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Federal Reserve Bank of St. Louis
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November 1985

In This Issue . . .

In the first article of this *Review,* Michael T. Belongia and Courtenay C. Stone investigate the validity of a conventional policy recommendation among agricultural economists: that reducing the federal budget deficit is a necessary component of any effort to increase agricultural exports. While widely accepted, Belongia and Stone argue that at least three propositions must be true for this recommendation to have some legitimacy. The first two propositions require positive relationships between deficits and the real rate of interest and between the real rate of interest and the real value of the dollar. The last proposition requires a negative relationship between the real value of the dollar and real farm exports.

Belongia and Stone investigate these propositions by explaining the relevant economic theory behind each and offering both simple and detailed statistical evidence regarding the predictions of these theories. Their analysis indicates there is considerable doubt that larger budget deficits have raised real interest rates and, consequently, the real value of the dollar. They do find support for the third proposition relating the exchange rate to farm exports. In view of the other conflicting evidence, however, the authors conclude that it is safe to say the relationship between budget deficits and farm exports is unresolved.

In the second article in this issue, "Monthly Economic Indicators: A Closer Look at the Coincident Index," Keith M. Carlson discusses the Commerce Department's composite index of coincident indicators. This index condenses the information from the most important monthly economic indicators into one summary measure. The component indicators from which the composite index is derived include employees on nonagricultural payrolls, personal income less transfer payments in constant (1972) dollars, industrial production, and manufacturing and trade sales in constant (1972) dollars.

After describing the coincident index and its component indicators, Carlson discusses the Commerce Department's scoring system. This system is based on seven criteria. The focus of the article, however, is on the criterion of cyclical performance. An examination of the component indicators reveals that each indicator generally conforms well with the National Bureau of Economic Research's business cycle reference points, particularly when viewed with some perspective.

Would Lower Federal Deficits Increase U.S. Farm Exports?

Michael T. Belongia and Courtenay C. Stone

MANY farm policy experts believe that U.S. agricultural exports would be increased significantly if federal budget deficits were reduced. One such expert, for example, has commented that "a more nearly balanced federal budget probably would do as much as anything to improve our agricultural export performance."[1] Other analysts also have predicted that the farm outlook will remain bleak until this nation develops "a credible plan to reduce the enormous Federal budget deficits."[2] This view is so pervasive that it might now be considered the conventional wisdom on the subject.[3]

If this view is valid, it has important implications for domestic farm policy legislation, including the pending farm bill.[4] If federal budget deficits have seriously reduced farm exports and, consequently, real farm income, then legislators should focus primarily on reducing the deficit to revive farm exports and income; in this case, current commodity programs may need little fundamental change once the deficit has been reduced. If budget deficits have not contributed materially to the decline in farm exports, however, then focusing attention on deficit reduction measures may divert attention from more fundamental changes that might be required in farm commodity programs. The purpose of this article is to describe the theoretical links between federal budget deficits and U.S. farm exports and to examine the empirical evidence on these links.

THE FARM EXPORT PROBLEM

singled out as a strong, perhaps the primary, suspect in attempts to explain why farm exports have declined so sharply in recent years. A *prima facie* case can be made for the deficit explanation by simply looking at the recent relationship between exports and the deficit; this comparison is shown in chart 1 for semiannual data since 1973.

If we look only at the past four years, we see that nominal farm exports declined from 1981 through 1983, rose marginally last year, and have fallen again through early 1985. During this same period, federal deficits, as measured by the national income accounts, skyrocketed, rising from $64 billion in 1981 to $176 billion in 1984. The association between rising deficits and falling exports appears to be obvious.

Yet, when the entire period is examined, this conclusion is not so obvious. Deficits were rising and falling from 1973 (when it was only $6 billion) to 1981. This period was one of generally rising farm exports. Thus, the view that rising deficits adversely affect exports is one that seems to be based primarily on evidence from the most recent period. Such a narrow focus necessarily raises questions about the generality of the presumed relationship and the likely effect of policies designed to exploit the relationship.

To get a better perspective on the relationship between deficits and farm exports, we must focus on the

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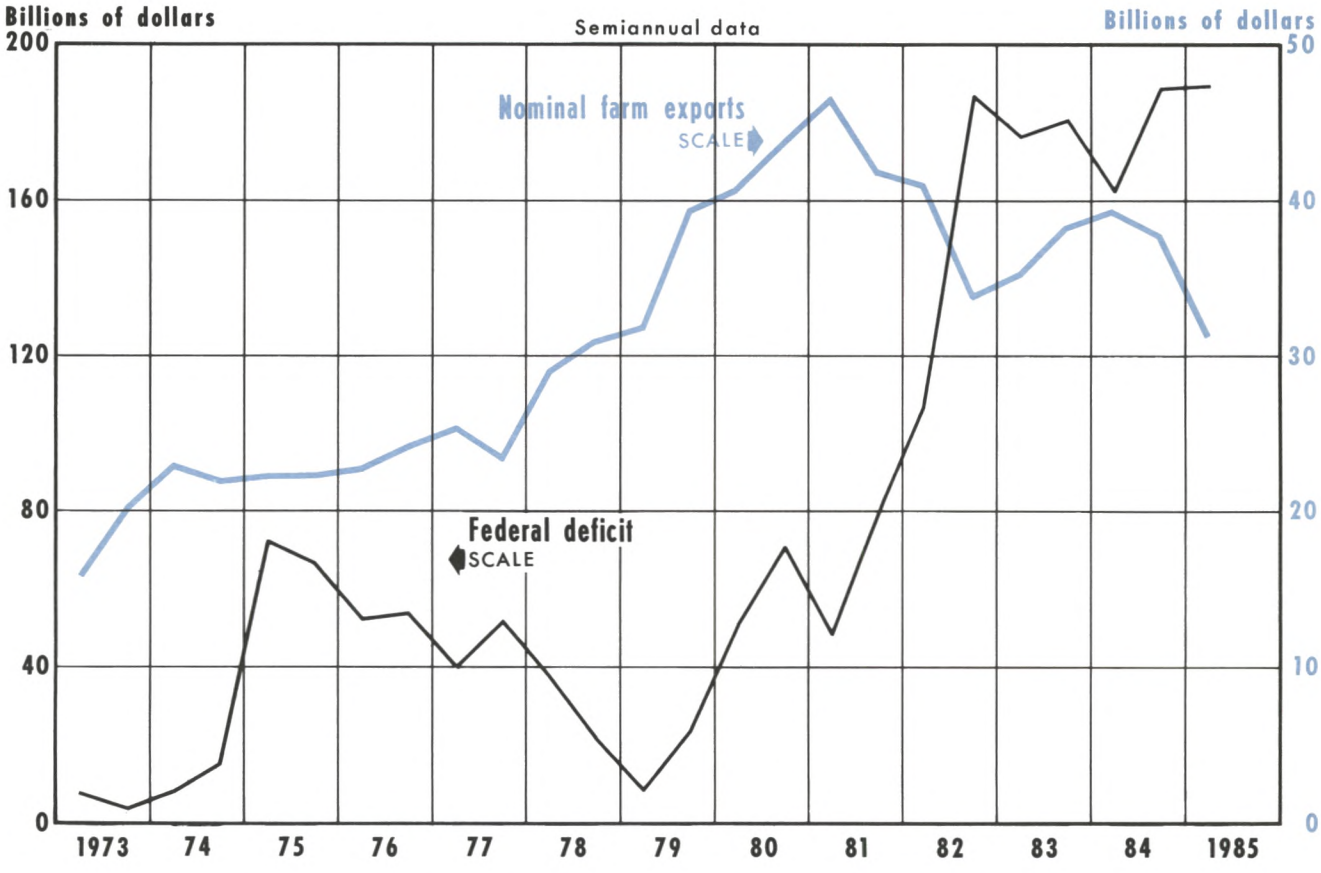
[1]Schuh (1984), p. 246.

[2]Duncan and Drabenstott (1985).

[3]Of course, this view is not confined solely to farm policy experts. It is held by a large number, perhaps even the vast majority, of policy analysts. For similar statements about the effect of deficits on exports, see Clark (1985), Downs (1985), Kraft (1985) and Modigliani (1985).

[4]The omnibus farm legislation currently in effect is a four-year bill that was passed in 1981. Congress is now debating the issues encompassed by a new four-year bill, renewal of existing legislation, or returning to the "permanent" legislation of the 1930s and 1940s that covers most major commodities.

Chart 1
Deficit and Farm Exports



theoretical relationships that tie them together and the empirical support for these underlying theories.

THE LINKS IN THE DEFICIT-FARM EXPORT CHAIN

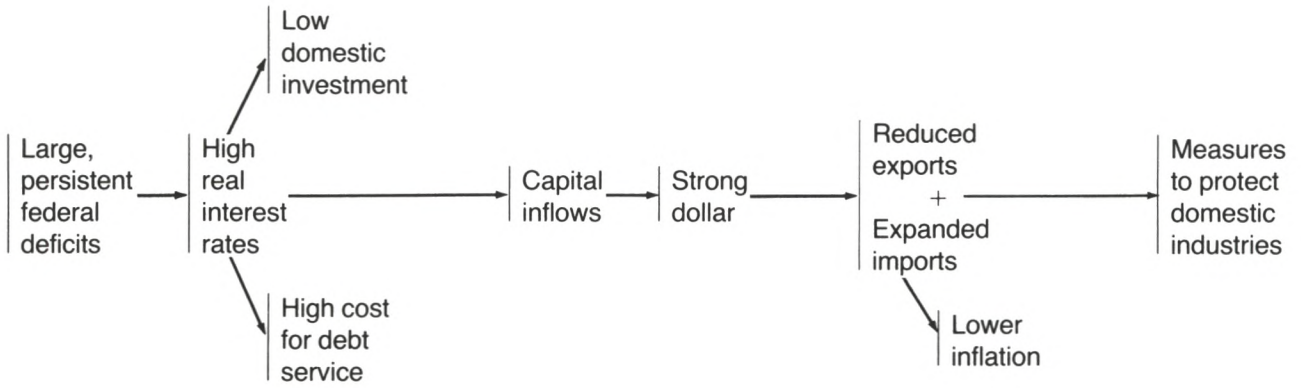
The conventional view of the links between deficits and farm exports is shown in figure 1. In this framework, the problems of reduced exports, expanded imports and political measures promoting protection for domestic industries can be traced backward, step-by-step, to their source: large, persistent federal budget deficits. An examination of figure 1 shows that there are at least three key economic relationships that must exist for this conventional view to be valid.

First, other things unchanged, deficits must be related systematically to real interest rates (interest rates adjusted for expected inflation); specifically, higher deficits must raise real interest rates and lower deficits must reduce them. Second, real interest rates must be related systematically to the real foreign exchange value of the dollar (the dollar's value after adjusting for differences in inflation between the United States and foreign countries); higher real rates must raise the dollar's real value and lower real rates must reduce it.[5] Third, the real foreign exchange value of the dollar must be related systematically to real agricultural exports (agricultural export receipts adjusted for movements in the general price level); higher real exchange rates must reduce real farm exports and lower exchange rates must increase them. The conclusion that

[5]More correctly, the second link refers to the impact of higher real interest rates in the United States vis-a-vis those in other countries. This is explained later in this article.

Figure 1

A Schematic View of The Theoretical Linkages Between Deficits and Farm Exports



SOURCE: Dobson (1984), p. 49.

lower federal deficits will increase farm exports by reducing real rates of interest and, thus, the real foreign exchange rate of the dollar, relies on the validity of these links. We analyze these links in turn in the following sections.

LINK #1: WOULD LOWER DEFICITS REDUCE REAL INTEREST RATES?

Choosing Appropriate Deficit and Interest Rate Measures

One basic problem with trying to discern the relationship between deficits and interest rates is that the measures we observe must be "adjusted," both to eliminate potentially confounding influences and to focus the analysis on those measures that are emphasized by the underlying economic theory. The deficit measure can be adjusted in a variety of ways. Three commonly used procedures are: (1) to adjust for the impact of inflation by using a real deficit measure; (2) to adjust for the size of the economy by dividing the deficit by some measure of spending or saving; and (3) to remove the business cycle influences on the deficit.

Interest rates also must be adjusted appropriately if we are to capture the deficit's influence on them. Market interest rates — the ones that we see quoted every day — can be thought of as the sum of two basic components: the expected inflation rate and the expected (or *ex ante*) real rate of interest.[6] Changes in the deficit per se should have no effect on the expected rate of inflation unless the Federal Reserve is expected to monetize the deficit (that is, increase its purchases of government bonds).[7] Since changes in the expected rate of inflation, however, cause nominal interest rates to change and obscure the impact of changes in the deficit, we must remove the influence of changes in inflation expectations; we must focus on the deficit's impact on the expected real rate of interest.

The Conventional View of the Deficit's Impact on the Real Rate of Interest

The view that larger deficits increase the expected real rate of interest is based on the validity of the "interest-rate crowding out" phenomenon. Interest-rate crowding out is demonstrated graphically in

[6]For discussions of the differences between nominal and real interest rates and between *ex ante* and *ex post* interest rate measures, see Santoni and Stone (1981a, 1981b and 1982); for an analysis of the problems associated with attempts to measure real interest rates, see Brown and Santoni (1981).

[7]For evidence that larger deficits per se are not associated with faster inflation, see Protopapadakis and Siegel (1984) and Weintraub (1981).

figure 2, which depicts the demand for and supply of real resources allocated through credit markets. The demand curve, labeled D, is the demand for resources by would-be borrowers: consumers, private firms and, of course, the government. The supply curve, labeled S, represents the amount of current saving that would-be lenders (savers) are willing to provide. The price that influences these borrowing and lending decisions separately, and that is determined jointly by the interactions of all borrowers and lenders, is the real rate of interest.

Using figure 2, it is easy to show how a larger deficit could increase the real rate of interest. If all other things remain the same, a larger deficit increases the demand in the credit market to D' and results in a higher price of credit as the real rate of interest rises to r_1. The additional resources that the government obtains come partly from additional saving (for example, people reduce their consumption) and partly from reductions in non-government borrowing (for example, private investment declines). The larger deficit and the resulting higher real interest rate have thus crowded out, or reduced, private sector consumption and investment.

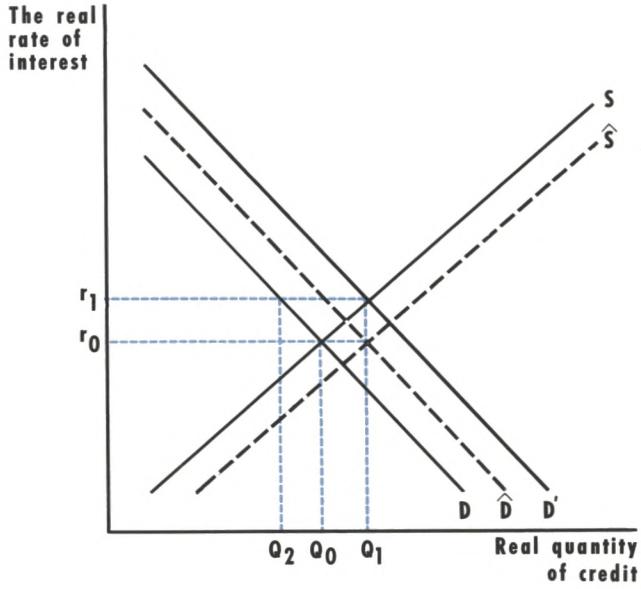
Of course, the extent to which the real rate of interest actually increases under the conventional view depends on the specific slopes of the demand and supply curves; the flatter are the demand and supply curves, the smaller the rise in the real rate of interest.

An Alternative Theoretical View of the Impact of Deficits

Interest-rate crowding out, as depicted in figure 2, is predicated on the view that increases in the deficit per se have little effect on the supply of or the demand for credit by consumers and private firms. Instead, consumers and private firms respond by moving along their unchanged demand and supply curves in response to changes in the real rate of interest produced by the increased government deficit.

An alternative view of how people respond to changes in government deficits suggests that the real rate of interest is essentially unaffected by government deficits.[8] This view states that people see deficits as

Figure 2
Comparison of Deficit's Impact on Interest Rates



implied taxes that eventually must be imposed on their future incomes to repay the larger government obligations. Thus, larger deficits today are equated with larger future taxes and reduced future after-tax incomes. As a result, an increase in the deficit reduces people's permanent incomes; this, in turn, reduces the private (and, thus, the total) demand for credit (to $\hat{D}$), while increasing private saving and, thus, the supply of credit (to $\hat{S}$). As shown in figure 2, although deficits crowd out private investment and consumption, they have no appreciable impact on the real rate of interest, which remains unchanged at r_0. The crowding-out is direct; it does not take place through increased real interest rates.

Deficits and Expected Real Interest Rates: Some Casual Evidence

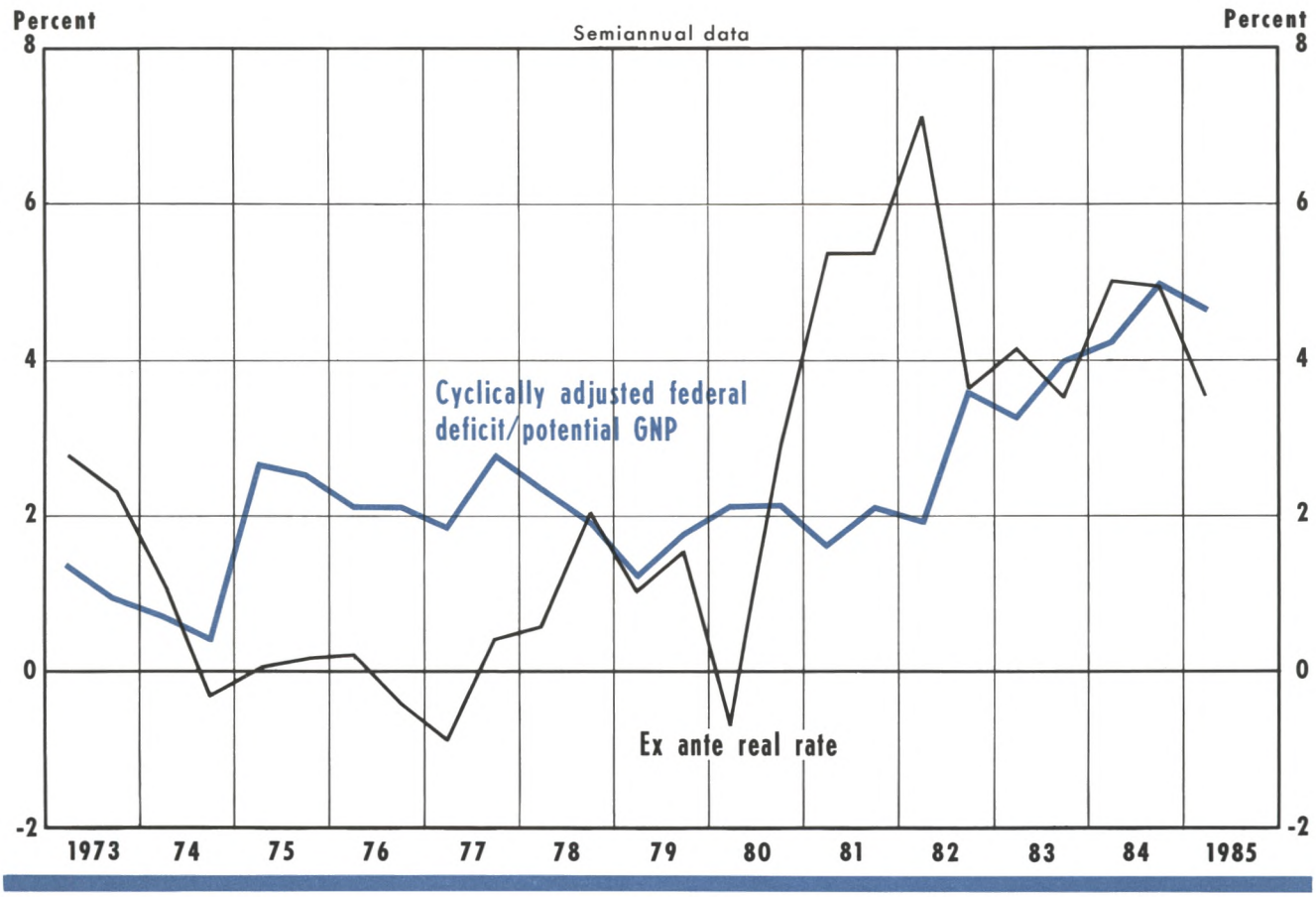
The conventional view suggests that, other things the same, larger deficits are associated with higher expected real interest rates; the alternative view suggests that they are not.

Chart 2 displays the behavior of one adjusted deficit measure and one measure of the expected real interest rate that, according to conventional theory, is influenced by federal deficits. The deficit measure used is the real cyclically adjusted deficit divided by poten-

[8]This view has been popularized by Barro (1974) and Seater (1982), among others. For a recent discussion of the conventional and alternative theoretical relationships between deficits and interest rates, see Rasche (1985) and Tatom (1985); for recent evidence supporting this alternative view, see Kormendi (1983) and Protopapadakis and Siegel (1984).

Chart 2

Deficit and Ex Ante Real Interest Rate



tial real gross national product (GNP).[9] The expected real interest rate measure is obtained by subtracting six-month inflation forecasts from six-month interest rates at the time the inflation forecasts were made.[10]

An examination of chart 2 provides some evidence that the real interest rate does not respond to changes in the federal deficit in the way that is generally expected. For example, average *ex ante* real interest rates were much higher in 1973–74 than they were in 1975–77, even though the federal deficit measure was about twice as high in the later years than it was in the earlier years. Similarly, the expected real rate rose spectacularly from early 1980 to early 1982 when the deficit measure was virtually unchanged; since then, the real rate has declined considerably, yet the deficit has climbed substantially.

Chart 3 summarizes the relationship between the deficit and the real interest rate in an alternative fashion. It is a scatter-diagram of the associated changes in the deficit and *ex ante* real interest rate measures. If increases (decreases) in the deficit generally were associated with increases (decreases) in real interest rates, then the vast majority of the associated pairs of deficit-interest rate changes would be in the first (I) and third (III) quadrants of the chart. As a perusal of chart 3 indicates, however, the points are scattered fairly randomly with half of them in the "wrong" parts of the chart.

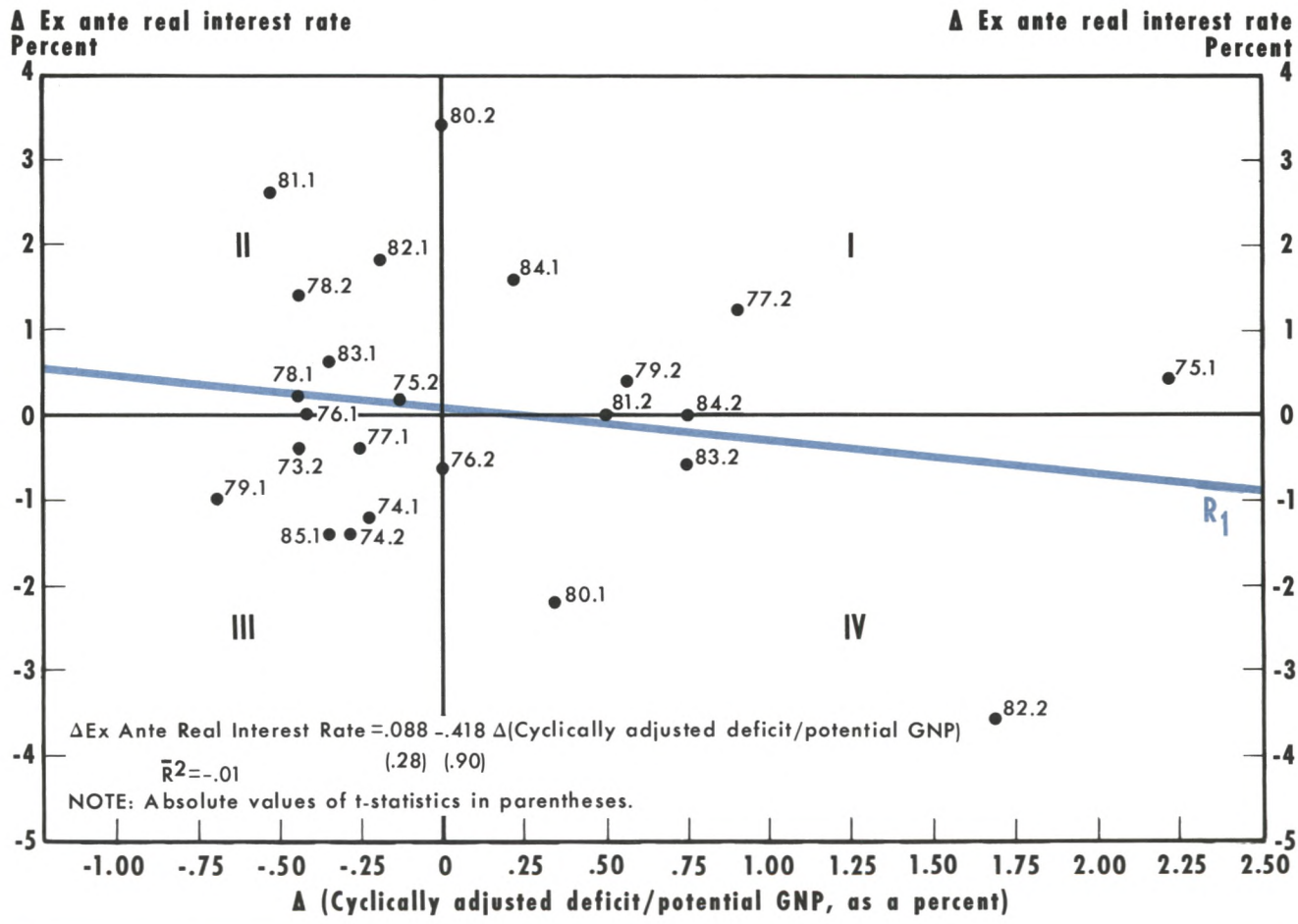
The solid line, labeled R_1, is the regression line

[9]For discussion of the rationale and use of cyclically adjusted deficit measures, see Tatom (1984); for discussion of the impact of recent recessions on deficits, see Malabre (1985).

[10]The *ex ante* real interest rate series was constructed by the following method: six-month-ahead inflation forecasts for the consumer price index (CPI) were derived from the Livingston survey data. These expected inflation figures were then subtracted from the quarterly averages for the six-month Treasury bill rate for the quarters in which the surveys were taken. For more details on this method, see Holland (1984).

Chart 3

Changes in Deficit and Ex Ante Real Interest Rate



showing the estimated linear relationship between changes in the deficit measure and changes in the expected real rate of interest. The conventional theory suggests that the line should slope upward from left to right in chart 3; in fact, it does not. The slope, however, is not statistically significant. Thus, a simple analysis suggests that changes in the deficit have no significant effect on movements in the real rate of interest.

Deficits and Interest Rates: Some Econometric Evidence

Charts 2 and 3 are not intended to demonstrate that deficits have no effects on real interest rates; they do show that there is no easily discernible relationship between them. Because a host of other influences could have confounding effects on such a simple comparison, more detailed econometric analysis is required to decipher the impact of deficits on interest rates.

Unfortunately, such analyses generally have not been able to isolate the effects of deficits on real interest rates or draw any firm conclusions. Table 1, which contains a summary of such studies, shows evidence that is highly ambiguous.[11] While some studies found positive impacts of deficits on interest rates, other studies found mixed or even negative effects; while the effects were statistically significant in some studies, they were insignificant in others. Another summary of such studies reported similar findings.[12]

[11] See Congress (1984), p. 100.

[12] U.S. Department of the Treasury (1984).

Table 1

Federal Deficits and Interest Rates: Some Empirical Findings

Author (Year of Study)	Time Period	Data Frequency	Statistical Technique	Dependent Variable		Deficit Variable			Sign of Deficit Variable	Statistically Significant
				Short-term Interest Rate	Long-term Interest Rate	Federal Deficit	Federal Debt Privately Held	Other		
Bradley (1983)	1966–1982	Monthly	IV[b]	X	X		X		Mixed[e]	No
Canto and Rapp (1982)	1929–1980	Annual	Granger-Sims Tests	X		X			Zero	No
Carlson (1983)	1952–1983	Quarterly	OLS[c]		X		X		Positive	Yes
DeLeeuw and Holloway (1983)	1956–1983	Annual	OLS		X			X	Positive[f]	Yes[g]
Dewald (1983)	1953–1981	Quarterly	OLS	X	X		X		Positive	Mixed[h,i]
Dwyer (1982)	1952–1978	Quarterly	VAR[d]				X		Mixed	No
Evans (1983)	1979–1983[a]	Monthly	OLS	X	X	X			Negative	Mixed[i]
Fackler and McMillin (1983)	1963–1979	Quarterly	VAR		X		X		Zero	No
Feldstein and Eckstein (1970)	1954–1969	Quarterly	OLS		X		X		Positive	Yes[k]
Feldstein and Chamberlain (1973)	1954–1971	Quarterly	OLS		X	X	X		Negative	No
Frankel (1983)	1954–1980	Annual	Theil-Goldberger mixed estimation	X	X		X		Mixed	No
Hoelscher (1983a)	1952–1976	Quarterly	IV	X			X	X	Positive	No
Hoelscher (1983b)	1953–1982	Annual	IV&OLS	X	X	X	X	X	Mixed	Mixed[l]
Kudlow (1981)	1958–1980	Annual	OLS		X			X	Positive	Yes
Makin (1983)	1959–1981	Quarterly	OLS	X		X		X	Positive	Mixed[m]
Makin and Tanzi (1983)	1960–1981	Quarterly	IV	X		X			Mixed	Yes
Mascaro and Meltzer (1983)	1969–1981	Quarterly	OLS	X	X		X		Mixed	No[n]
Miller (1982)	1948–1982	Annual	VAR	X				X	Positive	No
Motley (1983)	1958–1982	Monthly	OLS	X			X		Mixed	Mixed[o]
Plosser (1982)	1954–1978	Quarterly	VAR	X	X		X		Mixed	No[p]
Sinai and Rathjens (1983)	1960–1982	Quarterly	OLS	X	X	X	X	X	Mixed	Mixed

[a]Also 3 major war periods.
[b]Instrumental variables.
[c]Ordinary least squares.
[d]Vector autoregressions.
[e]Some positive, some negative.
[f]Negative in first-difference form.
[g]No in first-difference form.
[h]Some significant, some insignificant.
[i]No short rate, Yes long rate.
[j]No short rate, Yes long rate.
[k]Mixed signs and significance in flow models.
[l]No and negative sign for short rate, Yes and positive sign for long rate.
[m]Not significant in one case, marginally in other.
[n]Yes and negative for short rate for 1969-1979.
[o]No for most recent period.
[p]3 instances of significance at 10% level.

SOURCE: *The Economic Outlook* (February 1984), Congressional Budget Office. Simulation references were deleted.

Thus, it appears that econometric studies provide only weak evidence to support the view that federal deficits have a significant influence on interest rates.[13]

LINK #2: WOULD LOWER U.S. REAL INTEREST RATES REDUCE THE FOREIGN EXCHANGE VALUE OF THE DOLLAR?

Most farm commodities traded in international markets are priced in U.S. dollars regardless of where they are produced. Consequently, a set of events that raised the value of the dollar in terms of Brazilian cruzeiros, for example, would make Brazilian soybeans less expensive than U.S. soybeans. Nations that import soybeans could use their dollars to purchase cruzeiros and, hence, purchase Brazilian soybeans more cheaply than before. Because of this relationship, changes in farm exports are linked to changes in the value of the dollar.

While we typically think of the value of the dollar vis-a-vis one or another specific country's currency — for example, the Japanese yen, the French franc or the West German mark — such bilateral exchange rates by themselves, do not provide a clear picture of what is happening to the overall value of the dollar in foreign exchange markets. Instead, an *index* of the dollar's value often is used to incorporate information about the movement of the dollar relative to other major currencies. One index, called the trade-weighted exchange rate of the U.S. dollar, enables us to determine what is happening to the dollar's value relative to the currencies of our major trading partners.[14]

The foreign exchange value of the dollar is the relative price of the U.S. dollar in terms of other nations' currencies. The actual value of the dollar at any time is determined by the factors that underlie the demand for and supply of dollars in foreign exchange markets.

There currently is some controversy over which factors determine exchange rates and the relative influences they have on exchange rate movements at any particular moment.[15] There is, however, a fairly general analytical framework that suggests four factors as the main influences on the behavior of exchange rates: (1) differences in inflation rates between countries; (2) differences in real interest rates between countries; (3) differences in real economic conditions that influence trade patterns; and (4) differences in political and other risks associated with investment in specific countries.[16] We focus on the effects of changes in the first two factors on exchange rate movements. Unfortunately, changes in the remaining two factors can make it difficult to decipher the actual impacts of changes in inflation and real interest rate differentials on the exchange rate at any given moment.

Adjusting the Exchange Rate for Differences in Inflation Across Nations

Theoretical considerations suggest that changes in bilateral and trade-weighted foreign exchange values of the dollar are inversely related to differences between U.S. and foreign inflation rates. If this inflation differential (U.S. minus foreign) is positive, the value of the dollar will decline over time; if the inflation differential is negative, the dollar's foreign exchange value will rise.

This relationship, called purchasing power parity, is based on the notion that similar goods traded in world markets must command similar prices, regardless of where they are bought and sold. For example, if a bushel of corn costs $1.50 in the United States and £3 in the United Kingdom, an exchange rate of £2 per dollar would "equalize" the price of U.S. and U.K. corn to all purchasers. If inflation in the United States drove the price of corn to $3 per bushel, then, other things the same, the exchange rate would have to fall to £1 per dollar to bring the price of U.S. corn back in line with U.K. corn in world markets.

Of course, if changes in the value of the dollar were simply the result of changes in these inflation differen-

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[13]For a detailed discussion of the major problems associated with empirical estimation of the deficit's impact on interest rates, see Congress (1985a), pp. 77–84.

[14]The trade-weighted exchange rate used in this study is the Federal Reserve Board index (March 1973 = 100) of the weighted-average exchange value of the U.S. dollar against the currencies of other G-10 countries plus Switzerland. Weights are the 1972–76 average total trade shares of each of the 10 countries.

[15]For example, one analyst has noted that "there is no consensus on how exchange rates are determined. The interpretations vary widely among the various theories, ranging from the traditional approach of trade-oriented demand and supply factors, to the modern approach of asset-market mechanism and expectations. The analysis of currency determination is complicated by the interdependence of the exchange rates, monetary and other economic policies, and factors affecting economic and financial performance." Poniachek (1983), p. 2.3.3.

[16]This discussion is based on the framework developed in Isard (1980).

tials, exchange rate movements would be neutral with respect to trade patterns. Indeed, other things unchanged, exchange rate movements consistent with purchasing power parity will preserve current trade patterns.

Exchange rates are affected by other factors, however, so that their movements are not consistent solely with purchasing power parity conditions. If exchange rates rise more (or fall less) than inflation differentials warrant, prices of U.S. goods will rise relative to similar goods sold by other countries; if exchange rates rise less (or fall more) than inflation differentials warrant, prices of U.S. goods will fall relative to foreign-produced goods.

This discussion suggests that, if we want to assess the effect of exchange rate movements on exports in general, and farm products in particular, we should look at the movement in exchange rates after adjusting for the effects of inflation differentials. One such exchange rate measure is called the *real* trade-weighted exchange rate for the U.S. dollar.[17]

The Impact of Real Interest Rate Differences on the Real Exchange Rate

Theoretical considerations suggest that changes in the real trade-weighted exchange rate should be positively related to changes in the real interest rate differential (U.S. minus foreign). If U.S. real interest rates rise relative to foreign real rates, other things the same, the real trade-weighted value of the dollar should rise; if U.S. real interest rates fall relative to foreign real rates, the real trade-weighted value of the dollar should decline. The presumption is that a positive real rate differential will attract foreign capital, while a negative differential will make investment abroad more attractive. Thus, changes in the real rate differential should cause similar changes in the real trade-weighted exchange rate.

Changes in Real Interest Rate Differentials and the Real Exchange Rate: Casual Evidence

Chart 4 shows what has happened to the real trade-weighted exchange rate and one measure of the expected real interest rate differential (U.S. minus foreign expected real interest rates) from 1973 to the present.[18] These data suggest that the link between the real interest rate and the real exchange rate is not especially reliable. For example, average real interest rate differentials were approximately the same in the 1975–78 and 1982–85 periods, yet the real exchange rate was falling in the former period and rising in the latter one.

Chart 5 shows a somewhat different way of looking at the relationship between movements in the real interest differential and movements in the real exchange rate. It is a scatter-diagram of changes in the real interest rate differential and the associated percent changes in the real exchange rate. Other things unchanged, economic theory predicts that the points should lie predominantly in the first (I) and third (III) quadrants; positive (negative) changes in the real interest rate differential should be associated with positive (negative) percent changes in the real exchange rate. This is not the case: the data points lie mainly in quadrants II and IV.

The line labeled R_2 is the regression line relating the percent changes in the real trade-weighted exchange rate associated with the changes in the expected real interest rate differential. It should slope upward from left to right; instead, it slopes downward, suggesting that an increase (decrease) in the real interest rate differential is associated with a decrease (increase) in the real exchange rate. This estimated inverse relationship, however, is not a statistically significant one; that is, the claim that there is no simple linear relationship between these variables cannot be rejected at standard statistical significance levels. This puzzling result again suggests that deciphering the effect of changes in real interest rate differentials on exchange rate movements requires detailed and careful econometric analysis.

Some Econometric Evidence

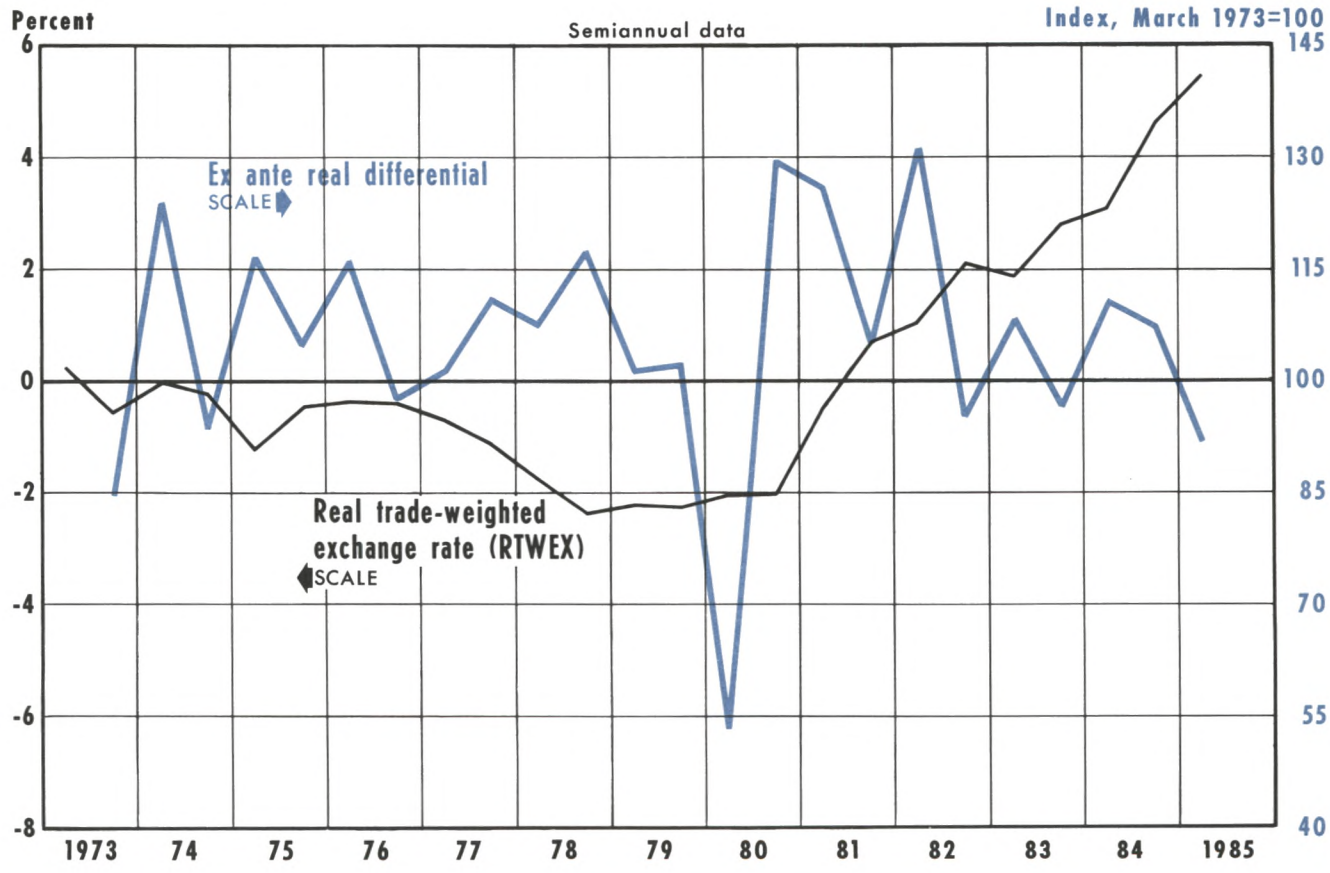
Empirical studies of real exchange rates and real interest differentials offer a somewhat qualified view of their relationship. For example, one recent investigation of the issue found a small statistically significant lagged response of the real exchange rate to the real

[17]The real trade-weighted exchange rate is the nominal trade-weighted exchange rate described earlier (see footnote 14) divided by the ratio of the U.S. consumer price index (CPI) to the foreign, trade-weighted CPI, each indexed to March 1973.

[18]The *ex ante* real interest rate differential is obtained from the U.S. three- and four-month money market interest rate minus the trade-weighted average three- and four-month money market rates for six industrialized countries adjusted by corresponding Organization for Economic Cooperation and Development (OECD) inflation forecasts.

Chart 4

Real Trade-weighted Exchange Rate and Real Interest Rate Differential



interest rate differential.[19] Specifically, the study found that a 10-basis-point change in the U.S. minus foreign real interest differential would cause, after two quarters, a 0.23 percent rise in the real value of the dollar. This study also found no independent effect of deficits on the real exchange rate.[21] In general, it appears that we know very little about the extent to which real interest rate differentials actually affect real exchange rates.

LINK #3: WOULD A LOWER VALUE OF THE DOLLAR INCREASE U.S. FARM EXPORTS?

Farmers and legislators would like to increase the real value of U.S. farm exports. Would lower exchange rates result in a significant increase in real farm exports?

We discussed earlier how exports *could* be affected by changes in the exchange rate. Purchasing power parity conditions suggest that movements in exchange rates should exactly offset changes in the price of the same commodity in different countries following some adjustment period. For example, the price of corn should be the same across countries after adjustments are made for exchange rate differences and costs of transportation.

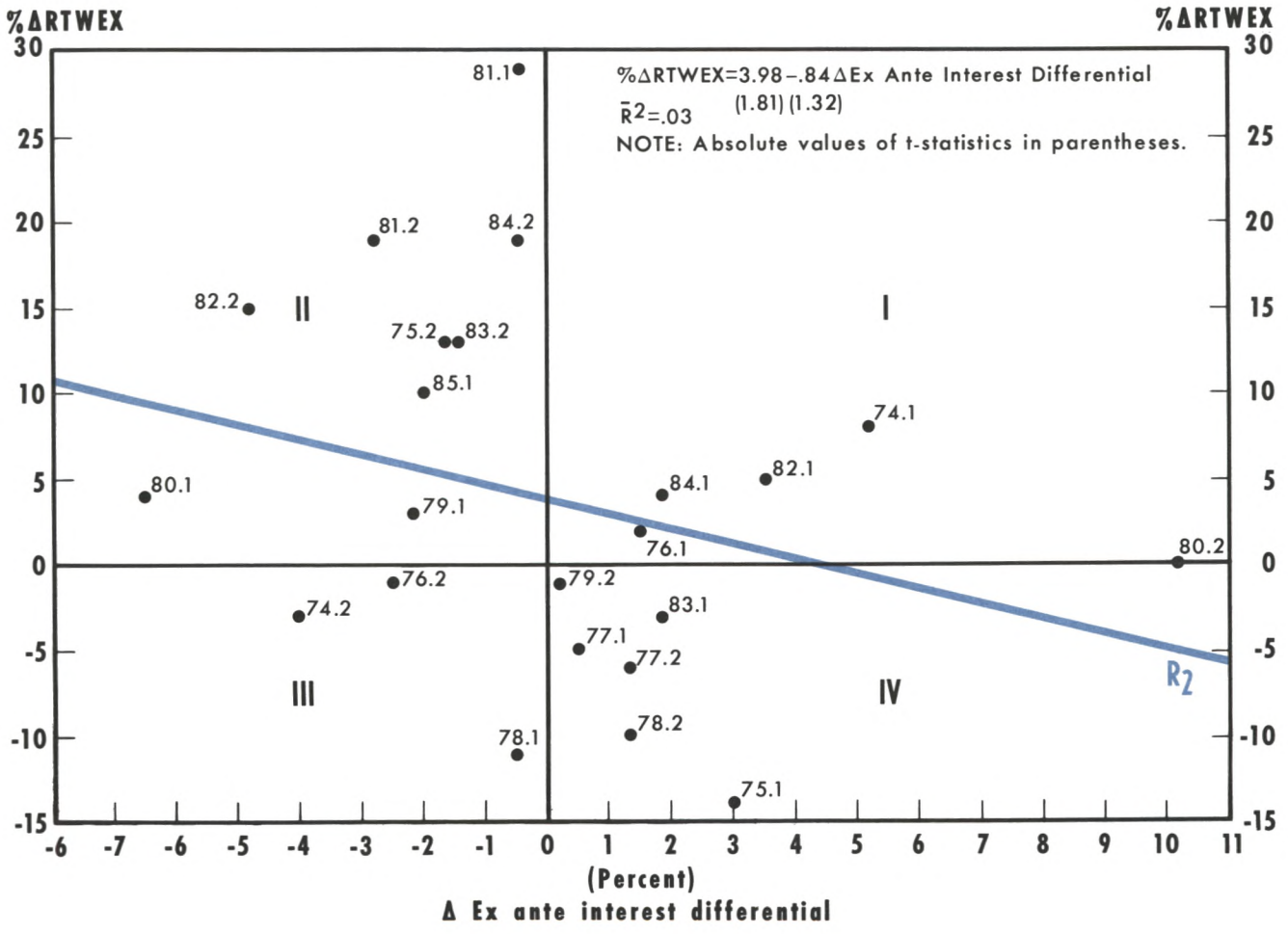
[19]Batten and Belongia (forthcoming 1986).

[20]The estimated coefficients from this type of statistical study are strictly valid only for small changes in variables. Therefore, the example presented should not be expanded to conjecture, for example, that a 100-basis-point change in the interest differential would cause a 2.3 percent change in the dollar's real value.

[21]Similar results were found by Bisignano (1985).

Chart 5

Growth of Real Trade-weighted Exchange Rate and Change in Real Interest Rate Differential



There is substantial evidence, however, that purchasing power parity does not necessarily hold in the short-run and that a considerable period of time, perhaps as long as five to 10 years, may be required before it finally is reached. If this is the case, deviations from purchasing power parity, characterized by changes in the *real* exchange rate, may have persistent and significant effects on real farm exports.

Changes in the Real Exchange Rate and Real Farm Exports: Casual Evidence

Chart 6 displays the behavior of the real exchange rate and real farm exports since 1973. Depending upon the specific years chosen, a perusal of the chart yields both confirming and contradictory evidence for the presumed inverse relationship between movements in the exchange rate and farm exports. For example, exchange rates and farm exports moved in opposite directions from 1976 to the first half of 1979, in 1982, and from the second half of 1984 to the first half of 1985. However, exchange rates and farm exports moved generally in the same direction from 1973 to the first half of 1976 and from 1979 to 1980; moreover, farm exports remained virtually unchanged from 1980 to the first half of 1982, and from the second half of 1982 through 1984, two periods when exchange rates were rising dramatically.

Chart 6
Real Trade-weighted Exchange Rate and Real Farm Exports

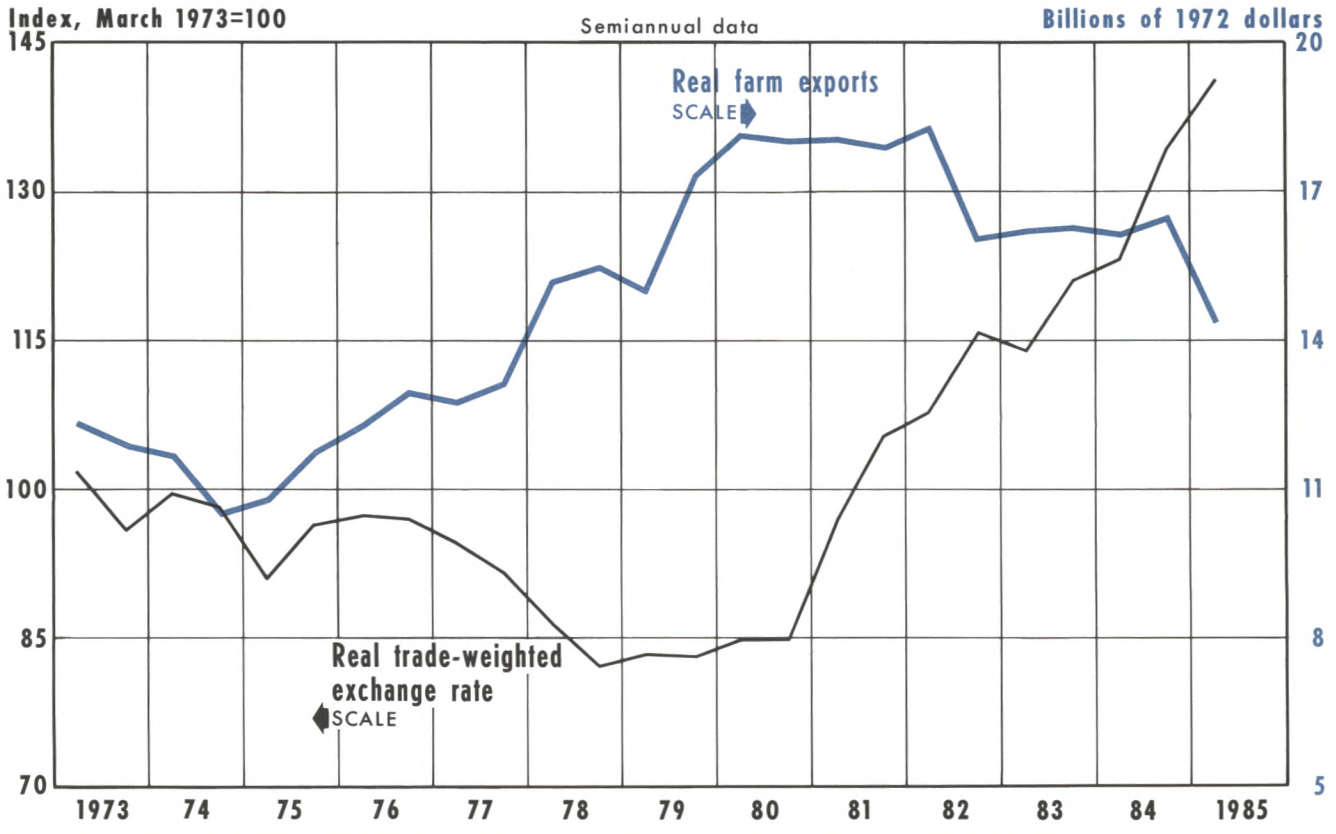


Chart 7 displays a scatter-diagram of changes in the real exchange rate and associated changes in real farm exports since 1973. Other things unchanged, economic theory predicts that the points should lie predominantly in the second (II) and fourth (IV) quadrants; positive (negative) changes in the real exchange rate should be associated with negative (positive) changes in real farm exports. This, however, is not the case: the data points are randomly scattered throughout the four quadrants and nearly half of them lie in the wrong ones.

The line labeled R_3 is the regression line relating the percent changes in real farm exports associated with the percent changes in the real exchange rate. It should slope downward from left to right and it does. The negative slope, however, is not statistically significant. Thus, the possibility that there is no contemporaneous relationship between changes in the exchange rate and farm exports cannot be rejected.

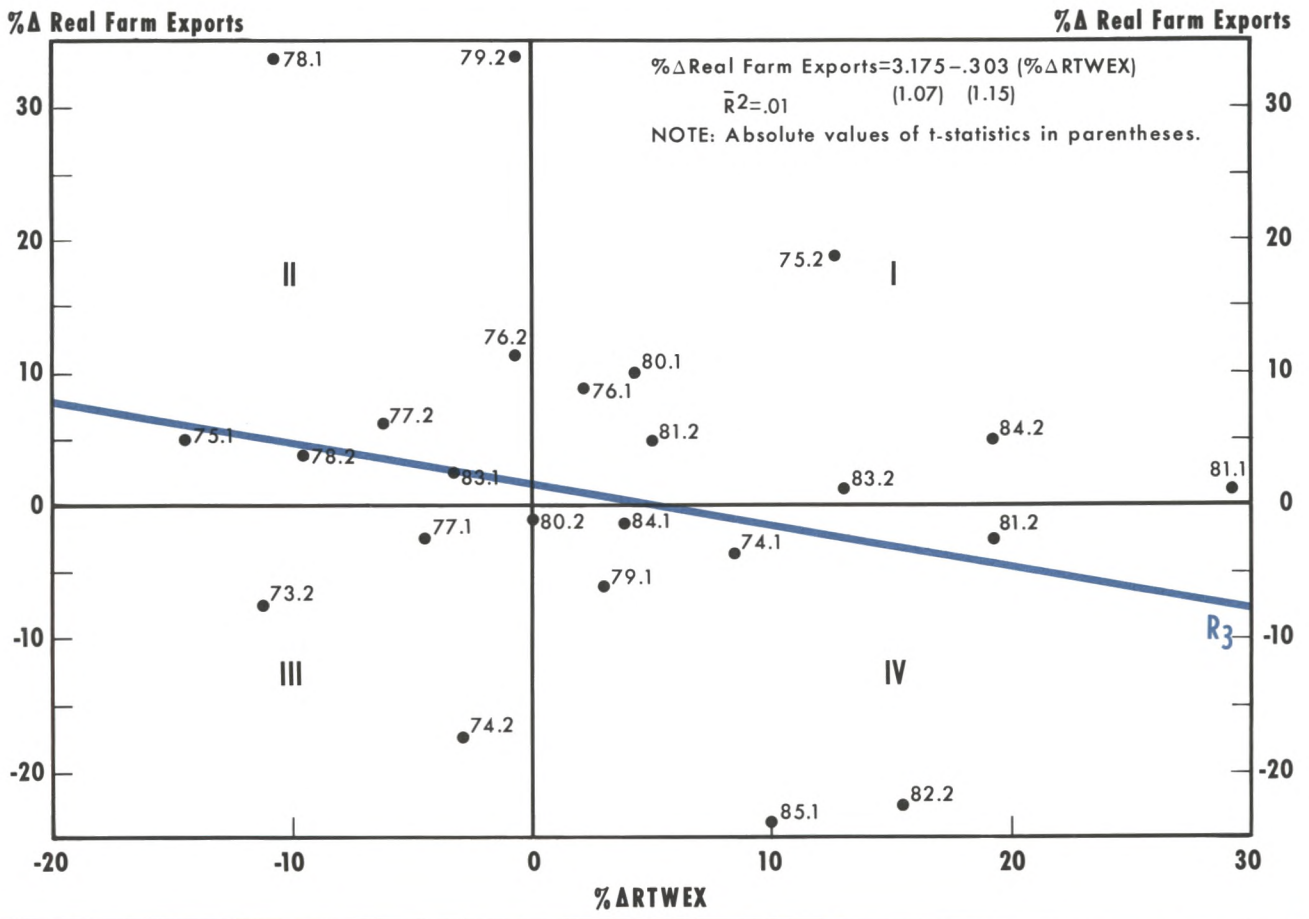
Some Econometric Evidence

Empirical studies have shown that changes in the real exchange rate do affect imports and exports over a considerable time period. When these longer-run effects are taken into account, movements in the real exchange rate have the expected effects on imports and exports. A summary of selected studies examining the long-run impact of changes in the real exchange rate on the demand for U.S. merchandise exports and imports is shown in table 2.[22] Merchandise exports consist of all products, including farm products, exported to the rest of the world; the "long-run price elasticity of export demand is the total percentage change in export volume in response to a sustained 1 percent change in the relative price of U.S. exports to

[22]See Congress (1985b), p. 49.

Chart 7

Growth of Real Trade-weighted Exchange Rate and Real Farm Exports



foreigners, after it has had time to adjust fully."[23] The elasticities are all negative as expected. Although the estimated elasticities range from −0.3 to −2.3, the more recent ones run close to −1, indicating that a 1 percent drop in the real exchange rate will, after sufficient time passes, induce a 1 percent rise in total merchandise exports.

Two recent studies focused specifically on the effect of changes in the exchange rate on agricultural exports.[24] After estimating a simple quarterly reduced-form equation for the real value of farm exports, they find that a 1 percent fall in the *real* value of the dollar will increase the real value of farm exports by 0.7 percent within one and one-quarter years.[25] Thus, unlike the previous two links, the third link in the chain running from deficits to farm exports has both theoretical and empirical support.

SUMMARY

There is a widely shared view that federal deficits have contributed significantly to higher nominal and real interest rates in the United States. Moreover, it is commonly believed that these higher rates have contributed significantly to the rising foreign exchange

[23]See Congress (1985b), p. 48.

[24]Batten and Belongia (1984, forthcoming 1986).

[25]Batten and Belongia (forthcoming 1986).

Table 2
Long-Run Price Elasticities of Demand for U.S. Merchandise Exports and Imports

Exports			Imports		
Study or Model	Year of Estimate	Elasticity	Study or Model	Year of Estimate	Elasticity
Adams et al.	1969	−0.60	Adams et al.	1969	−1.16
Houthakker-Magee	1969	−1.51	Houthakker-Magee	1969	−1.03
Basevi	1973	−1.44	Armington	1970	−1.73
Hickman-Lau	1973	−1.38	Taplin	1973	−1.05
Samuelson	1973	−1.13	Beenstock-Minford	1976	−1.04
Stern et al.	1976	−1.41	Stern et al.	1976	−1.66
Goldstein-Khan	1978	−2.32	Gylfason	1978	−1.12
Gylfason	1978	−0.62	Geraci-Prewo	1980	−1.23
Amano et al.	1981	−0.32	Goldstein-Khan	1980	−1.12
DRI Model	1982	−0.83	DRI Model	1982	−0.56
Helkie	1983	−0.90	Helkie	1983	−0.85
Wharton Model	1984	−0.98	Wharton Model	1984	−0.64
Average		−1.12	Average		−1.10

SOURCE: *The Economic and Budget Outlook: An Update* (February 1985), Congressional Budget Office.

value of the dollar. Thus, it frequently is argued that our nation's exporting sectors, producers of farm commodities in particular, will continue to suffer until federal deficits are reduced and U.S. interest rates are brought down.

In this article, we examined three vital links in the conventional argument that ties the deficit to farm exports. With respect to the first link, we noted that there is considerable theoretical controversy over whether larger deficits actually cause real interest rates to increase. We found little empirical evidence to support this view.

Second, we noted that, even if lower deficits did result in lower U.S. real interest rates, they would not necessarily have a salutary impact on the real exchange rate. Apparently, other influences on the real exchange rate have offset the effect, if any, of changes in real interest rate differentials in recent years. Among these other factors may be "the strong performance of the U.S. economy, confidence in the strength and stability of the political system in the United States, capital flight from debtor countries, [and] a substantial shift in the external position of American banks."[26] The important point is that there is little empirical evidence to show that changes in the real interest rate differential have had a significant impact on movements in the real exchange rate during the past 13 years.

Finally, we showed that, although U.S. farm exports are inversely related to the real exchange value of the dollar, the demand relationship is inelastic and exchange rate movements have their full effect only over a considerable time period. However, even though lower exchange rates would, over time, increase U.S. farm exports, the failure of the first two links to be supported suggests that we cannot necessarily expect that lower deficits will result in a lower value of the dollar in foreign exchange markets.[27]

None of the discussion above should be taken as evidence that deficits per se are either good or harmless. Nor does it prove that larger deficits have had no adverse effect on real interest rates, on the foreign exchange value of the dollar or on farm exports. Unfortunately, at the present time, there continues to be

[26]Pöhl (1985). Similar comments have been made by a wide variety of commentators: e.g., "At various times, other factors, which are difficult to measure, have also influenced the dollar ... The reversal in the dollar's fortunes since late 1980 may [be] related to (i) the election of a new administration committed to a more conservative approach to financial policies; and (ii) the increased risks associated with other currencies." Atkinson et al. (1985), pp. 37 and 39.

[27]See Poole (1985) for a discussion of why lower budget deficits might be expected to *raise* the value of the dollar.

considerable uncertainty about the effects that larger deficits actually have had on these key economic variables.[28]

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[28]For additional discussion and empirical evidence supporting this conclusion, see Bisignano (1985) and Wallis (1985). Even Dobson, whose diagram of the deficit's effects on the economy appears in figure 1, notes that "how much the federal deficits influence the variables in the diagram is not known with much certainty." Dobson, (1984), p. 49.

Monthly Economic Indicators: A Closer Look at the Coincident Index

Keith M. Carlson

DECISIONS relating to monetary policy are based on a considerable volume of economic information. One of these pieces of information is the current status of economic activity. Recent economic performance is a vital foundation required in the process of deciding what course monetary policy should take. There are many economic indicators released each month, and one problem for the monetary policymaker, as well as for businesses, consumers and governments, is to distill from this spate of information some assessment of just how well the economy is performing.

The U.S. Department of Commerce's *Business Conditions Digest* lists 84 different economic time series as monthly cyclical indicators. An analysis of all, or even a substantial subset, of these indicators could provide a confusing picture to even the most astute analyst. Fortunately, wading through such a morass is not necessary to determine how the economy is performing. The Commerce Department's Bureau of Economic Analysis (BEA) has simplified the process by publishing a "composite index of four roughly coincident indicators," which condenses the information from the most important monthly indicators into one summary index.

Because it is overshadowed by the simultaneous release of the more popular "index of twelve leading indicators," the coincident index does not receive extensive media coverage. Yet the coincident index provides valuable and reliable information. The purpose of this article is to describe the coincident index and its components, and to summarize their usefulness and reliability according to well-known criteria. Particular attention will be focused on the cyclical performance of these indicators.

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THE COINCIDENT INDEX AND ITS COMPONENTS: A BRIEF DESCRIPTION

The composite index of coincident indicators is published monthly and is constructed from four monthly indicators prepared and released by four different government agencies. A tabular summary of these indicators is given in table 1. A brief description of the component series and the coincident index follows. (A more detailed discussion of these series appears in the appendix.)

Employees on Nonagricultural Payrolls

This series commonly is called payroll employment; it is prepared by the Bureau of Labor Statistics of the Department of Labor. Usually released on the first Friday of the month, it generally covers the payroll period including the 12th of the preceding month. It is based on a survey of business establishments, in contrast to the estimate of total employment, which is based on a survey of households.

Personal Income Less Transfer Payments in Constant (1972) Dollars

This series is estimated by the BEA in the preparation of the national income accounts. The basic data on personal income and transfer payments for the

Table 1

The BCD Composite Index of Coincident Indicators[1]

	Employees on nonagricultural payrolls	Personal income less transfer payments in 1972 dollars	Industrial production	Manufacturing and trade sales in 1972 dollars	Composite index of coincident indicators
Source agency for basic data	U.S. Department of Labor, Bureau of Labor Statistics	U.S. Department of Commerce, Bureau of Economic Analysis	Federal Reserve Board of Governors	U.S. Department of Commerce, Bureau of the Census and U.S. Department of Labor, Bureau of Labor Statistics	U.S. Department of Commerce, Bureau of Economic Analysis
Units	Thousands of persons	Billions of 1972 dollars	Index, 1977 = 100	Millions of 1972 dollars	Index, 1967 = 100
Revisions	Two months back, and annually in June	Three months back, and annually in July	Two to three months back, and annually in September	Three months back, and twice annually, usually in March and May	Three months back and further as necessary
Name of release	The Employment Situation	Personal Income and Outlays	Industrial Production (G. 12.3)	Manufacturing and Trade Inventories and Sales	Composite Indexes of Leading, Coincident, and Lagging Indicators
Date of release	1st Friday of the month for the previous month	18th–20th of the month for the previous month	15th–17th of the month for the previous month	13th–15th of the month for two months earlier	30th–31st of the month for the previous month
Focus of release	Discussion equally divided between results from household survey data and establishment survey data	Personal income with discussion of wage vs. nonwage income. Also disposable income and saving	Total industrial production with some discussion of market and industry groupings	Brief discussion of sales, inventories and inventories-sales ratio	Highlights discussion of leading indicators with brief discussion of coincident and lagging indicators
Use in BCD	Used "as is" in coincident index	Transfer payments subtracted from personal income and deflated by personal consumption expenditures deflator	Used "as is" in coincident index	Sales deflated with BLS producer and consumer price indexes	Constructed from four series with unequal weights and detrending (see text)
BCD classification by economic process	Employment and unemployment	Production and income	Production and income	Consumption, trade, orders and deliveries	Composite indexes

[1]*Business Conditions Digest*, a monthly publication prepared by the U.S. Department of Commerce, Bureau of Economic Analysis. All series are seasonally adjusted.

previous month are released after the middle of the current month. The constant dollar estimate, however, is not available until the end of the current month, when the composite indexes are released.

Industrial Production

This series is an index (1977 = 100) of the output of manufacturing and mining establishments and utilities; it is prepared by the Federal Reserve Board. The estimate for the previous month is available after the middle of the current month. Industries covered by the index generate about 30 percent of the gross national product (GNP).

Manufacturing and Trade Sales in Constant (1972) Dollars

This series is a measure of monthly business sales; it is prepared by the Bureau of the Census of the Department of Commerce. The current dollar estimates are released about the middle of the current month for two months earlier; for example, the estimate for October is released in mid-December. The constant dollar estimate, which is prepared by the BEA, is not available until the end of the month, when it is released as a part of the report on composite indexes.

Composite Index of Coincident Indicators

The composite index of coincident indicators is a summary measure designed to signal changes in the direction of economic activity. The index measures the behavior of the four economic time series described above, which show similar timing at business cycle turns but represent widely differing activities or sectors of the economy. These four components were selected with the help of a detailed scoring system that places particular emphasis on cyclical timing. The choice of coincident indicators was based upon a comparison of the timing characteristics of the particular series with reference dates (business cycle turning points) designated by the National Bureau of Economic Research (NBER).[1]

Construction of the composite index of coincident indicators consists of several steps.[2] First, each of the component series is standardized by dividing the month-to-month percent changes by the long-run average of those changes. This prevents the more volatile series from dominating the index. A weighted average of these standardized changes is then computed with the "better performing" series assigned more weight. These weighted averages are then cumulated into an index. The final step is to "trend-adjust" this index so that its long-term average growth rate (since 1948) equals the average of the trend in its four components. This trend, which is similar to real GNP, can be viewed as a linear approximation of the average growth rate in economic activity.

CRITERIA USED TO EVALUATE ECONOMIC INDICATORS

The BEA uses a scoring system to evaluate economic time series as cyclical indicators.[3] This system provides information about which series are to be included in the composite index and the relative importance, or weight, attached to each series. Seven criteria are used to evaluate time series; the numerical scores for these criteria are summarized in table 2. For the most part, these scores are derived qualitatively. Where possible, however, there is an attempt to evaluate quantitatively.

The scoring system, first developed and applied by Moore and Shiskin in 1966, was published in 1967. It was modified by Zarnowitz and Boschan in 1975, but continues to be similar in the most important detail. According to Zarnowitz and Boschan:

> The system disciplines and systematizes the judgment of both reviewer and user of the indicators. It is an effort to insure that all the important aspects of the evaluation problem are considered in a consistent and, to a significant extent, replicable way.[4]

Economic Significance

How important is the economic process or variable for which the particular series stands, and what is the breadth of the series coverage in representing the activity concerned? Scoring for this criterion is subjective, depending primarily on a classification of indicators by "type of economic process." A broad hierarchy of three levels of economic variables was postulated:

(1) Comprehensive output and input aggregates in real and nominal terms; for example, real GNP is

[1]For a discussion of an example of how the NBER arrives at such a designation, see Zarnowitz and Moore (1983).

[2]For further detail, see the U.S. Department of Commerce (1984), pp. 65–70, and Ratti (1985).

[3]A complete discussion of this scoring system is found in Moore and Shiskin (1967).

[4]U.S. Department of Commerce (1977), p. 171.

Table 2
Series Scores

	Peaks	Troughs	All turns	Conformity	Smoothness	Timeliness	Statistical adequacy	Economic significance	Revisions	Total Peaks	Total Troughs	Total All turns
Composite coincident index	96	97	100	86	100	80	77	90	20	82	82	83
Nonagricultural employment	79	97	96	82	100	80	84	90	60	82	87	87
Industrial production	17	100	95	87	100	80	77	90	40	64	85	84
Real personal income less transfer payments	98	81	100	83	100	80	72	90	20	81	77	82
Real manufacturing and trade sales	19	87	88	78	80	54	74	80	40	57	74	74

SOURCE: 1984 *Handbook of Cyclical Indicators*, p. 169

the only series that is scored 100.

(2) The major components of the comprehensive aggregates and other variables to which causal roles in business cycles are attributed; for example, investment, profits.

(3) Variables whose role is primarily symptomatic rather than causal; for example, marginal employment adjustments.

All of the components of the coincident index apparently are classified as being included in (1) or (2). With the exception of real manufacturing and trade sales, which is scored 80, all of the other components are scored at 90.

Statistical Adequacy

How well does the given series measure the economic variable or process in question? The BEA considers eight aspects of this criterion:

(1) Quality of the reporting system — is it set up for statistical purposes or is it the by-product of an administrative program?

(2) Coverage of economic process — full enumeration, probability sample, etc.

(3) Coverage of time period — full month or quarter, one day per month, etc.

(4) Availability of estimates of sampling and reporting errors.

(5) Frequency of revisions.

(6) Length of series.

(7) Comparability over time — breaks in the series.

(8) Other considerations.

This detailed evaluation is constructed to be primarily quantitative rather than qualitative.

Cyclical Timing

How consistently does the series coincide with successive business cycle turns? Because this criterion is crucial for timely recognition of business cycle turning points, it is assigned the greatest weight of all the criteria. According to the BEA, this criterion has four phases: (1) identification and dating of specific cycles for the component series; (2) deciding on reference dates (depending mainly on the reference chronology established by the NBER); (3) matching the specific cycle turning points with the reference dates; and (4) scoring the cyclical performance of the particular indicator.

Conformity

How regularly do movements in the specific indicator reflect the expansions and contractions of the

overall economy? For an indicator to be useful, its specific cycles must parallel business cycles. Conformity is defined positively if the indicator rises during economic expansions and declines during contractions, and negatively if it moves countercyclically. This evaluation considers the number of business cycle phases and how they are matched by the cycle movements of the particular indicator. Also examined are false signals associated with specific cycles; that is, movements in the indicators that do not match general expansions and contractions. In addition, there is a consideration of amplitude. For example, larger movements than the average will tend to be more identifiable, thus contributing to the usefulness of an indicator.

Smoothness

How promptly can a cyclical turn in a series be distinguished from a directional change associated with shorter movements? It is desirable that the cyclical movements of the indicator are not obscured by relatively large and frequent irregular variations. Although there are other ways of improving smoothness (for example, by calculating a moving average), generally such procedures imply a loss of timeliness.

Timeliness

How promptly available is the particular series and how often is it reported? Two aspects are considered: (1) how frequently the figures are compiled, and (2) how promptly the figures are available.

Revisions

How large are the revisions? This criteria was added separately to the list prepared by Zarnowitz and Boschan in 1975. Series that are subject to large revisions, especially if they involve directional change, can be troublesome, providing misleading signals about the pace of economic activity.

THE BEA SCORING SUMMARY FOR THE COINCIDENT INDEX

The scores shown in table 2 cover the period from 1948 to 1980. The BEA's objective was to develop a composite index that reduces the number of false signals that might arise if one were to rely on a single indicator. The advantage of a composite index is that it will smooth out the noise in the component series and also capture the different economic processes represented — production, employment, real income and real sales.

Depending on the total performance score, weights are assigned to each indicator in the construction of the composite index. For example, nonagricultural employment receives the greatest weight (1.064) because of its 87 score, followed by industrial production (1.028), personal income less transfer payments in constant (1972) dollars (1.003), and manufacturing and trade sales in constant (1972) dollars (.905). These weights do not differ markedly, although the difference between the largest and the smallest is substantial.

Nonagricultural employment scores high on all criteria, followed closely by industrial production. According to table 2, the weight on industrial production is reduced by its performance at cyclical peaks and by the extent to which it is revised. Personal income receives a relatively low score, mainly because of the revisions. Clearly, the worst of the components is manufacturing and trade sales, which generally scores lowest by each criterion.

The scores for the constructed composite index are somewhat surprising. In particular, the total score is lower than that of both nonagricultural employment and industrial production. Apparently, this reflects the fact that the composite index is subject to substantial revision, since it has to be revised every time any one of the component series is revised.

CYCLICAL PERFORMANCE

The most important criterion used in the evaluation of economic indicators is the cyclical performance of the indicator in question. Generally, to be classified as a coincident indicator, an indicator must turn on average between -3 (3-month lead) and $+1$ (1-month lag) at peaks and between -1 and $+3$ at troughs. The differences at peaks and troughs reflect the historical distribution of timing. Specific peak and trough dates for each of the coincident indicators are summarized in table 3.

Specific Cycles vs. Reference Dates

Business cycle turning points are designated by a special committee appointed by the NBER. This designation usually occurs several months after the fact and is based on all available information at that time. No automatic rule is used in the determination of these reference dates.[5]

[5]See Zarnowitz and Moore.

Table 3

Specific Peak and Trough Dates for Coincident Indicators

	Reference peak date						
	July 1981	**Jan 1980**	**Nov 1973**	**Dec 1969**	**Apr 1960**	**Aug 1957**	**Jul 1953**
Composite coincident index	7/81(0)	1/80(0)	11/73(0)	10/69(−2)	1/60(−3)	2/57(−6)	3/53(−2)
Employees on nonagricultural payrolls	7/81(0)	3/80(+2)	10/74(+11)	3/70(+3)	4/60(0)	3/57(−5)	6/53(−1)
Index of industrial production	7/81(0)	3/80(+2)	11/73(0)	10/69(−2)	1/60(−3)	2/57(−6)	7/53(0)
Manufacturing and trade sales in 1972 dollars	4/81(−3)	3/79(−10)	11/73(0)	10/69(−2)	1/60(−3)	2/57(−6)	3/53(−4)
Personal income less transfer payments in 1972 dollars	8/81(+1)	1/80(0)	11/73(0)	NSC[1]	5/60(+1)	8/57(0)	6/53(−1)
	Reference trough date						
	Nov 1982	**Jul 1980**	**Mar 1975**	**Nov 1970**	**Feb 1961**	**Apr 1958**	**May 1954**
Composite coincident index	12/82(+1)	7/80(0)	3/75(0)	11/70(0)	2/61(0)	4/58(0)	8/54(+3)
Employees on nonagricultural payrolls	12/82(+1)	7/80(0)	4/75(+1)	11/70(0)	2/61(0)	5/58(+1)	8/54(+3)
Index of industrial production	12/82(+1)	7/80(0)	3/75(0)	11/70(0)	2/61(0)	4/58(0)	4/54(−1)
Manufacturing and trade sales in 1972 dollars	10/82(−1)	6/80(−1)	3/75(0)	11/70(0)	1/61(−1)	4/58(0)	12/53(−5)
Personal income less transfer payments in 1972 dollars	10/82(−1)	7/80(0)	3/75(0)	NSC[1]	12/60(−2)	4/58(0)	4/54(−1)

SOURCE: U.S. Department of Commerce, *Business Conditions Digest* (August 1985), p. 104.

[1]No specific cycle, that is, no specific turning point corresponding to the indicated reference is discernible.

There is considerable variation in the lead-lag time for the component indicators, although the range generally is smallest at cycle troughs. Personal income less transfer payments in 1972 dollars appears to coincide closest with the reference dates. Note, however, this series had neither a peak nor a trough associated with the 1969–70 recession.

Manufacturing and trade sales shows the greatest variation around reference dates. For only four of the 14 turning points did this series coincide. This is the only series that always leads or coincides with the reference dates, however.

Nonagricultural employment has an excellent record except for the 1973–75 recession. This recession was initiated by the OPEC oil shock and was thus unique among postwar recessions. The uncertain response of firms in deciding whether to retain or lay off employees in the face of this recession was no doubt related to the difficulty of interpreting the shock. Other than that period, nonagricultural employment turns near reference dates, although it tends to lag rather than lead.

The index of industrial production has an excellent record around reference dates, especially the trough dates. It is not clear, therefore, why the BEA scores this indicator so low around cycle peaks, but it may be due to subsequent revisions around such dates. In recent years, the specific cycle turning point has been within ± two months.

The coincident composite index should be expected to coincide almost identically with the reference dates, and in recent years it is very close. In earlier cycles, however, the difference was as much as six months. The explanation probably lies in the revision of data because reference dates are seldom changed and are based on data a few months after the

Table 4
One-Month Negative Changes during Expansions

Expansion period	No. of months	Composite coincident index	Nonagricultural employment	Industrial production	Real personal income less transfer payments	Real mfg. & trade sales
2/48–11/48	10	4	5	4	3	3
11/49–7/53	45	13	10	11	10	18
6/54–8/57	39	9	9	9	6	13
5/58–4/60	24	7	4	7	7	7
3/61–12/69	106	10	7	19	10	32
12/70–11/73	36	6	5	5	5	9
4/75–1/80	58	8	4	7	8	16
8/80–7/81	12	2	1	1	2	6
12/82–12/84	25	2	3	4	2	6
Total	355	61	48	67	53	110

Table 5
One-Month Positive Changes during Contractions

Contraction period	No. of months	Composite coincident index	Nonagricultural employment	Industrial production	Real personal income less transfer payments	Real mfg. & trade sales
12/48–10/49	11	2	2	2	4	4
8/53–5/54	10	0	0	2	3	3
9/57–4/58	8	0	0	0	1	0
5/60–2/61	10	0	0	1	5	3
1/70–11/70	11	1	4	1	6	3
12/73–3/75	16	2	11	4	4	4
2/80–7/80	6	0	2	1	1	1
8/81–11/82	16	2	1	2	4	6
Total	88	7	20	13	28	24

fact. The specific cycle turning points are derived from series as they are currently published.

False Signals

Another question of interest is the extent to which a particular series emits false signals. Does an indicator suggest a rise or fall in economic activity that is not confirmed by later information? To determine the extent of this problem, month-to-month changes in the component indicators and the composite were examined. A false signal is defined as a decline in the series during an expansion and an increase during a recession. Tables 4 and 5 summarize these results.

Table 4 indicates that one-month negative changes are common during expansions, even for the composite index. The frequency of these perverse movements ranges from 48 (or 13.5 percent) for payroll employment to 110 (or 31 percent) for manufacturing and trade sales. The frequency of false signals also appears high in table 5, which shows positive movements of the indicators during recessions. The composite index performs better than the individual components during recessions.

Month-to-month variation is expected, necessitating that some longer-term perspective be maintained. As an example of what happens when data are ana-

Table 6
Three-Month Negative Changes during Expansions

Expansion period	No. of months	Composite coincident index	Nonagricultural employment	Industrial production	Real personal income less transfer payments	Real mfg. & trade sales
2/48–11/48	10	0	0	0	0	0
11/49–7/53	45	0	0	4	0	3
6/54–8/57	39	1	2	2	0	1
5/58–4/60	24	2	0	3	1	1
3/61–12/69	106	0	0	0	0	0
12/70–11/73	36	0	0	0	0	2
4/75–1/80	58	2	0	0	0	1
8/80–7/81	12	0	0	0	0	0
12/82–12/84	25	0	0	0	0	0
Total	355	5	2	9	1	8

Table 7
Three-Month Positive Changes during Contractions

Contraction period	No. of months	Composite coincident index	Nonagricultural employment	Industrial production	Real personal income less transfer payments	Real mfg. & trade sales
12/48–10/49	11	0	0	0	0	0
8/53–5/54	10	0	0	0	0	0
9/57–4/58	8	0	0	0	0	0
5/60–2/61	10	0	0	0	0	0
1/70–11/70	11	0	0	0	2	0
12/73–3/75	16	0	9	0	1	0
2/80–7/80	6	0	0	0	0	0
8/81–11/82	16	0	0	0	0	0
Total	88	0	9	0	3	0

lyzed with some perspective, consider tables 6 and 7. These tables are constructed like tables 4 and 5, except that a false signal is defined as three successive months of perverse movement.

As tables 6 and 7 show, the frequency of false signals drops dramatically. On a percentage basis, the frequency is minuscule. During expansions, real personal income less transfer payments emitted only one false signal in the postwar period, followed closely by payroll employment with only two. Because it is a weighted average of all four components, the composite index emitted more false signals than either payroll employment or real personal income less transfer payments.

During recessions, the record is even better. The coincident index has a perfect record, as do two of the components. Payroll employment is perfect except that it kept climbing during the early stages of the unusual 1973–75 recession.

Correlation Between Indicators

Further analysis of the composite index and its components is summarized in the correlation matrix in table 8.[6] The highest component correlation is be-

[6]Shown is the Pearsonian coefficient of correlation, which is simply a measure of the closeness of association between two variables. If there is no association, the coefficient is zero; if the relationship is perfect, it equals 1. Also shown for comparison purposes is the correlation of the quarterly average with real GNP.

Table 8

Correlation Matrix: Coincident Indicators (monthly data, compounded annual rates of change)

Indicator	Employees on nonagricultural payrolls	Index of industrial production	Real personal income less transfer payments	Real manufacturing and trade sales	Composite index of coincident indicators
Employees on nonagricultural payrolls	1.00				
Index of industrial production	.71	1.00			
Real personal income less transfer payments	.58	.58	1.00		
Real manufacturing and trade sales	.38	.47	.35	1.00	
Composite index of coincident indicators	.84	.88	.77	.62	1.00
Real GNP (quarterly)	.70	.81	.83	.72	.84

tween nonagricultural employment and industrial production, and these two series also correlate most highly with the composite index. Clearly, the manufacturing and trade sales series performs least satisfactorily. When quarterly averages of the component indicators are compared with GNP, real personal income less transfer payments correlates most highly, followed closely by industrial production.

SUMMARY

Many economic indicators are potential candidates for inclusion in a list of sensitive measures of the economy's cyclical movements. To simplify the process of selection, the Bureau of Economic Analysis of the U.S. Department of Commerce has condensed the list to four key indicators and, in turn, has constructed a single composite index of coincident indicators. This article describes the composite index and its four component indicators, with special focus on their cyclical performance.

The four components of the coincident index are industrial production, nonagricultural employment, real personal income less transfer payments, and real manufacturing and trade sales. These four were rated highest by the BEA using a scoring system based on seven criteria. On the basis of these criteria, no single indicator dominates the others as a monthly indicator of economic conditions.

For the casual economic analyst, the least satisfactory indicator would be real manufacturing and trade sales because, of the four series, it is the most volatile on a monthly basis. Also, it is slow to be released; the estimate for a particular month is not available until a month and a half later. The release lag for two of the other series is about one week for nonagricultural employment and about 15 days for industrial production. Although the basic data for real personal income less transfer payments are released in about 20 days, the inflation-adjusted series is not released until the end of the month for the preceding month. The composite index is released at the end of the month, but the first estimate for the preceding month is based on only three of the components; because of the reporting lag, real manufacturing and trade sales is excluded from this first estimate.

An examination of the cyclical performance of the coincident index and its components revealed that each series generally conformed well with the NBER business cycle reference dates. This result is not surprising, since turning points in economic activity are among the most important criteria used in the selection of coincident series.

One key question relating to the cyclical reliability of an indicator is the extent to which it emits false signals. An examination of monthly movements of the indicators shows that they do, in fact, give false signals, between 15 percent and 30 percent of the time. All of the indicators perform very well, however, when false signals are defined as three successive months of perverse movement.

Finally, some insights into the comparative performance of the coincident indicators were gleaned from simple correlation analysis. This analysis indicates that nonagricultural employment and industrial production are most closely related on a monthly basis with the composite index. These two component series also receive the greatest weight in the construction of the index. On a quarterly basis, however, real personal income less transfer payments correlates most highly with real GNP. Real manufacturing and trade sales generally performs least satisfactorily.

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APPENDIX
Detailed Discussion of the Component Series of the Coincident Index

Employees on Nonagricultural Payrolls

This series measures the number of persons employed in nonagricultural establishments. Data are obtained from the establishment survey conducted each month by the Bureau of Labor Statistics. The data are primarily from payroll records voluntarily reported each month to state employment security agencies by employers in the 50 states and the District of Columbia. Most of these data relate to the payroll period that includes the 12th of the month; data for federal government employees represent positions occupied on the last day of the month. Included are full-time, part-time, temporary and permanent workers. Workers on paid leave and those who worked part of the pay period are included. Persons on the payroll of more than one establishment are counted each time they are reported. Excluded are persons on nonpay status for the entire period due to layoff, strike or leave without pay; the self-employed and unpaid volunteer and family workers; farm and domestic workers; and noncivilian government employees.

Personal Income Less Transfer Payments in Constant (1972) Dollars

This series measures personal income less transfer payments in constant (1972) dollars. Because transfer payments represent the largest part of personal income not accrued in production and some types of transfer payments tend to be countercyclical, their removal from personal income produces a series with greater cyclical amplitude. The current dollar series is deflated with the implicit price deflator for personal consumption expenditures.

Personal income is the income received by persons from all sources, that is, from participation in production, from transfer payments from government and business and from government interest, which is treated like a transfer payment. Persons consist of individuals, nonprofit institutions, private noninsured welfare funds and private trust funds.

Alternatively, personal income is defined as the sum of wage and salary disbursements, other labor

income, proprietors' income with inventory valuation and capital consumption adjustments, rental income, personal interest income and transfer payments less personal contributions to social insurance.

Transfer payments to persons are income payments, generally in monetary form, for which the recipients do not render current services. They consist of business and government transfer payments. Business transfer payments include liability payments for personal injury, corporate gifts to nonprofit institutions and bad debts incurred by consumers. Government transfer payments include payments under the following programs: federal old age, survivors, disability and hospital insurance; supplemental medical insurance; state unemployment insurance; railroad retirement and unemployment insurance; government retirement; workers' compensation; veterans benefits, including veterans life insurance; food stamps; black lung benefits; supplemental security income; and direct relief. Also included are government payments to nonprofit institutions other than those for work under research and development contracts.

The implicit price deflator for personal consumption expenditures (PCE) is a current weighted index (1972 = 100) derived by dividing current dollar PCE by constant dollar PCE for each period. It is a weighted average of the detailed price indexes used in the deflation of PCE with composition of the constant dollar PCE in each quarter as weights.

Index of Industrial Production

This series measures monthly changes in the physical output of the manufacturing, mining, and gas and electric utility industries. For manufacturing and mining, products at all stages of fabrication are included. The index does not cover production on farms or in the construction, transportation, trade and service industries. It does, however, include production at plants and shipyards owned and operated by the government. The index is constructed using data supplied by government agencies and trade organizations, and uses 1977 as the base year. It is based on 252 series that are combined with value-added weights to create the total index of industrial production.

Manufacturing and Trade Sales in Constant (1972) Dollars

This series measures the monthly volume of sales of manufacturing, merchant wholesalers and retail establishments in constant 1972 dollars. The series is compiled from data collected each month by the Bureau of the Census in the shipments, inventories and orders survey and in the merchant wholesalers and retail trade surveys. They are adjusted to benchmarks from the five-year censuses of manufactures, wholesale trade, and retail trade and to interim annual surveys.

Basic data on manufacturers' sales are the value of their shipments for domestic use or export. Shipments are measured by receipts, billings or the value of products shipped (less discounts, returns and allowances) and generally exclude freight charges and excise taxes.

Deflated sales are computed as follows: manufacturers' sales are deflated by industry levels (standard industrial classification as defined by the Bureau of the Census) primarily using producer price indexes combined with 1977 product-class shipments weights; wholesale sales are deflated by kind of business using appropriate producer price indexes along with 1977 commodity-line sales weights; and retail sales are deflated by kind of business using components of the consumer price index with 1972 census commodity-line sales weights.