin deficit hypothesis for Turkey in the period of 1987-2005 using Granger causality analysis. According to the results, in contrast to general theory, they determined a causal relationship from current account deficit to budget deficits.

The study of Ay et al (2004) investigated the twin deficits with Granger causality and regression analysis. In the study covering 1992-2003 years, Keynesian hypothesis was accepted.

In this study, Erinç (2008) tested the twin deficits hypothesis for Turkey between years of 1950-2005 with the co integration and Granger causality analysis. They determined that there is a long-term relationship between the budget deficit and the current account deficit. In addition to this, the direction of causality was found as from budget deficits to current deficits.

Bayrak and Esen (2011) applied the Johansen co integration and error correction model for period of 1975-2010. They determined both long-term and short term relationship between budget deficits and current account deficits.

Kutlar and Şimşek (2001) applied the co integration, error correction model (ECM) and Granger causality tests for the period of 1984:4-2000:2 in their study. They reached the results supporting the twin deficit hypothesis for short and long term.

Gök and Altay (2007) tested the Johansen cointegration, using action-reaction and variance decomposition analyses with the data of 1989-2005. Although they did not found any result supporting the twin deficits hypothesis in long term, they concluded that the twin deficit hypothesis is valid in short term.

Akbostancı and Tunç (2002) tested the twin deficits hypothesis by applying the cointegration and error correction model (ECM). According to the findings of the 1987-2001 periods, a relationship between two deficits was determined in long-term.

Another study of Kılavuz and Dumrul (2012) covers the 2006-2010 period. The different results were obtained in the long and short term in the study where limit test, Granger causality and VAR analyses were applied. While no relationship was observed in long term between budget deficits and current deficits, a bidirectional causal relationship was found in short term between two deficits.

II.II. Studies Made Outside Turkey

Tang (2013) examined the 1970-2011 period in his study which he made for USA. According to the cointegration test results, it is stated that the budget balance and the current account deficit are in relation with each other and support the twin deficit hypothesis.

Sobrino (2013) used two different samples in his study which he made for Peru. While the entire sample include 1980-2012 period, the main sample include the 1990-2012 period. In his study where he applied Granger causality test, he refused the twin deficit hypothesis and determined an inverse directional causality relationship from current deficits to budget deficits.

Magazzino (2012) investigated the relationship between the budget deficits and the current deficits for Italy with time series analysis by taking into consideration 1970-2010 periods. According to the results of this study, it is determined in results of co integration test that there is not a long term relation between the two variables in question. According to Granger causality test, a unidirectional causality from foreign trade deficits to budget deficits was observed.

Perera and Liyanage (2011) tested the twin deficits hypothesis for Sri Lanka by using the yearly data for 1960-2009 periods and the quarterly data for 1990-2009 periods. They applied the cointegration test and Granger causality test for both quarterly and yearly data. In the analysis results, it was determined that there was a relation in long term between the budget deficits and current deficits and a causality relation from the budget deficits to current deficits.

Zamanzadeh and Mehrara (2011) examined the twin deficits hypothesis for 1959-2007 periods in Iran. However, they excluded the oil revenues in current deficit accounts. In the study where they applied the cointegration and VECM analysis, the results supporting the twin deficits hypothesis were obtained.

Ganchev (2010) made a VAR analysis by using the data of the period 2000-2010. According to the findings of the study, it is stated that the twin deficit hypothesis was not validated in short term between the

current balance and the budget deficit but this hypothesis may be valid in long term. In the causality test results, a bi-directional relation was found between the variables.

Tang and Lau (2009) made an examination for USA by using the quarterly data of years 1973-2008. In the study, the current account balance, government budget balance, the investment and private savings rates were tested with the Johansen co integration analysis. In the results of the tests, a long term relationship was observed between the current account balance and public budget balance.

Chang and Hsu (2009) examined the causality relationship between the budget deficit and current account deficit for USA, Four Asian Tigers and five Northern European countries. They used the Toda-Yamamoto analysis with data of 1980-2007 related to the countries in question. According to analysis results, a uni-directional causality relationship was found from current deficits to budget deficits.

Marinheiro (2006) and (2008) examined whether the twin deficit hypothesis is valid in the context of the Egyptian economy. In his two studies, respectively Johansen co integration analysis, error correction model (ECM) and Granger causality tests were made. According to the analysis findings, the presence of a long-term relation was determined between budget deficit and current deficit, and a unidirectional causal relationship from current deficit to budget deficit.

Kim and Roubini (2008) investigated the long term relationship between the current deficit and the budget deficit by using the data of USA for the 1973-2004 periods. It was concluded in the study by using the VAR analysis that two variables move together in short and long period and the twin deficits hypothesis is present.

The relationship between the budget deficit and foreign trade deficit in Pakistan was tested with Granger causality analysis by Mukhtar et al. (2007). In the study covering the years 1975-2005, a long term relationship was determined between the budget deficit and foreign trade deficit. According to the results, a bi-directional relationship was determined between the variables.

Bagnai (2006) investigated 22 OECD countries in the period of 1960-2005 with the time series data. The current deficits, the short and long term relationship between budget deficits and investments were tested with the Westerlund cointegration analysis in the study. It was determined that there is a long term relationship between current deficits and budget deficits in OECD countries in hand.

Lau and Baharumshah (2006) investigated the twin deficits hypothesis between years 1980-2001 for 9 Asian countries[4]. According to the obtained findings, they determined a bi-directional relationship directly (from budget deficits to current deficits) and indirectly (budget deficits → interest rates → exchange rates→ current deficits) between budget deficits and current deficits.

Pattichis (2004) used yearly data of budget deficit and current account deficit for Lebanon in 1982-1987 in his study. He applied the regression analysis by constructing an error correction model (ECM) on the budget deficit and current account deficit and tried to determine the relationship between these variables. According to the analysis findings, it was observed that there was a short and long term causality relationship from the budget deficit to current account deficit for Lebanon.

Vyshnyak (2000) examined the relationship between the public budget balance and current account balance of Ukraine in his study. He analysed the 1995-1999 period with VAR analysis by using the quarterly data in his study. According to his causality analysis, the presence of a long term relationship between the budget deficits and current deficit and causality from the budget deficit to current account deficits were determined.

Alkswani (1999) tested the twin deficits hypothesis for 1970-1999 periods on Saudi Arabia of which economy is based on oil. Having used error correction model (ECM), cointegration and Granger causality analysis, he determined a relationship between the two deficits in short and long terms. Therefore, he did not accept neither Keynesian General Theory nor Ricardian Equivalence Theory for oil based economies.

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[4] Malesia, Singapore, Thailand, Indonesia, South Korea, Myanmar, Nepal, Sri Lanka and Philippines.

METHOD AND EMPIRICAL ANALYSIS

The study mainly purposes to analyse the relationship between budget deficits and current account deficit. For this purpose, the following simple linear regression models primarily were taken into consideration in order to analyse the causality relationship between budget deficit and current account deficit:

$$CA_t = \alpha_0 + \alpha_1 BA_t + e_t \qquad (2)$$

$$BA_t = \beta_0 + \beta_1 CA_t + u_t \qquad (3)$$

In addition to the budget deficit and current deficit series situated in mainly handled model, the exchange and interest rates affecting closely these two variables are situated in the causality analysis part. Besides, the relation of the exchange and interest rates with two variables are investigated separately. Hence four variables were used in the study. These variables, their definition and resource information are shown in the following table.

Table 3: Variables and Their Definitions Used in the Study.

Variable	Description and Definition	Source
Cd	Current deficit/ GDP	Central Bank, (EVDS)
Bd	Budget Deficit/ GDP	Ministry of Finance
R	Reel effective exchange rate	Central Bank, (EVDS)
I	Domestic borrowing rate of interest	Undersecretariat of Treasury and Ministry of Development

The current account deficit and budget deficit data are realized by being divided to the GDP deflator. Interest variable refers to government domestic borrowing rates, and the exchange rate refers to effective exchange rate. As our current deficit and budget deficit data include negative values and other variables are small, their logarithms are not taken. Although the variables are quarterly, it was tested whether they contain any seasonal effect but no seasonal effect was observed. Both because of this reason and as it was suggested by Davidson-MacKinnon (1993) that the use of data adjusted from seasonal effects in use of unit root test may cause oriented-results, the data we used was not adjusted for seasonal effects.

III.I. Unit Root Test

In order to make causality test in a reliable way in the application part, it must primarily check whether the series related to variables are stable. The stability of a time series relies on the fact that its average and variance must not to be changed in time and that its covariance between two periods must be liable not the period where it was calculated but to the distance between two periods (Gujarati, 1999, p.713). In case study with instable time series, the spurious regression problem arises. The spurious regression problem may lead to the results obtained by regression analysis do not reflect the real relationship (Granger and Newbold, 1974, p.111-120). The most common method used in investigation of the stability of time series is the "Augmented Dickey Fuller-ADF" unit root test which was developed by Dickey-Fuller (1981).

If the error term in Dickey-Fuller equation (u_t) has autocorrelation problem, by adding the lagged value of ΔY_t to the model as explanatory variable, this problem is solved and thereby ADF test is obtained. In the ADF analysis, the following equation is used:

$$\Delta Y_t = \beta_0 + \beta_1 t + \delta Y_{t-1} + \sum_{i=1}^{m} \alpha_i \Delta Y_{t-i} + u_t \qquad (4)$$

Stability analysis of time series used in this study was made by using the ADF unit root test.

Table 4: ADF Unit Root Test Results

	ADF Test Statistic	Critical Values		
		%1	%5	%10
Bd	-2.565147 (0.1072)	-3.574446	-2.923780	-2.599925
Δba	-5.114973 (0.0001)	-3.574446	-2.923780	-2.599925
Cd	-3.038932 (0.0384)	-3.574446	-2.923780	-2.599925
R	-3.362222 (0.0176)	-3.581152	-2.926622	-2.601424
I	-3.352902 (0.0176)	-3.568308	-2.921175	-2.598551

As seen in Table 4, according to the ADF unit root test we identify that, except for our budget deficit series, other series do not contain unit root I(0) at level. In order to determine the appropriate lag length, the ADF unit root test results were obtained according to the Akaike information criterion. Because, the large determination of lag length may lead to the multi linearity problem which reduces the degree of freedom and the low determination of lag length may lead to model building error. For avoiding from these problems, information criterions such as Akaike, Schwarz, Hannan-Quinn and the last line estimate are used (Gujarati, 2012, p.785).

As seen on Table 4, our budget deficit series were found stable I(0) at level according to the ADF unit root test. The budget deficit series is appeared to have unit root, so they are instable. In this case, the budget deficit series I(1) becomes stable in first difference.

III.II. Toda-Yamamoto Causality Analysis

Toda-Yamamoto (1995) developed the causality analysis to investigate the Granger causality analysis tests. While the instable series are analysed after being stationery in Granger (1969) causality analysis, Toda-Yamamoto (1995) developed a causality test insensitive to stability level. The case levels are used with Toda-Yamamoto analysis and the data loss became thereby avoided (Çil, 2006, p.169-170). Moreover, the Granger causality test is a lot more sensitive to determine the lag length. If the lag length is underestimated, additional lags in VAR model may make proper estimation difficult. In other words, instable series may give rise wrong causality relationships. In order to eliminate these problems and to obtain more consistent results, Toda and Yamamoto developed the analysis of causality based on the VAR model (Çetin and Şeker, 2013, p.131-132).

On the first stage of Toda-Yamamoto analysis, the appropriate lag length (p) must be determined. On the second stage, the maximum integration level of variable having the highest cointegration level (dmax) must be added to the lag length (p). On the third stage, lag length (p) is estimated a VAR (p+d_{max}) model having maximum integration level (d_{max}) (Toda and Yamamoto, 1995, p.230). In their study, Toda and Yamamoto (1995) state that its test would have the chi-square (χ^2) distribution by being used the developed Wald test statistic made by adding the lag value up to maximum integration level to VAR model. In other words, the significance of these constraints is tested by constraining the coefficients came from d_{max} and with developed Wald (MWald) test at last stage.

The estimated VAR model is defined as follows:

$$Y_t = \alpha_0 + \sum_{i=1}^{p+d_{max}} \alpha_{1i} Y_{t-i} + \sum_{i=1}^{p+d_{max}} \alpha_{2i} X_{t-i} + u_t \qquad (5)$$

$$X_t = \beta_0 + \sum_{i=1}^{p+d_{max}} \beta_{1i} X_{t-i} + \sum_{i=1}^{p+d_{max}} \beta_{2i} Y_{t-i} + v_t \qquad (6)$$

For the equation number (5), the null hypothesis of test assumes that there is not a causality relationship from X to Y. For the equation number (6), the null hypothesis of test assumes that there is not a causality relationship from Y to X.

The causality relationship between the variables used in this study is introduced by using Toda-Yamamoto (1995) causality analysis. It is not compulsory for the Toda-Yamamoto causality analysis series to be stable at the same degree. So, it offers the possibility to investigate the causality relationship without being required to have cointegration between the series. According to ADF unit root test results made on previous stage of the study, all series do not become stable on level values. The budget deficit series becomes stable only when the first I(1) difference is taken. ADF test results make it possible to analyse the causality relationship with Toda-Yamamoto approach.

In the study, each series was handled by being grouped in pairs in order that the relationship between variables gives consistent results. The lag length of series grouped in pair wises were determined without any causality analysis, and then it was tested whether the series have autocorrelation and changing variance in framework of determined appropriate lag length, and the causality relationship between variables was tested with Toda-Yamamoto method.

a. Causality Relationship Results of Current Deficit and Budget Deficit

Constituting the basis for this study, the causality relationship between current deficit and budget deficit is tested firstly. In order to obtain reliable results, firstly the appropriate lag length was determined and then it was tested whether the series have autocorrelation and changing variance in framework of determined appropriate lag length and finally the causality relationship between variables was tested with Toda-Yamamoto method. The estimated VAR model for the current deficit and the budget deficit series constituting the basis for this study are as follows:

$$CA_t = \alpha_0 + \sum_{i=1}^{p+d_{max}} \alpha_{1i} CA_{t-i} + \sum_{i=1}^{p+d_{max}} \alpha_{2i} BA_{t-i} + u_t \qquad (7)$$

For the equation number (7), the null hypothesis of test assumes that there is not a causality relationship from CA to BA.

$$BA_t = \beta_0 + \sum_{i=1}^{p+d_{max}} \beta_{1i} BA_{t-i} + \sum_{i=1}^{p+d_{max}} \beta_{2i} CA_{t-i} + v_t \qquad (8)$$

For the equation number (8), the null hypothesis of test; assumes that there is not a causality relationship from BA to CA.

Test results obtained from the estimated model are given below.

Table 5: Determination of Lag Length

lag	logL	LR	FPE	AIC	SC	HQ
0	751.2859	NA	9.47e-17	-31.22024	-31.14228	-31.19078
1	768.0071	31.35240	5.57e-17	-31.75030	-31.51640*	-31.66191
2	770.0942	3.739417	6.04e-17	-31.67059	-31.28076	-31.52328
3	775.0254	8.423965	5.83e-17	-31.70939	-31.16362	-31.50314
4	787.6377	20.49502	4.09e-17	-32.06824	-31.36654	-31.80306
5	796.5015	13.66509*	3.37e-17*	-32.27090*	-31.41326	-31.94680*

As seen on Table 5, our lag length number was determined as 5 according to SC, FPE, AIC and HQ information criterion. It was tested whether the VAR model having this lag length has the autocorrelation and changing variance. Test results are given on Table 6.

Table 6: Autocorrelation and Variable Variance Test Results

	Lagrange Multiplier (LM) Autocorrelation Test		White Variable Variance Test	
Lag Length	*LM- Test Statistic*	*Probability Value*	χ^2 *- Test Statistic*	*Probability Value*
1	9.330261	0.0534	12.70648	0.3907
2	11.01637	0.0264	30.38078	0.1725
3	8.220125	0.0838	55.64103	0.0194
4	1.688479	0.7928	70.37320	0.0193
5	**4.014292**	**0.4041**	**81.57348**	**0.0334**

According to results on Table 6, there is not an autocorrelation and changing variance problem on 5 lagged models at 1 % significance level. Thus, it is decided that the optimum lag length can be taken as 5. In this case, *p=5*.

Table 7: Results of Toda-Yamamoto Causality Test Between Current Deficit and Budget Deficit

	χ^2 Test Statistic	Probability Value	Decision
ba=>ca	6.341093	0.2744	There is a unidirectional causality relationship from current deficit to budget deficit.
ca=>ba	11.42879	0.0435	

According to the Toda-Yamamoto test results on Table 7, the probability value of analysis from current deficit to budget deficit shows the presence of a significant relationship. Regarding to the probability value of the above test results, it is seen that there is a bi-directional causality relationship from current deficit to budget deficit. But there is not a direct relationship from budget deficit to current deficit.

b. Causality Relationship Between Budget Deficit and Interest Rate

On this stage, we examine direction of the causality between budget deficit and interest rates which are particularly considered to be in relation with each other. The test results of causality relationship between budget deficit and interest are given below.

Table 8: Determination of Lag Length

Lag	logL	LR	FPE	AIC	SC	HQ
0	183.1937	NA	1.80e-06	-7.549738	-7.471771	-7.520274
1	263.3480	150.2894	7.56e-08	-10.72283	-10.48893*	-10.63444
2	264.6645	2.358752	8.46e-08	-10.61102	-10.22119	-10.46370
3	269.9027	8.948584	8.06e-08	-10.66261	-10.11685	-10.45637
4	**285.3793**	**25.14937***	**5.02e-08***	**-11.14080***	**-10.43910**	**-10.87563***
5	288.8894	5.411473	5.16e-08	-11.12039	-10.26276	-10.79629

As seen on Table 8, our lag length number was determined as 4 according to FPE, AIC and HQ information criterion. It was tested whether the VAR model having this lag length has the autocorrelation and changing variance. Test results are given on Table 9.

Table 9: Lagrange Multiplier (LM) Autocorrelation Test Results

	Lagrange Multiplier (LM) Autocorrelation Test		**White Variable Variance Test**	
Lag Length	*LM-Test Statistic*	*Probability Value*	χ^2*-Test Statistic*	*Probability Value*
1	0.870472	0.9288	51.26038	0.0000
2	6.352201	0.1743	65.34968	0.0000
3	7.440141	0.1144	76.33469	0.0001
4	**2.445403**	**0.6544**	**82.87961**	**0.0130**

According to results on Table 9, there is not an autocorrelation and changing variance problem on 5 lagged models at 1% significance level. Thus, it is decided that the optimum lag length can be taken as 4. In this case *p=4*.

Table 10: Causality Analysis Between Budget Deficit and Interest

	χ^2 **Test Statistic**	**Probability Value**	**Decision**
ba=>f	15.56812	0.0037	A bidirectional causality relationship was determined between budget deficit and interest variables.
f=>ba	22.19240	0.0002	

Regarding to the Probability Values on Toda-Yamamoto test results in Table 10, the presence of a bi-directional significant relationship is observed between the budget deficit and interest rates. These test results have the characteristics of supporting the theoretical views which state that there is a strong tie between budget deficits and interest rates.

c. Causality Analysis Between Budget Deficit and Exchange Rate

On this stage, it is regarded that a causality relationship exists between the budget deficit and the exchange rate. Test results are given below.

Table 11: Determination of Lag Length

Lag	logL	LR	FPE	AIC	SC	HQ
0	197.3088	NA	1.00e-06	-8.137867	-8.059900	-8.108403
1	**226.0950**	**53.97418**	**3.57e-07***	**-9.170626**	**-8.936726***	**-9.082235***
2	226.9636	1.556263	4.07e-07	-9.040152	-8.650318	-8.892833
3	228.6108	2.813916	4.50e-07	-8.942117	-8.396350	-8.735871
4	238.2276	15.62724*	3.58e-07	-9.176149*	-8.474448	-8.910975
5	239.0103	1.206770	4.12e-07	-9.042098	-8.184464	-8.717996

As seen on Table 11, our lag length number was determined as 1 according to LR, FPE SC and HQ information criterion. It was tested whether the VAR model having this lag length has the autocorrelation and changing variance. Test results are given on Table 12.

Table 12: Lagrange Multiplier (LM) Autocorrelation Test Results

	Lagrange Multiplier (LM) Autocorrelation Test		White Variable Variance Test	
Lag Length	*LM-Test Statistic*	*Probability Value*	χ^2 *-Test Statistic*	*Probability Value*
1	1.067569	0.8994	10.81196	0.5451

According to results on Table 12, there is not an autocorrelation and changing variance problem on 5 lagged models at 1% significance level. Thus, it is decided that the optimum lag length can be taken as 1. In this case *p=1*.

Regarding to the Probability Values on Toda-Yamamoto test results in Table 13, the presence of a unidirectional significant relationship is observed from the exchange rate to the budget deficit.

Table 13: Causality Between Budget Deficit and Exchange Rate Results

	χ^2 **Test Statistic**	**Probability Value**	**Decision**
ba=>k	0.002246	0.9622	There is a unidirectional causality relationship between budget deficit and exchange variable from exchange to budget deficit.
k=>ba	7.445562	0.0064	

When all the evidence that we have obtained are evaluated; the relations determined a significant causality between current deficit, budget deficit, interest rates and exchange rate and the causality direction can be summarized as follows;
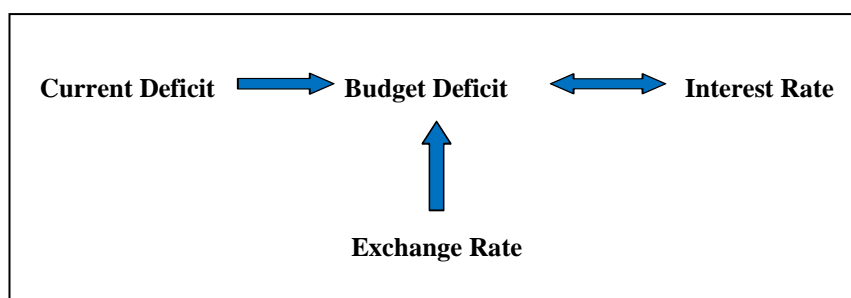

Figure 1: Relation Among Current Deficit, Budget Deficit, Interest Rate, Exchange Rate

CONCLUSION AND POLICY PROPOSALS

Regarding the relationship between the budget deficit and current account deficit, two basic approaches in literature are seen to be come into prominence. According to the traditional view of Keynes, with an expansionary fiscal policy, budget deficit directly affects current deficit by increasing disposable income and aggregate demand which will lead to a rise in imports and therefore in current deficit. Keynesian approach also suggests that budget deficit affects current deficit indirectly by increasing interest rates and attracting foreign funds into the country which will lead to overvaluation of national currency and to an increase in demand for imported goods. However, according to the Ricardian Equivalence Hypothesis, there is not any relationship between the two deficits. In addition to these two basic views, there are other approaches determining a bi-directional causality relationship between the two deficits and the causality relationship runs from current account deficit to budget deficit only (current account targeting).

In the study, direction of the causality between the twin deficits in Turkey was tested with Toda Yamamoto causality analysis. The data used in the study cover 2001-2014 period. The data set is composed of the proportion of current account balance to GDP, the rate of budget balance to GDP, reel effective exchange rate and domestic borrowing interest rates.

According to the obtained results, a uni-directional statistically significant causality relationship was determined between budget deficit and current deficit and the direction runs from current deficit to budget deficit. However, Keynesian general theory has suggested that high budget deficits cause to the current account deficit. Thus, it is seen that the findings of study do not support the Keynesian General Theory.

The findings of this study present parallelism with the approach offering a causality relationship so-called as 'current account targeting'. This approach predicts a causality relationship from current account deficit to budget deficit. In the literature, there are other studies in which similar results are obtained.

The direction of the relationship between current account deficit and budget deficit can be in same or opposite position. If this relation is in opposite (negative) direction, the improvement in current process increases the budget deficit. If the relationship between these two deficits is in same (positive) direction, the increase in current accounts also increases the budget deficit. In the first case, for the countries having growth dependence on imports, the improvement of current balance causes to slowdown of growth and the increase in public spending for compensating this case may cause budget deficits. In the second case, the borrowing made for compensating the inadequate internal savings especially in less developed countries causes a rise in interest rates and therefore both current deficit and budget deficit tend to increase.

Moreover, a bi-directional and statistically significant causality relationship between budget deficit and interest rate variables was determined in the study. This finding proposes that budget deficits would decrease (increase) as the interest rates decrease (increase). In addition, as the relation is bi-directional, it is possible to expect that the more budget deficit increases the more borrowing need of public increases and this process results in an upward trend in interest rates.

Finally, a statistically significant uni-directional causality relationship from exchange rate to budget deficit was determined in the study. This result can be explained with the fact, in case of deterioration of foreign trade balance and current deficit problem, currency shortage causes to a rise in exchange rate. This increase in exchange rate may lead a fall in demand of imported goods and a reduction of total spending. In order to compensate this fall in total spending, governments generally increase public spending which will eventually increase budget deficits.

According to the empirical results obtained from this study, the major macroeconomic variable for Turkey is the current deficit. The finance problem of current deficit makes a bond to be constituted between current deficit and variables like exchange rate, interest rate, costs of public borrowing and ultimately emergent budget deficit. Therefore, the most basic policy proposal to be drawn from this study for Turkey is to narrow the current deficit by increasing the export and decreasing the import. In order to provide that, it is necessary to shift investments to the sectors with high export potential and value added. It is also crucial to spend more on R&D activities on this field, to restrict imports by controlling home demand and to keep level of foreign exchange at a competitive level. Moreover, high interest rates offered to international markets should be reorganized and foreign dependency of domestic industry should be reduced. And in longer term,

to reduce dependency of domestic industrial production on import of energy and intermediate inputs, changing the structure of domestic production is seen as the most important policy proposal.

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