

Investigating U.S. Government and Trade Deficits

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During much of the past decade both the U.S. government and trade deficits grew dramatically, prompting empirical studies to determine whether there is a relationship between the two. Tallman and Rosensweig review causal evidence and economic models supporting the "twin deficits" notion and introduce alternative models that cast doubt on a causal link. Noting that the way researchers have used deficit data in their empirical work influences results, Tallman and Rosensweig conduct statistical tests to determine the appropriate form—either levels or variables measured as changes from the previous period—for representing the data. Using a technique that accounts for dynamic interaction among variables, the authors examine deficit data in levels form, as ratios of GNP. Their findings suggest a causal relationship between government debt and the trade deficit, indicating that fiscal policy could play an important role in balancing U.S. trade accounts.

The 1980s witnessed record-sized deficits of more than \$150 billion on both the U.S. government and trade accounts. The development of these deficits during approximately the same time span prompted frequent allusions to them in business, policy-making, and academic circles as "twin deficits."

For much of the decade, trade imbalances and government budget deficits were major news topics in the business press (see John Greenwald 1984, Mike McNamee et al. 1988, and "Some of My Best Friends Are Deficits" 1990). The media put forward an image of the United States as a debtor nation, borrowing domestically and internationally to support extravagant spending behavior by the government as well as the private economy. Meanwhile, the issue of growing debt, both the government's and the nation's as a whole, also became central in policy debates as numerous analysts questioned the long-term viability of economic progress with a growing external debt. With the change in status of the United States from net foreign creditor to debtor nation, policymakers and economists face the challenge of dealing with a possible decline in living standards.

By 1983 a casual explanation directly linking the two mushrooming deficits—the twin deficits story—was gaining wide exposure.¹ The notion suggests that the two series' large movements in the same direction occurred because of an underlying interrelationship. A combination of existing theory on international economics and what appeared to be compelling empirical facts observed

primarily in the United States during the 1980s gave rise to the idea. The validity of the hypothesized relationship between these two deficits is a crucial issue as the United States faces ongoing massive fiscal deficits into the 1990s and the foreseeable future.

Following a presentation of some of the visual evidence that prompted the twin deficits explanation, this article includes a more rigorous examination of existing theory and of scholarly investigation into the linkages between government and trade deficits. It concludes with a discussion of how the authors' original research contributes to this academic and policy debate.

Origins of the Twin Deficits Idea

Briefly, the twin deficit story as it pertains to a flexible exchange rate regime (it will be treated more fully in a later section) claims that an increased government deficit places incipient upward pressure on real, or inflation-adjusted, interest rates, attracting foreign capital in search of these higher returns. This increased flow of capital into the United States prompts the real exchange rate to appreciate, raising

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the dollar's foreign exchange value. In turn, the higher exchange rate inhibits exporting by making U.S. products costlier abroad. A higher-valued dollar also results in relatively less expensive—and therefore more attractive—imported goods. Falling exports and rising imports eventually move the trade balance toward deficit.²

The twin deficits hypothesis is one possible explanation of the comovements portrayed in data such as that shown in Charts 1 and 2. However, such an informal method of inference does not provide sufficient evidence of a fundamental underlying relationship. Further cursory analysis, performing straightforward statistical analysis (standard correlation techniques) on these two deficit series to explore basic relationships among the data, reveals that the two series have positive correlation contemporaneously, with correlation coefficients of approximately 0.7 in level terms and 0.34 in ratios to nominal GNP (see Table 1). These findings suggest that the variables move together to some extent over time, consistent with the comovement displayed in Charts 1 and 2.

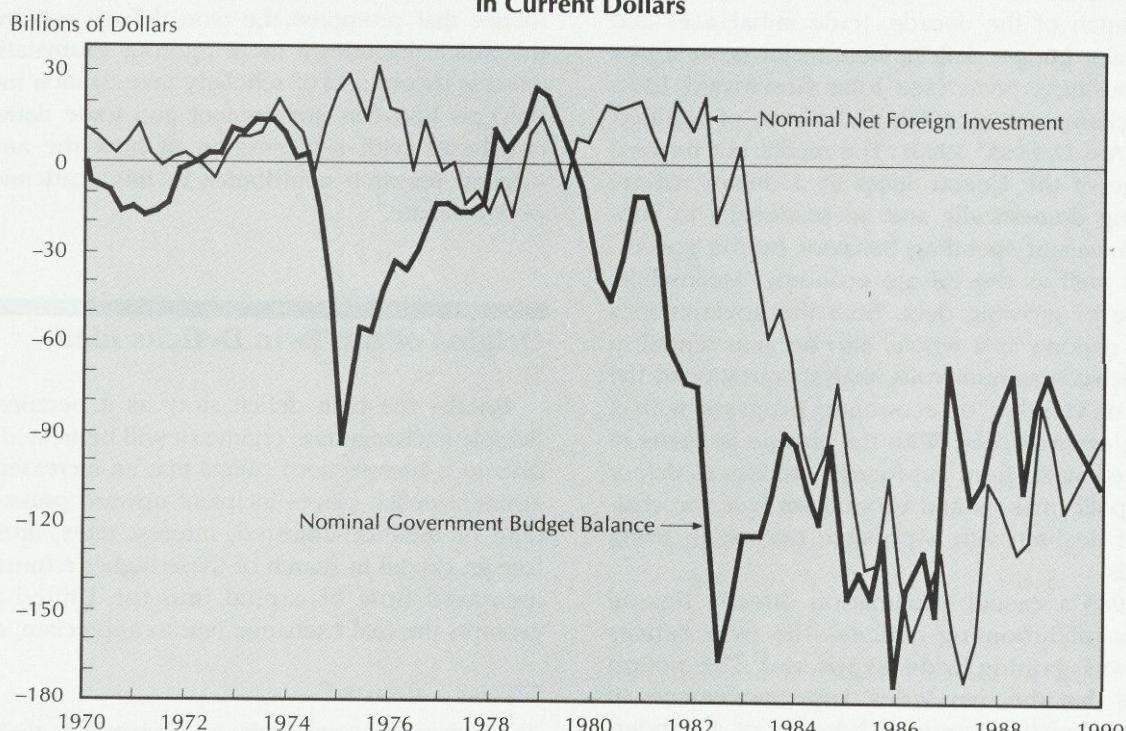
Chart 1 shows the gross facts regarding the two deficits, facts that underlie the initial appeal of the

hypothesized relationship between them. The two data series—net foreign investment balance and total government budget balance—both moved dramatically into deficit during the 1980s; the government balance turned radically into unprecedented deficits (in nominal magnitudes) prior to similar movements in the trade measure.³

The striking aspect of Chart 1 is the apparently extreme magnitude of both deficit measures during the 1980s. However, because these deficits are measured in level terms in current face-value or nominal dollars, observed associations between these deficit magnitudes may not be based on a structural interrelationship between the data series.

Many macroeconomic series tend to grow over time because of inflation as well as economic growth. Therefore, economists often scale or normalize nominal dollar totals by dividing them by a nation's nominal gross national product (GNP). Taking each deficit series as a ratio to nominal GNP accounts for economic growth and removes any inflationary bias from using nominal magnitudes, allowing clear focus on the specific relationship between the deficits. Most of the study uses deficit measures scaled as a ratio to GNP.

Chart 1
Total Government Budget Balance and Net Foreign Investment
in Current Dollars



Source: All charts and tables were calculated by the authors using data from the National Income and Product Accounts (NIPA), U.S. Department of Commerce, Bureau of Economic Analysis.

Does the apparent relationship of the two deficits remain after adjusting them for GNP? Chart 2 plots the two measures as ratios to GNP; the fiscal and trade deficits still appear to be related, although the similarities in movement are less striking. What is noteworthy, however, is the lengthy duration of substantial deficit in the 1980s that the two series have in common.⁴

Consistent with Chart 1, Chart 2 shows that the government budget balance ratio to GNP turns sharply into deficit immediately before the similar downturn in the trade balance ratio (to GNP) during the early 1980s. This empirical observation likely enhanced the popularity of the twin deficit explanation for the conjunction of record-sized deficits. The explanation not only refers to a relationship between the deficits but suggests a causal impact running from the government to the trade deficit.

To investigate the possibility of lead-lag relationships, cross-correlation techniques, which measure the linkage of one variable's movement with that of another a number of periods before or after observation of the initial variable, have been used. Table 1 presents the cross-correlations for various quarterly lags and leads spanning twelve periods in either di-

rection. The table indicates large positive correlations of movements in trade and those in the government budget deficit several quarters earlier the largest correlations exist roughly at the point when the government deficit measure is lagged seven quarters relative to the trade deficit: 0.87 for deficits measured as nominal levels and 0.72 for deficits as ratios to nominal GNP. To compare movements in the government balance with succeeding movements in trade, Chart 3 shows the government deficit ratio lagged seven quarters in relation to the trade deficit ratio.

As expected, given the pattern found in the cross-correlations, Chart 3 shows an even stronger relationship between the two deficit series than Charts 1 and 2 indicate. However, like the visual and statistical evidence presented earlier, this information is still only casual evidence that increased government deficits may lead to larger trade deficits.

Theoretical Support

In addition to the suggestive causal evidence, there are theoretical frameworks that support the existence

Chart 2
**Total Government Budget Balance and Net Foreign Investment
Relative to Nominal GNP**

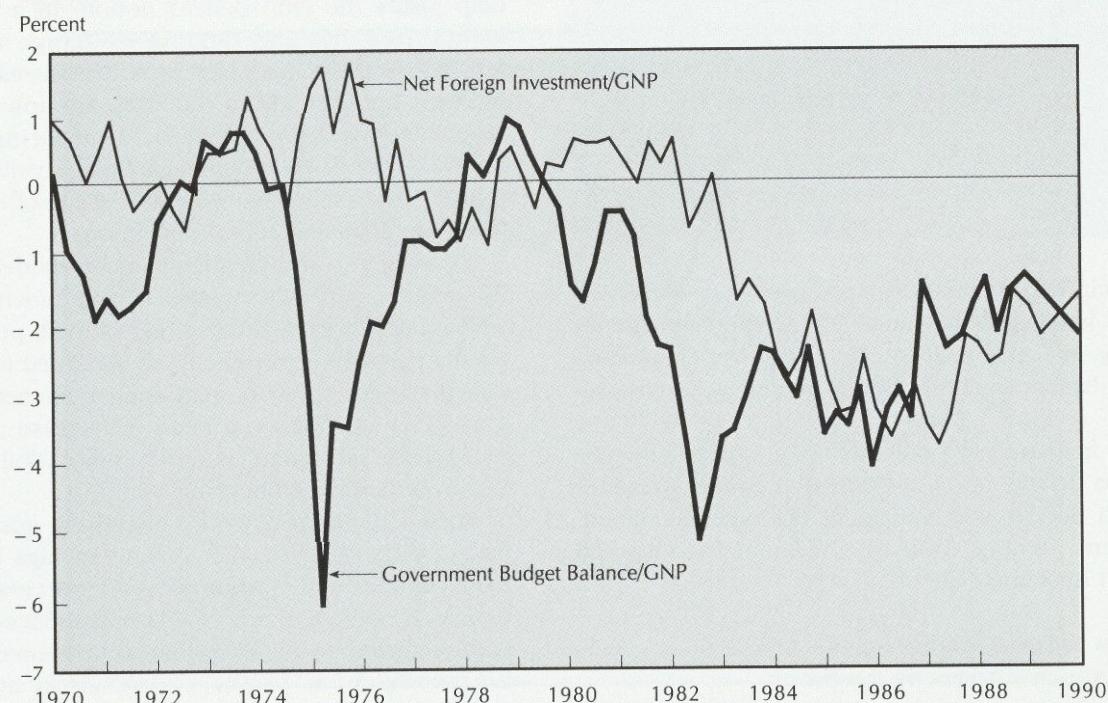


Table 1
Correlations and Cross-Correlations of
U.S. Government Deficits
and Trade Deficits

Cross-Correlations of Trade Deficits with Quarterly Leads (-) and Lags of Government Deficits*		
Lead/Lag	Levels	Ratios
-12	.161	.067
-11	.202	.079
-10	.255	.083
-9	.313	.093
-8	.346	.092
-7	.375	.092
-6	.424	.109
-5	.488	.168
-4	.529	.210
-3	.558	.245
-2	.611	.270
-1	.662	.306
0	.698	.339
1	.707	.389
2	.756	.458
3	.815	.559
4	.832	.608
5	.837	.662
6	.854	.685
7	.867	.724
8	.844	.709
9	.813	.690
10	.794	.660
11	.776	.648
12	.731	.582

* Cross-correlations at 0 are contemporaneous correlations.

of a twin deficits relationship. Combined, these two factors have provided ample motivation for further inquiry into the validity of a twin deficit notion, which has been the focus of recent academic research.

The frequently hypothesized relationship between the two deficits is often buttressed by the presence of both deficits in a variant of the core savings/investment identity from the National Income and Product Accounts (NIPA):

$$\text{Gross National Savings} = \text{Gross Investment by the Nation.} \quad (1)$$

This identity can be disaggregated into a familiar form:

$$S_p + S_g = I + NFI, \quad (2)$$

where S_p is private savings, S_g is government savings (total government budget balance), I is private domestic investment, and NFI is the nation's net foreign investment. The additive inverse of NFI is net foreign borrowing, which in this research is considered a theoretically pleasing broad measure of the trade deficit. Thus, net foreign borrowing ($-NFI$) is used as the trade deficit measure, $TDEF$. Employing the additive inverse of government savings ($-S_g$) as the government deficit ($GDEF$), the following relationship suggests the twin deficits relationship:

$$TDEF = GDEF + (I - S_p). \quad (3)$$

The identity above provides a useful framework for analyzing the proposed twin deficits relationship. While the framework does not indicate any behavioral or temporal relationships, it predicts that any government deficit increase not offset by changes in the private-sector savings/investment balance will affect the trade deficit. The trade deficit may not respond if private savings changes to offset government deficit movements. The crucial question is whether or not government deficit changes are fully offset by private savings responses.

A model of international economics proposed by Robert Mundell and J. Marcus Fleming in the early 1960s provides one theoretical perspective that may help justify the twin deficits notion. In a world of capital mobility and flexible exchange rates, the Mundell-Fleming model predicts that increased government budget deficits put incipient upward pressure on domestic interest rates, inducing capital inflows that lift the foreign exchange value of the dollar. After a time lag, the higher value of the dollar retards exports and stimulates imports.

According to the Mundell-Fleming model, a positive relationship exists between government deficits and trade deficits because, it is assumed, people implicitly perceive government bonds issued to finance deficit expenditures as increasing their net wealth. Thus, they do not see a need to increase their current private savings to cover future tax liabilities arising from the deficit financing.

Recent theoretical work concerning government fiscal policy suggests that private savings behavior may change in the presence of increased budget deficits. Robert J. Barro (1974) reintroduced a concept, referred to as Ricardian equivalence (in acknowledgement of the contribution by David Ricardo), suggesting that people recognize that financing tax cuts by bonds merely alters the time profile of taxation. In this view, rational people re-

alize that a tax cut financed by bonds does not increase their net wealth: while current taxes are reduced, future tax liabilities, in "present value" terms, increase by the same amount. As a result, a tax cut resulting in a government budget deficit may induce rational individuals to save an additional portion of their income.⁵ The Ricardian equivalence proposition suggests that the net private savings term in the savings/investment identity increases to offset government deficit movements. If Ricardian equivalence holds, then private savings rather than the trade deficit (net foreign borrowing) finances the increased government deficit. There is no anticipation of a twin deficits linkage in this framework.⁶

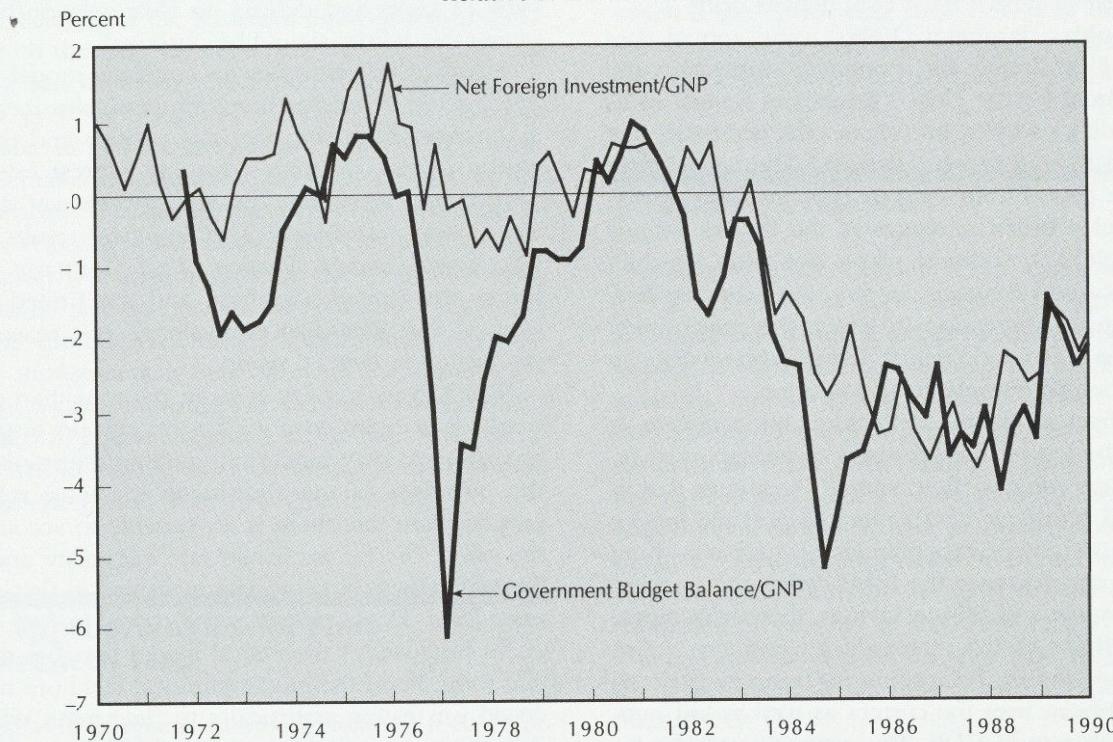
The implications of the Mundell-Fleming approach contrast clearly with those of Ricardian equivalence in regard to the relevance and validity of a twin deficits relationship. Among the numerous theoretical approaches to open-economy macroeconomics, these two were selected as frameworks for interpreting the empirical analysis because of their prominence in the discipline and their sharply contrasting conclusions.

Research Findings

Recent economic research has produced a substantial body of empirical literature employing rigorous econometric estimation techniques to test the validity of the twin deficits hypothesis. Nonetheless, the current body of evidence does not yield a consensus on the relationship between government and trade deficits. Some studies using a Mundell-Fleming framework indicate that the twin deficit notion is consistent with the data. In contrast, other studies, finding no underlying relationship between government and trade deficits, are consistent with the predictions of Ricardian equivalence.

How did the empirical work lead to such diametrically opposed conclusions? The following summaries of selected, representative empirical studies include some possible explanations for such varying results and implications. Clearly, certain issues are of primary importance—for example, the choice of appropriate data series and data samples (periods) for examination. These and other important issues are emphasized in the following discussion of existing

Chart 3
**Government Budget Balance (with Seven Lags) and Net Foreign Investment
 Relative to Nominal GNP**



empirical research into whether the twin deficits notion fits the evidence.

Stephen M. Miller and Frank S. Russek's (1989) empirical work is concentrated on two subperiods of post-World War II U.S. data—one subsample associated with the fixed exchange rate period (1946:Q1 to 1971:Q2) and the other generated during years of flexible exchange rates (1971:Q3 to 1987:Q2). The researchers use measures of the trade and government deficits in nominal levels as well as in ratios to nominal GNP. Only in the flexible exchange rate period do their results support the twin deficit notion for *both* deficit levels and deficit ratios. Thus, Miller and Russek present evidence suggesting a causal impact of government deficits on trade deficits during the floating rate era.⁷

Despite rigor and attention to detail in their study, Miller and Russek, using bivariate analysis of two deficit measures, do not address the interrelationships between government and trade deficits and other relevant explanatory variables. The observed relationship between the two deficit measures does not necessarily reflect an underlying twin deficits structure because one or more other variables may explain the apparent comovements in both series.⁸ Research into the twin deficits story requires explicit examination of the entire set of variables that may relate meaningfully to trade and government deficits behavior. A number of other studies estimate relationships between a selection of additional variables that appear relevant for the twin deficits story.

B. Douglas Bernheim (1988), using annual data from the Organisation for Economic Cooperation and Development for the United States and several of its major trading partners, investigates the possibility that fiscal deficits lead to trade deficits.⁹ The data sample spans the period from 1960 to 1984, and the estimations employ broad measures of the deficits relative to the relevant nominal gross domestic product (GDP) measures for each country. Bernheim explicitly estimates a regression in which the government deficit affects the trade deficit, but not the reverse, an assumption that restricts his specification.

The effect of budget deficits on trade deficits is likely to be less in the presence of unemployed resources, according to Bernheim.¹⁰ He argues that in weakened economic conditions it is possible for additional government expenditures or a tax cut—both of which may increase the fiscal deficit—to increase private income and private savings, thereby minimizing the effects of the increased government deficit on the trade deficit. To account for business-cycle effects, Bernheim uses the current as well as last period's growth rate in GDP. The estimation results for the United States suggest that the fiscal deficit does

significantly affect the trade deficit. Evidence for the trading partners—except for Japan, where no relationship appears to exist—is also consistent with the twin deficits story.

While it provides some evidence for the existence of a twin deficits relationship across nations, the Bernheim study is limited by the absence of additional potentially important variables, namely the real exchange rate and the real interest rate. Because they are not included as explanatory variables in Bernheim's estimations, some aspects of a twin deficit investigation remain unresolved.

Another criticism of earlier studies, aside from excluding important variables from the estimations, is that there is no explicit theoretical structure generating the empirical models for estimation. Rather, those previous studies are centered on a proposed relationship suggested by the Mundell-Fleming framework. The lack of a formal structure as a foundation for the empirical work leaves researchers with few hypotheses that can be rejected.

Recent research by Paul Evans (1989) uses an abstract model economy in which people (agents) make decisions rationally and over a lifetime horizon; his model and theoretical framework provide a more rigorous structure for empirical estimation than has been seen in prior research. Primarily, the model generates a testable hypothesis about the relationship between fiscal deficits and trade deficits—specifically, that in a world incorporating a Ricardian view of taxes and deficits no clear relationship between the deficits should be observed.

Evans (1989) estimates an empirical model that is specified in first-difference form (variables measured as changes from the previous period) and that includes a real (inflation-adjusted) interest rate, real government spending, and real government debt as explanatory variables.¹¹ The empirical results using data from Canada, France, West Germany, Italy, Japan, the United Kingdom, and the United States suggest that Ricardian equivalence is a reasonable abstraction in the real world.

While Evans's study is more rigorous than earlier work, it is open to criticism on certain empirical grounds that may hinder interpreting the results. For the purposes of this discussion the most relevant criticisms are that there is no variable to account for the effect of real exchange rate variability and that the estimations employ data measures in first difference form. Evans estimates the model in first differences because his theoretical model specifies data in that form. Recently, much empirical literature has focused on testing statistically to determine whether data are more appropriately modeled in levels than in first differences. The issue becomes most relevant

when results achieved by using first-differenced data have implications different from those of tests involving data specified in levels. In Evans's case the use of first-differenced data is simply intrinsic to the model, but, as discussed below, the question of whether it is more appropriate to model in levels or in differences can be addressed explicitly and prior to estimation of an empirical model, as in Jeffrey A. Rosensweig and Ellis W. Tallman (1991). The topic is addressed more fully in the next section.

Walter Enders and Bong-Soo Lee (1990) follow Evans in modeling more rigorously the economic behavior underlying the observed relationship between the trade and government deficits.¹² Using quarterly data on the United States from 1947:Q3 to 1987:Q1 for real consumption, real government spending, real public debt, real interest rates, the external current account, and the exchange rate, the researchers apply an estimation methodology known as vector autoregression (VAR). Through techniques that account for dynamic interaction among variables, the methodology allows estimation of relationships without imposing very restrictive assumptions on the specification. Essentially, a VAR specifies that each variable in a system or model is determined by its own lagged values (an autoregression) and the lagged values of all other variables in the system. Despite what appears to be an important effect of the changes in the real public debt on the current account, the model suggests no direct relationship. An explicit test of the Ricardian equivalence proposition with the data cannot reject the hypothesis that budget deficits do not affect the current account.

The criticism of Enders and Lee's (1990) research is similar to that lodged against Evans (1989). First, the estimates are performed on data specified in first differences. The specification in first differences is only a criticism if statistics suggest that such a transformation is inappropriate for the data. However, Enders and Lee do not provide statistical evidence to support the first difference transformation. An additional shortcoming is that, although the nominal exchange rate is among the explanatory variables included in Enders and Lee's work, their measure of this variable exhibits no movement for the fixed exchange rate period from 1947:Q3 until 1973.

The Appropriateness of First-Differenced Data

One vein of recent empirical literature focuses on statistical tests that examine whether data are more appropriate for model estimation in first differences

or in level form. Statistical techniques are used to determine whether data are stationary in levels—that is, whether the data series' statistical properties, such as means and variances, do not change over time. That quality is an important one to identify because nonstationary data employed in estimation techniques produce statistics that should not be analyzed in the same way as those generated from stationary data. In many cases, estimations using nonstationary data series produce results that lead to incorrect statistical inferences.

Clearly, the answer to the question of whether data used in an examination of twin deficits should be in levels or in first differences is more pertinent if estimation results using first-differenced data lead to inferences that are different from those drawn from data in level form. Among the empirical studies surveyed above, those that support the twin deficits notion tend to have either deficit levels or deficit ratios to GNP as the main variables under study. On the other hand, researchers who found no twin deficits relationship were more often investigating data transformed into first differences.¹³ These patterns suggest that the particular data transformation does significantly color the results of inquiry into the twin deficits phenomenon; the choice of data transformation influences whether evidence supports or contradicts the twin deficits story.

The research discussed below, detailed in Rosensweig and Tallman (1991), explicitly considers which is the appropriate form (levels or differences) for representing the data in estimation. Statistical tests guide the choice of data transformation.

Additional Evidence

Rosensweig and Tallman (1991) examine the empirical relationship between the U.S. government and trade deficits using a data set that includes a real interest rate measure as well as a real exchange rate measure. The additional variables capture common movements in trade and government deficits that result from these two variables. Like Enders and Lee (1990) and John D. Abell (1990), Rosensweig and Tallman employ vector autoregression methodology.¹⁴ Additional evidence presented below concerning support for the twin deficits story corroborates the results in Rosensweig and Tallman. The research focuses on the idea that movements in the government deficit have a causal impact on the trade deficit.

The data set employed consists of quarterly observations on the variable measures listed above from

the period of flexible exchange rates, 1971 to 1989. The trade and government deficit variables are measured as ratios to GNP to account for growth and inflation, as discussed above.

Despite contrasting evidence from typical Dickey-Fuller tests for stationarity, the Rosensweig and Tallman (1991) study shows that there is statistical support for estimating the VAR in level form rather than as differences.¹⁵ Hence, in the research reported here, levels of the four variables (with the deficit series as ratios to GNP) in a VAR with eight lagged quarterly values of each series have been used.¹⁶ Each part of the investigation takes place within the paradigm of VAR, employing the set of four variables described above.

According to the twin deficits notion, movements in the government deficit precede similar changes in the trade deficit, implying that past government deficits would explain a substantial portion of the movements in subsequent trade deficits. This assertion is tested using VAR, which is well suited for such inquiries, by determining whether the statistical evidence supports the hypothesis that the other variables are unaffected by past movements in the government deficit.¹⁷ If the statistics suggest that the movements in other variables are not affected by past movements in the government deficit, the implication would be that the government deficit movements do not precede the movements in the other variables.

The estimated statistics imply rejection of the proposed hypothesis at conventional significance levels, as shown in Table 2, indicating that the government deficit has an important explanatory role and appears to precede statistically the movements in the trade deficit. The implications of these statistics are consistent with evidence from the simpler single-equation estimations also presented in Table 2, where the F-statistics show that *GDEF* is important for explaining *TDEF* movements.

For completeness, the importance of lagged values of *TDEF* on the remaining system of variables is examined by testing statistically for whether the model's other variables respond to trade deficit (as ratio to GNP) movements. The twin deficits story suggests that past movements of the trade deficit should show no impact upon subsequent movements of the other variables.

If the statistical evidence suggests that past trade deficits do have substantial effects on the other variables' subsequent values, then the inferences from the finding that government deficit movements precede trade deficit changes is weakened. Instead, the indication would be that the trade and government deficit variables each affect the other. In formal

Table 2
Block-Exogeneity Tests and
Single-Equation Block F-Tests

Tests of the Multivariate Hypothesis

GDEF (ratio to GNP) lags are unimportant
to the VAR system

$$\chi^2(24) = 41.75$$

Critical Value 36.415 at 5 percent significance level.
Reject the null hypothesis. *GDEF* lags are important to the VAR system.

TDEF (ratio to GNP) lags are unimportant
to the VAR system

$$\chi^2(24) = 27.94$$

Critical Value 36.415 at 5 percent significance level.
Cannot reject the null hypothesis that *TDEF* lags are unimportant for the VAR system.

Single-Equation Block F-Tests*

Variable	F-Statistic on 8 lags	Significance Level
Dependent Variable - <i>GDEF</i>		
<i>GDEF</i>	8.34	.00
<i>REALI</i>	.66	.72
<i>REALEX</i>	1.32	.26
<i>TDEF</i>	.84	.57
Dependent Variable - <i>REALI</i>		
<i>GDEF</i>	2.08	.07
<i>REALI</i>	4.71	.00
<i>REALEX</i>	.42	.90
<i>TDEF</i>	1.98	.08
Dependent Variable - <i>REALEX</i>		
<i>GDEF</i>	1.73	.13
<i>REALI</i>	2.22	.05
<i>REALEX</i>	15.77	.00
<i>TDEF</i>	1.70	.13
Dependent Variable - <i>TDEF</i>		
<i>GDEF</i>	3.06	.01
<i>REALI</i>	1.07	.40
<i>REALEX</i>	.97	.47
<i>TDEF</i>	4.98	.00

* *REALI* indicates real interest rates; *REALEX* indicates real exchange rates.

terms, if the statistics imply rejection of the hypothesis that lagged values of the trade deficit have no impact on the other variables, then the statistics would suggest bidirectional causality.

The statistics generated from the test on the trade deficit measure suggest that past trade deficits do not affect subsequent movements in other variables.¹⁸ Results from tests of the single-equation restrictions (tested by F-statistics and presented in Table 2) coincide with those of the multivariate test. Overall, the evidence suggests that trade deficits have little effect on the subsequent behavior of the system's variables. Both the statistical evidence presented above and the findings of Rosensweig and Tallman's (1991) empirical work point toward the existence of a twin deficit relationship in U.S. data.¹⁹

Conclusion

The movement of both the U.S. fiscal and external trade accounts into substantial, persistent coinciding deficits has become an often noted or bemoaned phenomenon. This joint, precipitous slide into deficits during the 1980s, combined with an apparent temporal relationship whereby fiscal changes precede trade balance movements, led to the development of a popular "twin deficits" story. This explanation has relied on causal evidence to assert a causal influence of the government deficit on subsequent trade deficits.

The notable gross facts of dual deficit expansion underlying the widely popular twin deficit hypothesis has been further backed up by certain economic

frameworks that lend theoretical underpinnings to the notion. However, other frameworks, stemming from a Barro-Ricardian theory, are less supportive of the possibility that there is a truly causal linkage between the deficits. The crucial nature of large and persistent deficits in the U.S. government budget and external accounts, the seemingly compelling evidence of their coincidence during the 1980s, and the uncertainty arising from theoretical alternatives about their potential causal linkage have stimulated intensive empirical scrutiny of the twin deficit notion's validity.

The evidence from a range of detailed studies has been mixed or inconclusive. Those starting from a Ricardian framework (such as Evans 1989 and Enders and Lee 1990) find Ricardian results; that is, they find little support for a clear link between the two deficits. However, many of these studies that fail to support the twin deficits idea use particular data transformations (first differences). In contrast, other studies (for example, Bernheim 1988 and Miller and Russek 1989) present evidence in favor of a twin deficit explanation.

The original research reported here was based on an extensive data set and a relatively unrestricted vector autoregression methodology. Further, the deficits data were examined in levels form (as ratios of GNP). This crucial choice of data transformation—versus first differences—was motivated by tests for stationarity of the data. The results provide clear evidence favoring the validity of a twin deficits notion.²⁰ Clearly, if, as the evidence suggests, government deficits lead or influence subsequent trade deficits, then fiscal policy could well have an important role to play in any attempt to bring the U.S. trade accounts toward balance.

Notes

1. See, for example, Feldstein (1983), Laney (1986), and Volcker (1984).

2. Feldstein (1983), Laney (1986), and Volcker (1984) are useful references for the story.

3. The two data series are net foreign borrowing (additive inverse of net foreign investment), a broad measure of the trade deficit, denoted as *TDEF*, and the total government deficit (additive inverse of government balance) as the government deficit series, denoted as *GDEF*. These series are examined on a quarterly basis for the period 1971:Q1 to 1989:Q4, from essentially the beginning of the flexible exchange rate regime under which the large trade and government deficits of the 1980s developed.

4. In ratio form, the government deficit reached 6 percent of nominal GNP in 1975 during the deep recession in 1974-75. In 1982 the deficit-to-GNP ratio approached 5

percent again during a recessionary period, then remained in the 3 percent to 4 percent range throughout the recovery and expansion years as well. Government budget deficits are likely during recessions because, as incomes shrink, tax revenues decline and government outlays for unemployment compensation and the like rise. These "automatic stabilizers" increase the government deficit in ways that may have little to do with the trade deficit and its movements. This recessionary phenomenon is likely to appear again during 1991.

5. In a simple economic model, the Ricardian equivalence proposition predicts that agents will save the tax cut so that the interest proceeds will cover increased tax liabilities in the future.

6. The Ricardian view does not imply that a twin deficit phenomenon cannot be observed in data. The proposition suggests, though, that there are no behavioral or

structural underpinnings to the observation of twin deficits. The main empirical difficulty in distinguishing between Mundell-Fleming and Ricardian implications is that if government deficit movements are correlated with changes in government spending behavior, the twin deficits may appear to be consistent with Mundell-Fleming and also to behave consistently with a Ricardian view. This situation, referred to as observational equivalence, may arise because of the Ricardian view that government spending behavior affects private consumption decisions by reducing the amount of output available for private consumption. Government choice of financing method—debt versus taxes—does not alter the amount of output available for private consumption and therefore does not affect perceived wealth.

7. The researchers present empirical evidence about whether the government deficit "Granger causes" the trade deficit. Granger causality is a statistical notion that innovations in one variable precede innovations in another variable. The inferences drawn from Granger causality tests can be controversial. However, the statistical evidence is consistent with the theoretical implications presented in the Miller and Russek article.
8. Darrat (1988) finds bidirectional Granger causality between the government deficit and the trade deficit in estimates that use an assortment of additional explanatory variables. Also, he estimates the relationship using one data sample that mixes data generated during both the fixed and flexible exchange rate regimes.
9. The countries he studies are Canada, Japan, Mexico, West Germany, the United Kingdom, and the United States.
10. This point relates to the argument above that business-cycle downturns affect the government budget deficit in ways that probably do not influence the trade deficit.
11. The model includes the real government spending variable because the theory suggests that government spending rather than the method of financing government spending affects private consumption decisions (see note 5). Also, Evans (1989) discusses measurement error in the existing current account data that fails to account for the increased market value of U.S. investment abroad. For more detail on this issue see Dewald and Ulan (1990).

12. Abell (1990) estimates a VAR system with several relevant explanatory variables. Using first-differenced data, he finds little support for the government deficit as a primary explanatory variable for the trade deficit measure. The results suggest the absence of the causal underpinnings of the twin deficit story. It is notable that the data sample—monthly observations from 1979 to 1985—presents only a limited picture of the historical behavior of the two deficits and the related variables.
13. It is also important to note that Evans (1989) and Enders and Lee (1990) employ government spending variables and measures of the real public debt rather than only measures of the fiscal deficit, as in the previous studies. The model implications suggest the relevance of the government spending measures for the estimates.
14. Runkle (1987) criticizes the use of VAR techniques without providing some mechanism to infer statistical significance of the results. Rosensweig and Tallman (1991) provide confidence intervals for the relevant statistical output.
15. Rosensweig and Tallman (1991) employ Monte Carlo integration techniques to estimate a Bayesian posterior probability for the stationarity of the data in level form. Results suggest that the model should be specified in levels.
16. A VAR with six lags produced statistics with the same inferences as those presented in the text.
17. A block exogeneity test, a multivariate test that examines whether the regressions for all the remaining variables are (statistically) significantly changed by removing the lagged values of the government deficit (to GNP) ratio from all regressions, is used. The chi-square statistic with 24 degrees of freedom of 40.9 suggests rejection of the null hypothesis that *GDEF* lags are unimportant at the 5 percent significance level.
18. The chi-square statistic for 24 degrees of freedom of 27.94 does not allow rejection of the null hypothesis at the 5 percent significance level.
19. See Rosensweig and Tallman (1991) for more detailed attention to issues like the percentage of variance explained, the direct impact on particular variables of shocks to other variables, and the dynamic effects of shocks.
20. These findings do not contradict Ricardian equivalence because the specification does not allow a direct test of Ricardian hypotheses.

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