D o s y a   D ı ş ı

Is the Twin Deficits Hypothesis
Valid in the case of Turkey?

Fuat Sekmen[1]
Ünsal Ozan Kahraman[2]

Abstract: This study deals with the relationship between the current account deficit and the budget deficit in Turkey. Artificial Neural Networks are employed to investigate this relationship. According to the results of the application the twin deficits hypothesis which indicates a positive correlation between the two deficits isn't valid in Turkey. As this paper tries to analyze the factors accounting for the absence of this kind of correlation, it develops a flexible understanding which doesn't refuse a hypothesis or a theory (the twin deficits hypothesis) completely, on the contrary, emphasizes the importance of investigating the conditions in which a hypothesis, theory or a model is valid.
Keywords: Budget Deficit, Current Account Deficit, Neural Networks, JEL Classification: H62, F32, C45

Introduction

The position of the budget deficit in an economic matrix has importance in both the economy theory and the economy policy. Because the budget deficit interacts with a number of macroeconomic variables and/or it is often analyzed whether the budget deficit has a relationship with the other important variables. According to the twin deficits hypothesis proposed in

---

[1] Doç. Dr., Sakarya Üniversitesi İktisat Bölümü
[2] Araştırma Görevlisi, Sakarya Üniversitesi İktisat Bölümü.

1980's, when high levels of budget deficit accompany high levels of current account deficit in the United States, the budget deficit has a strong effect on the current account deficit. Great numbers of economists believe that the two deficits have a significant relationship (Makin, 2002:94). It is true to say that all schools of economic thought interpret this issue in accordance with the role of the government in the economic matrix in which they make sense of the economic system.

The twin deficits hypothesis is one of the issues which have been most studied both theoretically and empirically. One reason of this is related with the economy policy. If the fiscal policy of a country leads to more budget deficit and the current account deficit increases in consequence of increasing budget deficit levels, it is strongly recommended that the government alter the policy. However, in most cases the relationship between the two deficits is complex (as a number of variables take place in the function explaining this relationship) and dynamic (as this function changes over time). So it is required to search which factors or effects are determinant and why in every single cases rather than generalizing the conditions of the twin deficits hypothesis.

The Theoretical Frame

The formal structure of the twin deficits hypothesis is indicated in the national income identity (Salvotore, 2006: 702). This identity exhibits the picture of the economic system clearly. However it causes misdetection and misquotation to explain the twin deficits hypothesis by using only the national income identity. Because the identity gives us only the present actual equality which must be true all the time. There exist the differences among the economic schools and economists when analyzing the indirect relationships of the variables in the identity (not when analyzing the identity itself). Let Y, C, I, G, X, M, SP, T, SG, SF and CA represent respectively gross domestic product, consumption, investment, government expenditures, exports, imports, private sector savings, tax, government savings, foreign savings and current account deficit.

$$Y=C+I+G+(X-M)$$

By subtracting T from both sides of the equation, we reach

Y-T=C+I+G-T+(X-M)

Y-T-C=I+G-T+(X-M)

(Y-T) is the disposable income and (Y-T-C) is the private sector savings.

SP=I+G-T+(X-M)

SP+T-G=I+(X-M)

(T-G) is the government savings.

SP+SG=I+(X-M)

(X-M) is the trade balance and let it coincide with the current account balance (CA).

(M-X) is the negative of the current account deficit and gives us the foreign savings.

SP+SG+SF=I

A fall / rise in SG leads to an equal rise / fall in SF, ceteris paribus. So a fall / rise in the budget deficit (explained as the negative of SG) lead to a fall/rise in the current account deficit, ceteris paribus. However the assumption of ceteris paribus isn't valid in most cases and the changes in the other variables determine the relationship between the budget deficit and the current account deficit. As mentioned above, it is essential to regard the national identity and its derivatives as completely ex-post in order to understand the big picture of the economy.

The basic transmission mechanism from the budget deficit to the current account deficit can be explained by the Mundell-Fleming Model. In an economy with a fixed exchange rate regime, a rise in the budget deficit increases the domestic interest rate inducing a capital inflow. And the Central Bank supplies more money to fix the exchange rate and under the assumption of 'perfect capital mobility' the domestic interest rate turn back to the initial level, but the output of the economy increases and this induces imports causing the current account deficit to rise (Fleming, 1962: 370-371). Under the assumption of 'imperfect capital mobility' the domestic interest

rate doesn't remain the same, rather increases due to the positive relationship between the domestic interest rate and the output in the foreign exchange market. The rise in the domestic interest rate makes the output, imports and the current account deficit increase less than the case under perfect capital mobility. So it can be said that the positive causality from the budget deficit to the current account deficit is observed under the assumption of imperfect capital mobility, but this causality reduces as the level of mobility of capital decreases.

In an economy with a flexible exchange rate regime and under the assumption of perfect capital mobility, a rise in the budget deficit increases the domestic interest rate inducing a capital inflow and causing a real exchange rate appreciation (Mundell, 1968: 254). The real appreciation of the domestic currency increases the current account deficit. This mechanism is known as Feldstein chain (Feldstein, 1986: 2-3). In this case the output remains the same and it is the real exchange rate appreciation that increases the current account deficit while the budget deficit increases. Under the assumption of imperfect capital mobility there exists a rise in the output due to the positive relationship between the domestic interest rate and the output in the foreign exchange market; but the change in the exchange rate is determined by the elasticity of balance of payments to the interest rate and the elasticity of money demand to the interest rate. If the former is lower, the real exchange rate appreciates. In this case it is both the rise in the output and real exchange rate that increase the current account deficit. However in the case in which the latter elasticity is lower, the real exchange rate depreciates. Under the assumption that the effect of the rise in the output on the current account deficit is larger than the one of the real exchange rate depreciation, a rise in the budget deficit increase the current account deficit in this scenario.

On the other hand Ricardian Equivalence Hypothesis (REH) based on the Permanent Income Life Cycle Hypothesis indicates that there is no relationship between the budget deficit and the current account deficit (Seater, 1993: 90-142). An increase in the budget deficit leads to a rise in the private sector savings as the economic actors expect that the current budget deficit will be financed by a rise in the future taxes. Because the national

savings remain the same, the levels of domestic interest rate, exchange rate, output and current account deficit don't change. For instance, the aggregate demand and the other variables remain the same in a classical case in which the budget deficit increases due to a fall in the current taxes (Sachs and Laraine, 1993: 201). However REH has very restrictive constraints which point out that all consumers are rational and have full information, all the taxes are lump-sum and don't change the relative prices and don't cause a redistribution of income among households with different levels of marginal propensity to consume, and the life cycles of the public and private sectors are the same. Even if REH has a constrained power of explaining the economic picture, it puts forwards a coherent and useful theoretical frame for the laboratory of economics.

The Empirical Evidence

There is a growing body of empirical literature about the twin deficits hypothesis. Nevertheless the body of evidence doesn't yield a consensus. Most of the early studies deal with the United States and the other developed countries. Milne (1977), Darrat (1988), Abel (1990), Bachmann (1992), Normandin (1994) and Bahmani- Oskooee (1995) are some of the ones supporting the twin deficits hypothesis. Besides Müller and Rusek (1989), Haug (1990), Enders and Lee (1990), Winner (1993) and Norman-din (1994) are some of the ones arguing for REH. Normandin (1994)'s study is special due to its results which approve REH in the case of the United States and support the classical twin deficits proposition in the case of Canada.

According to Normandin (1999) there are some special difficulties for investigating the twin deficits hypothesis empirically. First of all, the reduced forms of the variables may cause artificial causality (Normandin, 1999: 173). And the second is that the studies falsifying REH don't indicate any quantitative predictions about the causality between the budget deficit and the current account deficit even if they are perceived to do. They only point out that the government can affect the current account deficit by changing the taxing period.

Normandin (1999) applies the Blanchard Model in his study. He considers a hypothetic case in which the budget deficit results from a fall in taxes.

According to the results of the work the stochastic properties of budget deficits are determinant in the analysis. For example, the impact of a rise in the budget deficit on the consumption and the current account deficit is expected to be larger in the case in which the tax burden can be transferred to the next generations easily. And the persistence of budget deficit matters, too. As persistent budget deficits lasting long years make the economic actors anticipate that they will face budget deficits in the next periods, they increase the consumption and the current account deficit. Normandin concludes that a rise of 1 $ in the budget deficit increases the current account deficit by between 0,22 $ and 0,98 $ in the United States and between 0,19 $ and 0,67 $ in Canada (Normandin, 1999: 174).

Fidrmuc (2003), using quarterly data of OECD countries and several developing economies investigates the possibility that budget deficits lead to current account deficits. The data spans from 1970 to 2001. Fidrimuc indicates that the two deficits interact with each other through investments and supports the twin deficit hypothesis even if he implies that the causality between the deficits has weakened since 1990's.

Corsetti and Müller (2006) suggest that the influence of the budget deficit on the current account is determined by the level of openness of an economy and the persistence of fiscal shocks. They find that the budget deficits are much more influential on the current account deficit in the cases of Canada and the United Kingdom by comparison with the cases of the United States and Australia, where the levels of openness and persistence of fiscal policies are lower.

Salvatore (2006) confirms one of the classical frames of the twin deficits hypothesis in which a rise in the budget deficit leads to a rise in the domestic interest rates inducing a capital inflow and causing a real exchange appreciation which makes the current account deficit deteriorate. However he points out that one year or more must elapse for the effects of the budget deficit on the current account deficit to emerge.

It must be noted that a causal relationship between two variables is independent from the accompanying relationship between them. For instance consider a case in which the two variables analyzed have a strong causality which makes them move in the same direction and the changes in the other

variables cause them to move in opposite directions. And let the changes in the other variables are dominant. In the last picture of such a case it seems that the two variables don't have a causality relationship, but in fact they have. So we must be very careful and think elastically in the field of economics which has a number of dynamic 'other variables'. When analyzing the twin deficits, it shouldn't be allowed the changes in the other variables to conceal the causality between the deficits if it is.

Corsetti and Müller (2007) take the fluctuations as the other variable in their study based on the International Business-Cycle Model to investigate the twin deficits. They suggest that a rise in the output leads to an increase in the current account deficit and a fall in the budget deficit. Therefore the deficits move in opposite directions although they have a significant causality which makes them move in the same direction. It accounts for the cases in which most of the studies imply a strong causality which makes the deficits shift in the same direction while the real data points out that the deficits change in opposite directions.

Kim and Roubini (2008), using a vector autoregressive model investigates the twin deficits in the United States. The results suggest that a rise in the budget deficit reducing investments leads to a real exchange rate depreciation and a rise in the private sector savings as REH implies. However Kim and Roubini indicate that it is, to a considerable extent, the fluctuations in the output that makes the deficits move in different directions rather than the causality opposite to the twin deficits.

Grier and Ye (2009) emphasize the importance of the models with structural breaks. They support that models without structural breaks make it harder to analyze the relationships of variables. The results of their study imply that there is a significant causality which makes the deficits move in the same direction in the short run.

As mentioned above the empirical literature doesn't yield a consensus. A number of studies and models using different endogenous variables and empirical methods and dealing with different economies and periods provide different results. However it doesn't indicate a kind of weakness of economics. Rather this implies that the economists should investigate the conditions in which the hypothesis (theory or model) they analyze is valid

rather than searching a perfect model which explains an economic fact for all economies and all periods of time under all conditions.

Methodology and Data

The study uses Turkish quarterly observations covering the period 2003:1 to 2010:2 to investigate the twin deficits in Turkey. The raw data is obtained from Turkish Statistical Institute and the Central Bank of the Republic of Turkey and it is processed into a more sophisticated form for the analysis considering a space which contains lnRER, lnGDP, BD/GDP, CA/GDP, RIR where lnRER is the log of unit labor cost based real exchange rate, lnGDP is the log of real gross domestic product based on the prices of 1998, BD/GDP is the ratio of budget deficit to real gross domestic product, CA/GDP is the ratio of current account deficit to real gross domestic product and RIR is the real interest rate which is represented by the weighted average of real interest rates of deposits in Turkey. While calculating RIR, the detailed equation of real interest rate is employed (RIR=(i-e)/(1+e) where i is the nominal interest rate and e is the inflation rate). The study uses artificial neural networks to investigate the twin deficits hypothesis in Turkey. It is purposed to estimate a regression equation of the variables above. The data is divided into six parts to create a learning set and the averages and standard deviations of the column variables of the set are taken as the inputs. The outputs are, of course, the coefficients of the regression equations.

Let the code of the web be net=newff(pr, [s1,s2,…sn], {tf1,tf2,…tfn}, btf, blf,pf) where pr is a matrix containing the minimum and maximum values of the input vector with R members, si is the number of neurons in the i. layer, tfi is the transfer function of the i. layer, btf is the training function of the feedback neural network, blf is the learning function of the feedback neural network and pf is the performance function. There is an input vector with four members in this problem. The interlayer has ten neurons and the outer layer is consisted of one neuron. The transfer function of the interlayer is sigmoid and the one of the outer layer is linear. And a gradient descent learning algorithm is used. The problem is designed as an unknown system with four entries and an exit. The values of the entries and the exit characterize the system.

The Network Topology of the Problem
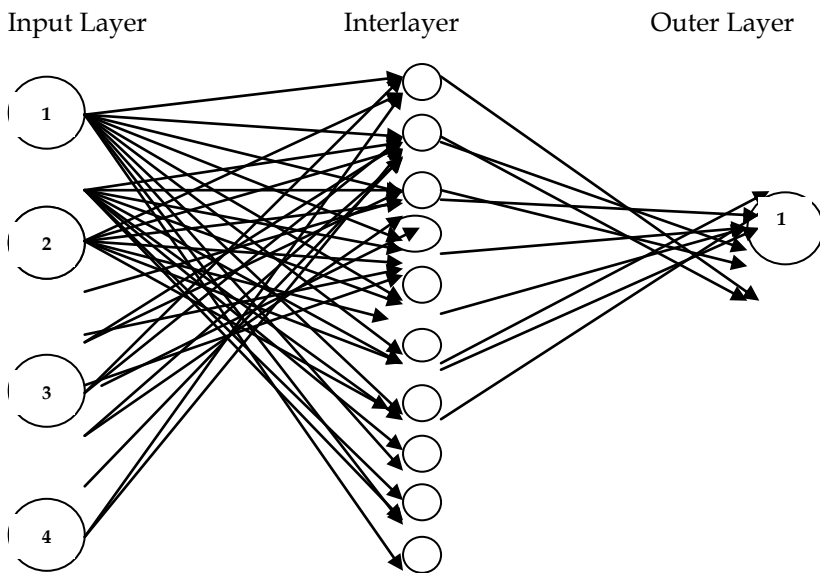
After a number of iterations until reaching a %98 of performance, the regression equation for the last data set is as follows:

CA/GDP= -15.700 − 0.2134lnRER + 0.6958lnGDP − 0.4785BD/GDP + 0.3526RIR

The model goes against the twin deficits hypothesis while suggesting that a rise / fall of one percent in the ratio of budget deficit to real gross domestic product leads to a fall/rise of 0.4785 percent in the ratio of current account deficit to real gross domestic product.

Conclusion

The empirical analysis of the study doesn't support the twin deficits hypothesis in the case of Turkey. It isn't possible to put forward the classical theoretical chains of the hypothesis suggesting that a rise in the budget def-

icit results in a rise in the current account deficit by leading to a rise in the domestic interest rate inducing a real exchange rate appreciation and/or increasing the output in Turkey. However it isn't reasonable to suggest the argument of REH which points out that a budget deficit is accompanied by a rise in the private sector savings and the interest rate, the exchange rate and the current account deficit remain the same. As mentioned above it should be essential to analyze the conditions in which a hypothesis (theory or a model) is valid or not rather than rejecting it.

We suppose that there are four major factors accounting for the result of the empirical analysis of the study. (i) First of all, a rise in the budget deficit in Turkey leads a real exchange appreciation which decreases budget deficits as most of the public debt is in terms of foreign currency. So there is an important factor which offsets the transmission mechanism of the twin deficits hypothesis at the first step (decreasing the increasing budget deficit). (ii) The fiscal structure of Turkey is an explanatory factor for the analysis, too. The tax system of Turkey relies heavily on indirect taxes, the bulk of which is based on import duties. For this reason imports and the current account deficit decrease while the budget deficit increases and vice versa. (iii) Furthermore a considerable part of the budget deficit in Turkey is based on the untradeable service sector, which doesn't increase the current account deficit. As Cavallo explains, in such a case, a rise in the budget deficit is compensated by an increase in the workforce in the public sector instead of a rise in the current account deficit. (iv) In addition to this, most of the exports of Turkey are based on imported inputs. This makes exports and imports move in the same direction. This factor weakens the proposition of the twin deficits hypothesis because when exports are supposed to decrease/increase, imports decrease/increase, too and the expected change in the current account deficit doesn't exist.

This study postulates that the twin deficits hypothesis isn't valid in the case of Turkey. However the relationship between the budget deficit and the current account deficit is complex and dynamic as mentioned above. So it is essential to search key variables and transmissions for each case and design policy proposals in accordance with the analysis.

Özet: Bu çalışma Türkiye'de cari açık ve bütçe açığı arasındaki ilişkiyi konu alır. Bu örgüyü analiz etmek için yapar sinir ağları kullanılmıştır. Ampirik analizin sonuçlarına göre, iki açık arasında pozitif bir korelasyon olduğuna işaret eden ikiz açıklar hipotezi Türkiye örneğinde geçerli değildir. Bu makale, böyle bir korelasyonun ortaya çıkmamasının nedenlerini açıklamaya çalışırken bir hipotezi veya bir teoriyi tamamıyla reddetmeyen esnek bir anlayış-sezgiyi esas alır ve bir hipotezin, teorinin veya bir modelin reddedilmesi veya doğrulanmasından ziyade bunların hangi koşullarda geçersiz veya geçerli olduğunun analiz edilmesinin alan yazında anahtar olduğunu vurgular.

Anahtar Kelimeler: Bütçe Açığı, Cari İşlemler Açığı, Yapay Sinir Ağları, JEL Kodu: H62, F32, C45

References

Abell, J. D. (1990), "Twin Deficits During the 1980's", **Journal of Macroeconomics,** Volume 12, p.81-96.

Bachman, D. D. (1992), "Why Is the US Current Account Deficit So Large? Evidence from Vector Autoregressions", **Southern Economic Journal,** Volume 59, Number 2, p.232-240.

Bagnai, Alberto (2006), "Structural Breaks and the Twin Deficits Hypothesis", **International Economics and Economic Policy,** Volume 3, p.137-155.

Barro, Robert J. (1974), "Are Government Bonds Net Wealth?", **Journal of Political Economy,** Volume 81, p.1095-1117.

Baxter, Marianne (1995), "International Trade and Business Cycles", in [(eds.) Gene M . Grossman and Kenneth Rogoff (1995), **Handbook of International Economics**, Volume 3] p.1801-1864.

Bernheim, B. D. (1989), "A Neoclassical Perspective on Budget Deficits", **Journal of Economic Perspectives**, Volume 3, p.63.

Blejer, M. and A. **Cheasty** (1991), "The Measurement of Fiscal Deficits: Analytical and Methodology Issue", **Journal of Economic Literature**, December 1991, p.1657.

Cavallo, Michele (2005a), "Understanding the Twin Deficits: New Approaches, and New Results", **FRBSF Economic Letter,** Number 16.

Cavallo, Michele (2005b), "Government Consumption Expenditures and the Current Account", **FRBSF Working Paper Series**, Number 3.

Chowdhury, Khorshed and A. S. **Saleh** (2007), "Testing the Keynesian Proposition of Twin Deficits in the Presence of Trade Liberalization: Evidence from Sri Lanka", **University of Wollongong Working Paper Series**, Number 07-09.

Corsetti, Giancarlo and Gernot J. **Müller** (2007), "Twin Deficits, Openness and the Business Cycle", **Journal of the European Economic Association**, Volume 6, p.404-413.

Corsetti, Giancarlo and Gernot J. **Müller** (2006), "Twin Deficits: Squaring Theory, Evidence and Common Sense", **Economic Policy**, October 2006, p.597-638.

Darrat, D. A. (1988), "Have Large Budget Deficits Caused Rising Trade Deficit", **Southern Economic Journal**, Volume 54, p. 879-887.

Denton, J. W. (1995), "Causal Forecasting with Neural Networks", **Journal of Business Forecasting Methods and Systems**, Volume 14, Number 2, p.17-20.

Enders, Walter and Bog-Soo **Lee** (1990), "Current Account and Budget Deficits: Twins or Distant Cousins", **Review of Economics and Statistics**, Volume 72, Number 3, p.373-381.

Engelbrecht, A. P. (2007), **Computational Intelligence: An Introduction**, California: John Wiley & Sons Ltd. (Second Edition).

Erceg, Christopher J., Luca **Guerrieri** and Christopher **Gust** (2005), "Expansionary Fiscal Shocks and the Trade Deficit", **International Finance**, Volume 8, p.361-397.

Feldstein, M. (1992), "The Budget Deficit and Trade Deficit Aren't Really Twins", **National Bureau of Economic Research Working Paper Series**, Number 1050.

Feldstein, M. (1986), "The Budget Deficit and the Dollar", **NBER Working Paper**, Number 1898.

Fleming, J. M. (1962), "Domestic Financial Policies under Floating Exchange Rates", **IMF Staff Papers**, Number 9.

Frenkel, J. A. and A. **Razin** (1987), **Fiscal Policies and the World Economy: An Intertemporal Approach**, Cambridge: The MIT Press,

Frenkel, J. A. and A. **Razin** (1986), "Fiscal Policies in the World Economy", **Journal of Political Economy**, Volume 94, p.564-594.

Frenkel, J. A. and H. G. **Johnson** (1976), **The Monetary Approach to the Balance of Payments**, Toronto: University of Toronto Press.

Grier, Kevin and Haichun **Ye** (2009), "Twin Sons of Different Mothers: The Long and the Short of the Twin Deficits Debate", **Economic Inquiry** (October 2009), Volume 47, Number 4, p.625-638.

Güneş, M. (2011), "Bulanık Doğrusal Sistemler ve Regresyon Modellerine Uygulanması", **A Review of Social, Economic & Business Studies** (Fall 2001), Volume 1, Number 1, p.176-192.

Jarko, Fidrmuc (2003), "The Feldstein-Horioka Puzzle and Twin Deficits in Selected Countries", **Economics of Planning**, Volume 36, p.135-152.

Kim, Soyoung, and Nouriel **Roubini** (2008), "Twin Deficits or Twin Divergence?

Fiscal Policy, Current Account and Real Exchange Rate in the U.S.", **Journal of International Economics**, Volume 74, p.362-383.

Lee, K. Y. and M. A. **El-Sharkawi** (2008), **Modern Heuristic Optimization Techniques Theory and Applications to Power Systems**, New Jersey: John Wiley & Sons Inc. (Second Edition).

Makin, A. J. (2002), **International Macroeconomics**, London: Pearson Education.

Milne, E. (1977), "The Fiscal Approach to Balance of Payments", **Economic Notes** (November 1977), p.89-107.

Mundell, R. A. (1968), **International Economics**, New York: The Macmillan Co.

Mundell, R. A. (1960), "The Monetary Dynamics of International Adjustment under Fixed Flexible Rates", **Quarterly Journal of Economics**, p.227-257.

Muller, S.M. and F. S. **Russek** (1989), "Are the Twin Deficits Really Related?", **Contemporary Policy Issues**, Volume 7, p.91-115.

Normandin, M. (1994), "Budget Deficit Persistence and the Twin Deficits Hypothesis", **Universite du Quebec a Montreal Working Paper**, Number 31.

Normandin, M. (1999), "Budget Deficit Persistence and the Twin Deficits Hypothesis (revised form)", **Journal of International Economics**, Volume 49, p.171-193.

Sachs, Jeffer. D. and Filipe B. **Larraine** (1993), **Macroeconomics in the Global Economy**, New Jersey: Prentice-Hall Inc.

Salvatore, Dominick (2006), "Twin Deficits in the G-7 Countries and Global Structural Imbalances", **Journal of Policy Modeling,** Volume 28, p.701-712.

Samadi, A. H. (2006), "The Twin Deficits Phenomenon in Some MENA Countries", **Iranian Economic Review,** Volume 10, Number 16, p.129-140.

Seater, J. J. (1993), "Ricardian Equivalence", **Journal of Economic Literature**, Volume 31, p.90-142.

Winner, L. E. (1993), "The Relationship of the Current Account Balance and the Budget Balance", **The American Economist,** Volume 37, Number 2.