The Budget Deficit and the Trade Deficit: Insights Into This Relationship

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I. INTRODUCTION

During the last decade, the "twin deficits" have been unusually high and have become a major concern for economists and policy makers alike. Since 1980, after a long history of surpluses, the U.S. has had a large trade deficit with every major trading partner. As for the budget deficit, it is true that since World War II, surpluses have been more the exception than the rule; but in the 1980's federal deficits were brought into the spotlight, because of their unusually large size. In the 80's alone, governmental borrowing to finance the deficit exceeded $1 trillion.

This paper addresses the issue of concomitant high U.S. budget and trade deficits. Is it just a coincidence or is there any systematic relationship? If there is a relationship, then what is the nature of such relationship? More specifically, is the relationship between those two variables uni-directional, bidirectional or are they independent.

II. LITERATURE OVERVIEW

Although there seems to be a wide spread political and popular perception that the twin deficits must somehow be interrelated, there is quite a great deal of controversy in the literature as to how and what extent they are related. A rudimentary national accounting identity can be used to relate the trade deficit, the government deficit, and investment and saving:

$$S + T + M = I + G + X$$

or

$$T - G = X - M + (I - S)$$

Where:

S – Gross private saving

T – Government revenues

M – Imports

I – Gross private domestic investment

G – Governmentspending

X – Exports

If savings is kept constant, an increase in the budget deficit will either reduce investment or increase trade deficit, or most likely a mix of both. This simple analysis suggests a positive relationship

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between the two deficits. Can we say, then, that higher budget deficit results in higher trade deficit? At one end of the spectrum we find Niskanen (1988). Niskanen broadens the definitions of exports by adding capital grants received by the United States and imports by adding transfer payments and interest payment by the government to foreigner; and then assesses the relationship between the foreign balance (or current account deficit) and government sector balance. He has found that the relationship between the two balances has not been stable over time.

During the recovery from 1974–75 there was a strong *negative* relationship between the foreign balance and the government balance. However, from 1982 through 1987, following the 1981–82 recession, there was little apparent relationship between the foreign balance and the government balance. In addition, he has found that the longer-term U.S. experience (1974 through 1986) as well as a cross-country comparison, does not indicate any significant direct relationship of the foreign balance and the government balance.

Niskanen's results suggest that the reason why U.S. government balance does not appear to have had a significant effect on the trade balance is because changes in the government balance were offset by changes in private saving and domestic investment, with very little effect on the foreign balance. And, therefore, the "twin deficits" of the 1980's were primarily a coincidence or unrelated conditions, rather than the result of a significant relationship between the trade and budget deficits.

This is quite a controversial conclusion, (although Niskanen is not alone) because the conventional view is that budget deficits *do* increase trade deficits. Quite a few economists, most notably Martin Feldstein (1984), have proposed the following chain of effects between the budget and trade deficits: higher budget deficits result in higher interest rates that tend to appreciate the exchange rate, which in turn results in higher trade deficits. The validity of this chain has been tested, for the most part, on a link by link basis. Do large deficits produce high interest rates? Do high interest rates increase the exchange rate? Do high exchange rates increase the trade deficit?[1]

Many people believe that large budget deficits spell higher interest rates; but it has been very difficult to prove that association empirically. Some studies even reject that proposition all together. One of those studies, perhaps the most comprehensive, is by Evans (1985). His analysis covers over a century of U.S. history and offers no evidence of a positive association between deficits and interest rates. He analyzed periods during which federal deficit has exceeded 10 per cent of national income: the U.S. experience during the Civil War; the U.S. experience during World War I; and the U.S. experience during World War II. In none of those periods did interest rates rise appreciably. Regression analysis applied to date from those three periods showed no evidence of a positive association between deficits and interest rates. The same conclusion was drawn for the post war period. In fact, the evidence more strongly supports a negative association than a positive one.

Evans' conclusion that large deficits have never been associated with high interest rates is not calmly accepted, but evidence to the contrary is sparse. Cases in point are, Cebula (1987), who found a strong positive relationship between federal government deficits and short-term interest rates and Wachtel and Young (1987) who also found a positive relationship between announcements of unanticipated changes in projected deficits and interest rates on the day of the announcement.

When it comes to the impact on exchange rates, the controversy continues. Evans (1986) did not find any significant direct effect of budget deficits on exchange rates. Others have tied high exchange rates to high interest rates—see for instance Hutchinson and Pigott (1984). The impact on the trade deficit turned out to be weaker than expected, as the U.S. trade deficit did not seem to respond, at first, following lower exchange rates after 1985. The lag turned out to be much longer than economic theory predicted.

In short, even though this "conventional" chain is intuitively appealing, the empirical evidence for each link is somewhat weak. Therefore, the question remains, how are the 'twin deficits' actually related? Is the relationship unidirectional, bidirectional or there is no relationship between the two? The investigation of this relationship is the main purpose of this study.

III. METHODOLOGY

In this section an attempt will be made to test the causal relationship between trade deficits and budget deficits for the United States using quarterly data for the period 1971.1 to 1989.3. Specifically, we will look into four possible relationships. First, it is the budget deficit that is causing the trade deficit, second it is the trade deficit causing budget deficit, third, the variables are causally dependent i.e. budget deficit causes trade deficit while trade deficit causes budget deficit. Finally the variables may be independent of each other.

To test these alternative hypotheses empirically, we will use the test of causality as suggested by Granger (1969). Granger defines causality in terms of predictability of time series. A variable X causes variable Y, if present Y can be better predicted by using the past values of x than by not doing so, when account has been taken of the past values of X and Y. We can write the condition for time series X cause time series Y in the following equation:

$$(1) \qquad \delta^2(y/y, x) < \delta^2(y/y)$$

where $\delta^2(y/y, x)$ is the minimum mean squared error predictor (prediction error variance) of Y given both the past values of Y, denoted by Y and the past values of X denoted by X. The term $\delta^2(y/y)$ is the variance of the prediction error variance of y based on the information contained only in the past values of Y.

Similarly, Y is said to cause X if:

$$(2) \qquad \delta^2(x/x, y) < \delta^2(x/x)$$

A bi-directional causality is present between the two time series X and Y when equations (1) and (2) occur simultaneously; that is, if X causes Y and Y causes X.

The two time series are not temporally related or they are independent of each other if:

$$(3) \qquad \delta^2(x/x) < \delta^2(x/x, y) \wedge \delta^2(y/y) < \delta^2(y/y, x)$$

Based on the Granger's definition of causality, Sims (1972), has developed a statistical test for the presence of causality between two variables using the following two steps procedure. First, to isolate part of variable Y that can not be predicted using its own past, the variable is filtered to produce a Whitenoise time series, so that serial correlation is removed. Second, a regression of Y on future and past values of x is performed using the white noise time series. According to Sims' test, Y causes X if the leading values of X have regression coefficients, which as a group are significantly different from zero. Another approach to empirically applying Granger's causality criterion is suggested by Haugh. In Haugh's test, pre-whitened data series are cross correlated and test statistics s and S* computed. Under the null hypothesis of independence, the cross correlation function has zero values at all positive, zero, and negative lags and both s and S are distributed asymptotically chi-square with (2m + 1) degrees of freedom.

$$(4) \qquad s = N \sum_{k=-m}^{m} \delta^2(k)$$

$$(5) \qquad S^* = N^2 \sum_{k=-m}^{m} \delta^2/(N - |K|)$$

Since Haughs' test is strictly valid only as a test of independence or dependence between two time series, Granger or Sims causality tests are needed to determine the direction of causality.

The direct test of causality has been found to be most efficient in empirical work. See for instance, Geweke, Dent and Meese (1983). To empirically determine the relationship between trade deficit and

budget deficit, we will use the test proposed by Granger. Using Granger's procedure, we have to estimate the following two equations:

(6)
$$TD = \sum_{j=1}^{n} a_j TD_{t-j} + \sum_{i=1}^{m} b_i BD_{t-i} + U_t$$

(7)
$$BD = \sum_{j=1}^{n} C_j BD_{t-j} + \sum_{i=1}^{m} d_i TD_{t-i} + V_t$$

where, U and V are uncorrelated and $E(U_t, U_s) = 0$, $E(V_t, V_s) = 0$ and $E(U_t, V_s) = 0$ for all $t \neq s$.

Following the above equations, unidirectional causality from trade deficit to budget deficit can be established if the estimated coefficient on the lagged trade deficit variables as a group are significantly different from zero in equation (7) while the estimated coefficients on the lagged values of budget deficit variables as a group are not significantly different from zero in equation (6). This finding, however, would not support the conventional proposition that budget deficit causes trade deficit.

Similarly, unidirectional causation from budget deficit to trade deficit is implied if the estimated coefficient on the lagged budget deficit variable as a group are significantly different from zero in equation (6). A relationship of this nature is consistent with the conventional proposition. Bi-directional causality or feedback between the two variables is present if the estimated coefficient on the lagged values of both budget and trade deficit as a group in both of the equations are significantly different from zero. However, if the estimated coefficients are not significantly different from zero, then no causality is present and we can say that trade deficit and budget deficit are independent of each other. In this paper, the direction of causality is tested by using the conventional joint F-Test.

An important factor in causality test is the determination of the appropriate lag lengths for the variables under consideration. In this respect various measures have been suggested from time to time. However, all of those relate to large time series data. It is, however, important to note that the acceptance or rejection of the null hypothesis is sensitive to the lag length selected (Thornton and Batten, 1985). In order to determine the optimum finite lag lengths for variables subject to causality test, Hsaio has developed a technique based on Akike's final prediction error criterion. The primary objective of his approach is to determine the combination of lags that minimize the final prediction error. In the present study, for lag length selection we relied upon final prediction error criterion as suggested by Hsaio.

IV. EMPIRICAL RESULTS

The empirical test conducted in this section is based on the quarterly data for the United States for the period of 1971.1 through 1989.3. All data for this period were taken from various issues of the Economic Reports of the President. With a view to test the four possible relationships, more specifically to focus on the direction of the causal relationship between trade deficit and budget deficit, we estimated the following two equations:

(8)
$$TD = \sum_{j=1}^{n} a_j TD_{t-j} + \sum_{i=1}^{m} b_i BD_{i-j} + U_t$$

(9)
$$BD = \sum_{j=1}^{n} C_j BD_{t-j} + \sum_{i=1}^{m} d_i TD_{t-i} + V_t$$

Since Granger's methodology can be applied only to co-variance stationary series, in the present study, all the variables were in their first difference form. Moreover, a constant and a time trend variable were added in the estimated regression, to induce co-variance stationarity in the two time series. It can be mentioned that, in all cases, the coefficient on time trend came out to be insignificant, implying stationarity in the time series under study.

Using the final prediction error criterion, under the null hypothesis that trade deficit do not cause

budget deficit, optimum lag turned out to be one on budget deficit and one on trade deficit. On the other hand, under the null hypothesis that budget deficit does not cause trade deficit, the number of lags on the budget deficit and trade deficit were four and one respectively.

A direct comparison of the minimum FPE for the equation with budget deficit as the dependent variable and the hypothesis that trade deficits do not cause budget deficits, we found that for the optimal uni-variate and bi-variate model the FPE (univariate) < FPE (bivariate). The low F statistics (1.96) also fails to reject the hypothesis that there is no causality running from trade deficit to budget deficit. For the United States, considering budget deficit as the difference between nominal federal government expenditure and revenue and trade deficit as the difference between total exports and imports, these results indicate that high trade deficits are not causing high budget deficits. This is a relevant finding but needs further examination.

Under the null hypothesis that budget deficit does not cause trade deficit, a comparison of the FPEs with optimal uni-variate and bi-variate model shows that FPE (univariate) > FPE (bivariate) implying presence of one way relationship. The F statistics in this case (3.51) also leads to a clear rejection of the hypothesis that budget deficits do not cause trade deficits. This observation supports the conventional proposition where the direction of causation is from budget deficit to trade deficit.

V. CONCLUSION

This paper employs a bi-variate Granger causality approach and quarterly data in an effort to determine whether a causal relationship exists between trade deficit and budget deficit. Using Granger's methodology we tried to test the validity of four alternative relationships. Our paper employed Akike's final prediction error criterion to determine the appropriate lag specification for each variable. The empirical results indicate that the budget deficit and trade deficit are related and the evidence, however, supports the conventional proposition that high budget deficits have caused high trade deficits. The finding that no causality is running from trade deficit to budget deficit needs more research in terms of variables and methodology used.

NOTE

1. Ali F. Darrat (1988) used a multi-variate analysis to determine the relationship between budget and trade deficits and found a bi-variate relation between the two variables. He also examined the role of other macroeconomic variables in the analysis of budget and trade deficits relationship.

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