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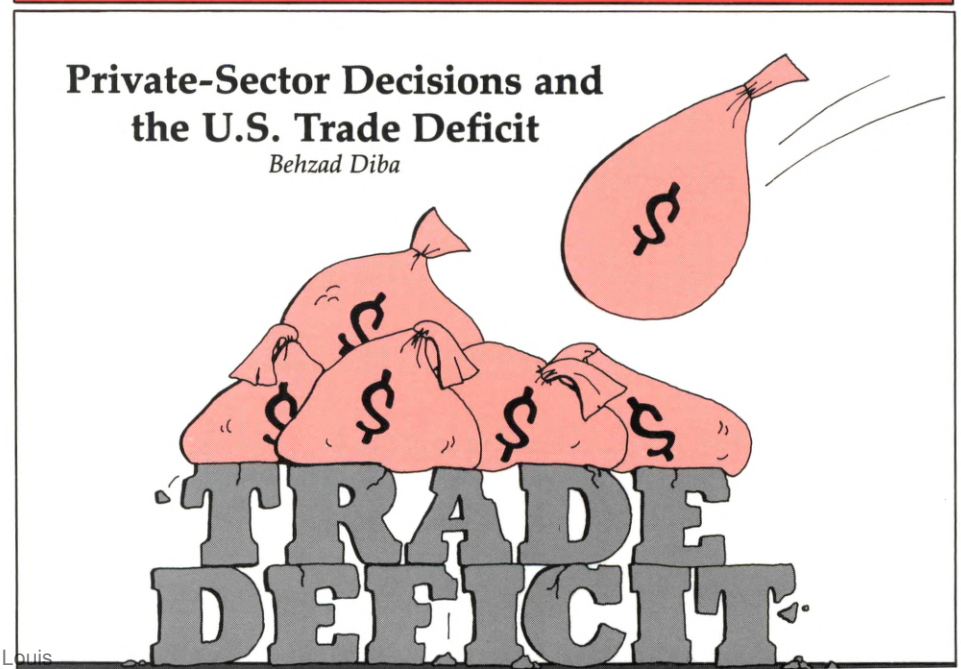

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Can Stock Prices Reliably Predict Recessions?

*Leonard Mills**

The stock market crash of October 19, 1987, has had its impacts on Wall Street—including congressional calls for more regulation of the financial markets, the New York Stock Exchange's proposals for limits on trading, and reduced volume and liquidity in the financial markets. The expected impact on Main Street, however, never seemed to materialize. Immediately following the crash, predictions of recession—or, reminiscent of 1929, depression—were rampant. But overall the economy remained strong in the fourth quarter of 1987 and the first half of 1988, and fears of recession soon dissipated.

The economy's resilience in the wake of the crash has surprised many observers. Some have argued that the time between a decline in stock prices and a recession is so long that we have yet to see the upcoming recession. But others claim to be not surprised, arguing that stock prices have never been a reliable indicator of impending recessions. This view is summarized in the

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often-quoted quip by Paul Samuelson: "The stock market has predicted nine of the last five recessions!"[1]

To be fair, however, no indicator of future economic activity is infallible, and the October crash may be just one of those rare occasions when the stock market made an incorrect prediction. In short, the issue that the crash has resurrected is whether stock prices, by themselves, are a reliable leading indicator of recessions. Theory alone cannot provide the answer; it is an empirical issue. But analysts looking at the same set of numbers do not always reach the same conclusions. So we should first try to quantify objectively the stock market's performance as a leading indicator. One statistical technique, recently developed by Salih Neftci and one that has been applied to other economic indicators, can provide a helpful perspective when applied to stock prices. The results of the Neftci technique suggest that though stock prices alone offer some indication of the economy's future, broader indicators, such as the Index of Leading Indicators, are more reliable.

DECLINING STOCK PRICES COULD SIGNAL RECESSIONS

There are sound economic reasons for thinking that a fall in stock prices would be a good leading indicator of recessions. One reason is that declining stock prices may have direct effects on consumer spending because falling stock prices lower the financial wealth of stockholders. This decline in wealth may induce them to decrease their spending on goods and services. Consumers who do not own stock also could be affected by falling stock prices because they may lose confidence in the economy and feel their own income prospects are dimmer. Hence, they may become more cautious in their current spending. For businesses, lower stock prices raise the cost of acquiring equity funds to purchase new plant and equipment, so investment spending could be reduced when stock prices fall. And as investment and consumer spending decrease because of declining stock prices, the economy could grow at a slower rate and perhaps slip into a recession.

The 1987 stock crash, however, seemed to have only modest effects on consumer spending and investment. After slowing in the fourth quarter of 1987, consumption and business investment came back in the first half of 1988. In a recent study, Alan Garner concludes that "this relatively small effect is consistent with empirical studies showing that the stock market has only a modest impact on consumer spending."[2] Likewise, in an earlier study, Douglas Pearce finds that most empirical studies have concluded that decreases in stock prices lead to decreases in investment, but that the size of the effect is uncertain.[3]

Even if the direct impact of stock price declines is small, stock prices may still be a good leading indicator. The conventional view is that stock prices reflect firms' expected future earnings. According to this view, a general decline in stock prices means that market participants have lowered their expectations of firms' future earnings, presumably because they foresee a downturn in the economy. If the expected downturn actually occurs, the decline in stock prices will have preceded it. So to the extent that an economic downturn, whatever its cause, can be foreseen, its onset should be forewarned by the stock market.

An alternative view is that stock prices sometimes fluctuate for reasons unrelated to the economic fundamentals. In particular, the stock market may be subject to speculative bubbles. In a bubble, speculators bid up the current prices

[1]Paul A. Samuelson, "Science and Stocks," *Newsweek*, September 19, 1966.

[2]C. Alan Garner, "Has the Stock Market Crash Reduced Consumer Spending?" Federal Reserve Bank of Kansas City *Economic Review* (April 1988) pp. 3-16.

[3]Douglas K. Pearce, "Stock Prices and the Economy," Federal Reserve Bank of Kansas City *Economic Review* (November 1983) pp. 7-22.

of stocks simply because they expect to sell the stocks at still higher prices in the future, even though expectations of future earnings remain unchanged. For a while, the expectations of higher prices are self-fulfilling. A second group of buyers is willing to pay more than the first because it expects to get even higher prices from a third group, and so on. But at some point in time, people lose faith that prices will go any higher—an expectation that is likewise self-fulfilling. The bubble then bursts and stock prices come tumbling down. In this circumstance, a decline in stock prices is *not* the result of lowered expectations of future earnings. Some analysts have argued that the October crash, which followed a steep run-up in stock prices earlier in 1987, was just such an episode and that the crash did not mean that market participants had foreseen an economic downturn.[4]

Casual observation of stock prices over the postwar period reveals that they do seem to be a leading indicator of recessions, though an imperfect one. Since 1947 the S&P 500-stock index, shown in Figure 1 (p. 6), has often declined just before the onset of recessionary periods (depicted by the vertical bars). The recessions of 1959 and 1973 are examples. But stock prices do not seem to be completely reliable as a leading indicator. Sometimes, as in 1962, a bear market cried wolf: stock prices fell dramatically, but no recession followed. Ideally, a leading indicator would not generate these false signals. Other times, as in 1980, a recession started without a decline in stock prices: that is, the stock market gave no advance warning. An ideal leading indicator would anticipate all recessions.

In practice, there is no leading indicator that meets the ideal standard of emitting no false signals and anticipating every recession. And a precise answer to how many errors are acceptable for an indicator depends on the costs of these errors. Nevertheless, the number of false signals and the number of unanticipated recessions are useful quantitative measures in assessing a leading indicator's reliability.

THE NEFTCI RULE HELPS EXTRACT THE SIGNALS

Evaluating an indicator's success or failure as a predictor requires some method of determining when the indicator is signaling recession. One method is the x-month rule. If the indicator decreases for x consecutive months, then it is said to be predicting that a recession is imminent. This kind of rule has been applied primarily to the Index of Leading Indicators by analysts who say that three consecutive monthly declines in this index presage a recession. Another method is the x-percent rule. In this rule, if the indicator declines by x percent, then it is said to be signaling a recession. This kind of rule has often been applied to stock prices by analysts who say that a 10 percent decline in stock prices, for example, signals a recession.[5] But any x-month or x-percent rule is somewhat arbitrary and may not take full advantage of the information provided by the indicator. An alternative approach for extracting a turning-point signal is to apply a more sophisticated statistical rule called Neftci's optimal prediction rule.

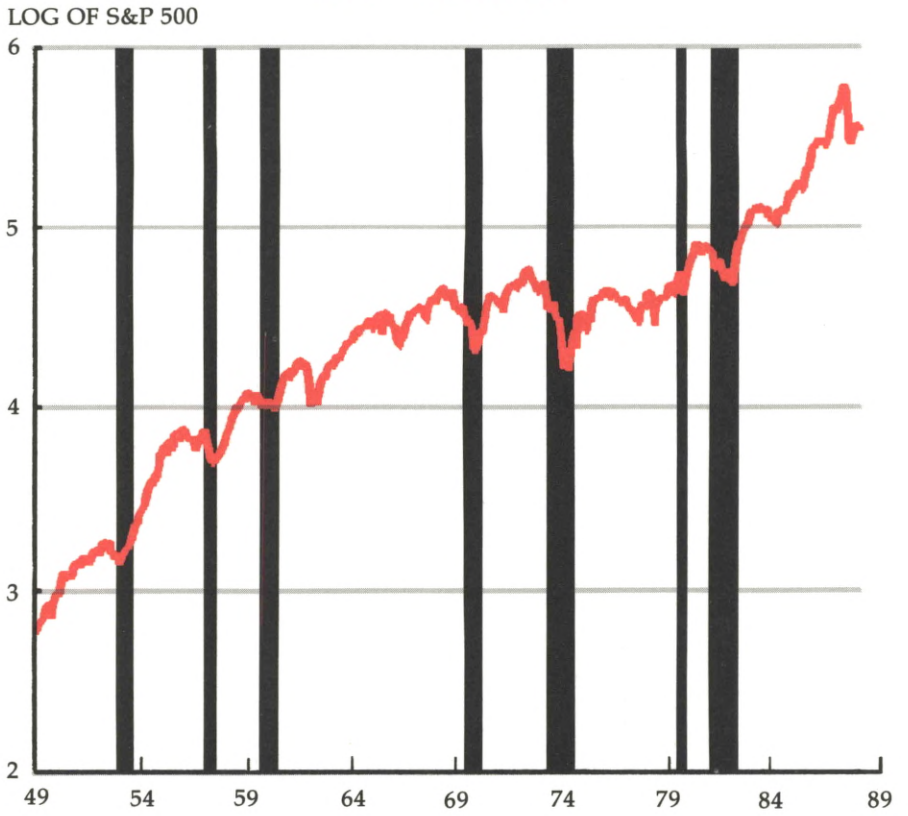
How the Neftci Rule Works. The Neftci rule starts with the same assumption underlying the more popular rules: that a substantial downturn in an indicator presages an upcoming recession. After each new reading of the indicator, an

[4]For a discussion of experimental evidence suggesting that bubbles are possible, see Herbert Taylor, "Experimental Economics: Putting Markets Under the Microscope," this *Business Review* (March/April 1988) pp. 15-25, and the references therein. However, evidence that the run-up in stock prices in 1986-87 was not the result of a speculative bubble is presented in Gary Santoni, "The Great Bull Markets 1924-29 and 1982-87: Speculative Bubbles or Economic Fundamentals?" Federal Reserve Bank of St. Louis *Review* (November 1987) pp. 16-30.

[5]For applications of the x-percent rule to stock prices as a leading indicator, see Bryon Higgins, "Is a Recession Inevitable This Year?" Federal Reserve Bank of Kansas City *Economic Review* (January 1988) pp. 3-16, and Alfred Malabre, "As Economy Goes, So Goes Stock Market," *Wall Street Journal*, February 9, 1987.

FIGURE 1

The S&P 500-Stock Index and Recessions 1949 — Present



analyst using the Neftci rule would assess the probability that the indicator has gone into a "down" phase. When this probability climbs above a critical value prespecified by the analyst, the indicator is interpreted to be signaling a coming recession. Taking stock prices as an example, each month the Neftci procedure will calculate a probability that the stock market has entered a "bear" market. If that probability is higher than the critical value, the analyst will interpret this to mean that the stock market is calling for a recession.

The critical probability value that must be reached before a recession is signaled also determines the probability of false signals that the analyst is willing to accept. For instance, suppose an analyst—call her Denice D'spair—sets her critical probability at 75 percent. When the probability that the indicator has entered a down phase increases to .75 or higher, Denice warns that a recession is imminent. At this critical probability value, Denice is willing to accept the 25 percent probability that the indicator has not entered a down phase and hence that the prediction of recession is wrong.

In general, choosing the critical value involves a trade-off between the number of false signals and the number of unanticipated recessions that

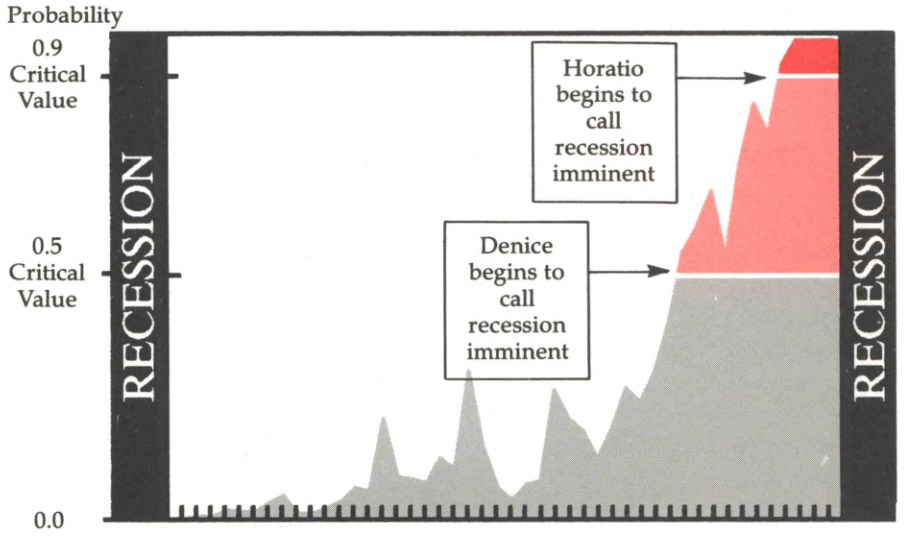
arise. The higher the critical value, the smaller the number of false signals but the larger the number of unanticipated recessions. The appropriate critical value depends on the relative costs of these errors to the analyst. As an example, suppose Denice's boss tells her that an unanticipated recession is very costly to the firm because it would leave the company with large inventories of unsold goods. Denice might then decide to lower her critical value to, say, .50. So when the probability that a downturn in stock prices has occurred is .50 or higher, Denice warns that a recession is coming. That is, Denice will predict a recession every time a recession is at least a 50-50 proposition. Thus, while it is unlikely that Denice's company will be caught by a surprise recession, there is also a good chance that a false signal of recession will be given.

For contrast, consider an analyst with a different company—call him Horatio Hope. Horatio's company is more concerned with preserving its market share and does not want to lose any customers because of orders going unfilled. False signals of recession are more costly to Horatio's employer than are unanticipated recessions. Consequently, he chooses a high critical value, say .90. Horatio calls for a recession only when the Neftci probability value climbs above .90, implying only a 10 percent chance that a signal is false. (See Figure 2.)

To estimate the actual probability of a downturn, the analyst uses each new reading of the indicator to update the probability of recession by applying Neftci's rule. (See Appendix for a technical description of calculating the probability of recession.) For example, suppose times have been good so that Denice begins with a recession probability of 10 percent. Then she observes a large fall in stock prices, say a 7 percent monthly decline. Using this new information, Denice would then recompute the probability of recession, which would show an increase to perhaps 30 percent. This new figure then serves as her probability of a downturn

FIGURE 2

Effects of the Critical Value on the Forecaster's Decision to Call for a Recession



until her next observation of the indicator. So suppose in the next month Denice observes a 15 percent increase in stock prices. Using the Neftci rule to combine the previous estimate of a 30 percent probability of a downturn with this new observation would produce a lower probability of recession, say 12 percent. Thus, as new information on stock prices becomes available, Denise's assessment of the probability of recession is revised based on both current and past movements in stock prices.

The updating aspect of the Neftci procedure takes the advantages of the x-month and x-percent rules and improves upon them. Like the x-month rule, the Neftci rule includes information from previous movements in stock prices. Like the x-percent rule, the Neftci rule also uses the information revealed by the magnitude of the change in stock prices. That is, a large decline in stock prices will raise the probability of recession more than a small decline will. But the x-month and x-percent rules allow only the crude statements that a recession is either likely or unlikely. There will always be some uncertainty in any economic forecast, but the popular rules do not quantify the degree of uncertainty. The Neftci rule improves on the popular rules because it produces probability statements, such as "the recent decline in the stock market implies that the probability of a coming recession is 67 percent," thus indicating the analyst's degree of uncertainty.

Using the Neftci Rule to Count Errors. Any leading indicator can be evaluated by comparing its signals of recession with the dates of actual recessions. To define what he means by a correct signal, however, the analyst must define an acceptable lead time. The lead time is the number of months between the time the indicator flashes the signal and the onset of the recession. For our purposes a lead time of 12 months or less may be considered acceptable. The shortest expansion in the postwar period lasted 12 months. Since we will compute the probability of a recession only while we are in an expansion, 12 months is the longest lead time possible for all of the expansions.[6]

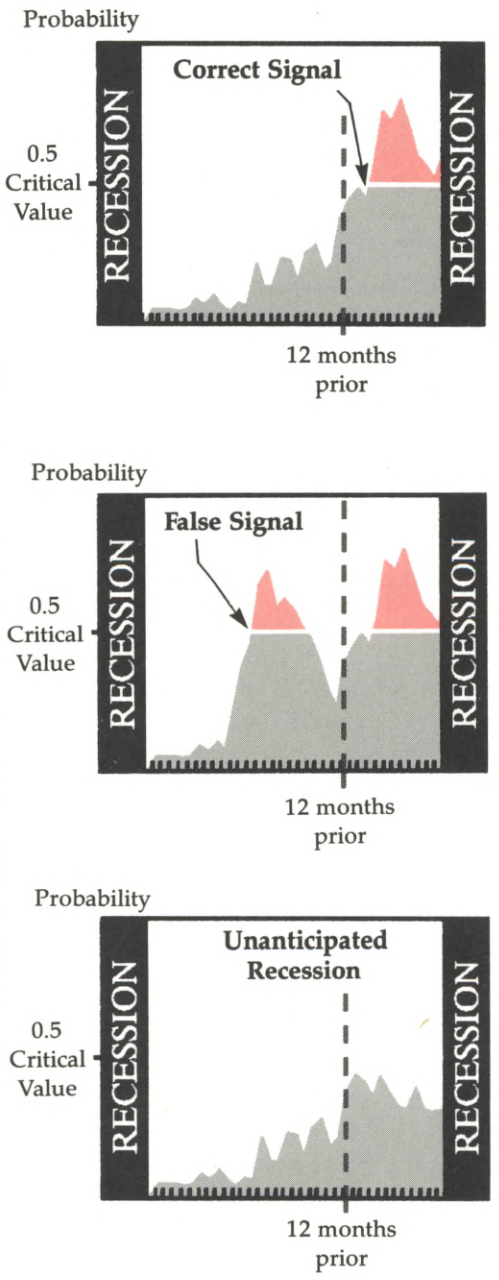
With the prespecified critical probability and a lead time that is considered acceptable, we can label every signal of recession as either correct or false and every recession as either anticipated or unanticipated. If the indicator gave a probability of recession above the critical value sometime within the 12 months prior to the recession, then the indicator correctly anticipated the recession. The top panel in Figure 3 gives an example of a correct signal. In contrast, if the indicator switched on, and then off, more than 12 months prior to the recession, then it gave a false alarm, as shown in the middle panel. Finally, if the signal was never on within the 12 months prior to the recession, then the indicator failed to anticipate the recession. The bottom panel of Figure 3 illustrates this type of error.

HOW RELIABLE ARE SIGNALS FROM STOCK PRICES?

The Historical Record. Applying the Neftci rule to the monthly growth rate in the S&P 500-stock index during the 1947-82 period produced the probabilities of recession shown in Figure 4 (p. 10). Clearly, stock prices contain some information about the economy's future direction; the probability of recession climbed before each of the seven recessions that occurred between 1949 and 1982 (represented by the vertical bars). Before five of the seven recessions, the probabilities based on the stock market rose above the 50 percent critical value within 12 months of the economic downturn. These five successful predictions of recession all occurred before 1975. The lead times of the five correct predictions ranged from one to 11 months. Although all of the recessions were anticipated during this period, stock prices did emit some false signals. Using the 50 percent critical value resulted in four false signals before the December 1969 peak and one false signal before

[6]A lead time of zero months—or no lead time—is considered to be a useful signal because it usually takes several months to recognize that a recession has in fact occurred.

FIGURE 3
Types of Signals



the November 1973 peak.[7] Thus, of the 10 recession signals given before 1975, five were false and five were correct.

Unfortunately, the two recessions in the 1980s were cases in which the stock market failed to provide a useful signal. Before the recession that began in January 1980, the stock market sent a signal that was considerably earlier than our 12-month lead time. The probability of a downturn climbed above 50 percent in April 1977 and stayed there for the remaining 33 months of the expansion. This type of signal is considered correct, even though its lead time is greater than 12 months, because the probability never fell below the 50 percent critical value prior to the recession. But the severe prematurity of this signal, relative to the lead times of the previous correct signals, means that stock prices had little value in predicting the timing of the 1980 recession. Before the recession that began in July 1981, the stock market did not send any signal at all; stock prices failed to push the probability of recession above the 50 percent level. In short, using the .50 critical value for extracting recession signals from the stock market worked reasonably well through the 1970s, but the stock market's performance as an indicator seems to have deteriorated in the 1980s.

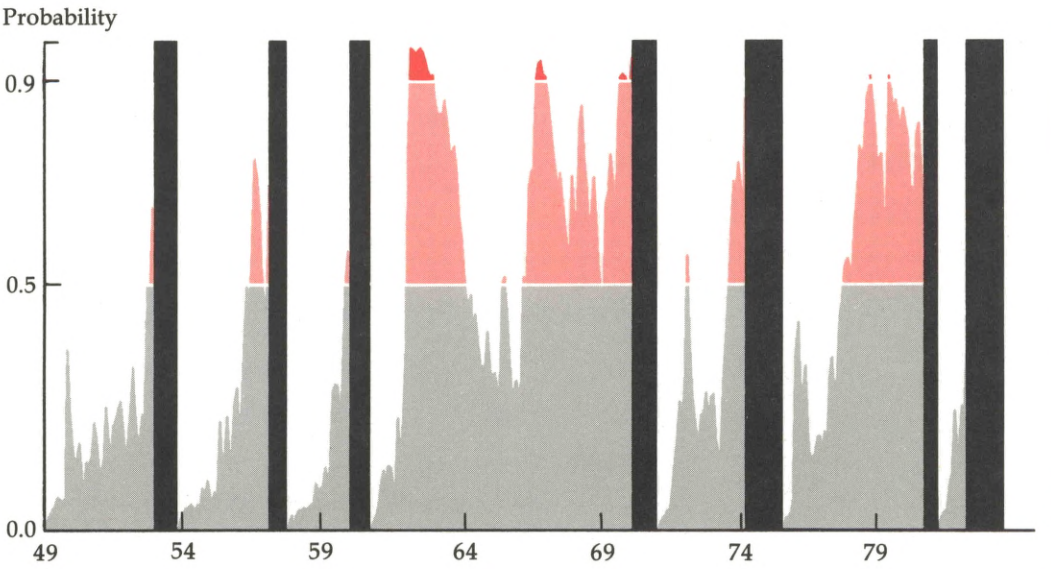
In Figure 4, raising the critical value for recession signals to .90 reduces the number of false signals slightly, from five to four over the entire postwar period. But the number of unanticipated recessions increases dramatically, from one to six. Apparently, we cannot presume that a high probability of a stock market downturn is associated with a high probability of recession. We should certainly be suspicious, then, of claims that stock prices have always been a reliable leading indicator.

The Crash of 1987. The stock market crash of

[7]In fairness to stock prices, some of these false signals were associated with pronounced economic slowdowns that were not quite severe enough to be labeled recessions; an example is 1966-67.

FIGURE 4

Probabilities of Recession — S&P 500
1949 — 1982



1987 can now be interpreted with the benefit of this historical perspective. Figure 5 shows the probabilities of recession given by stock prices since the beginning of the current expansion in December 1982. Stock prices generated false signals early in this expansion: at the .50 critical value, they flashed a recession warning between February and December of 1984. Thereafter, generally rising stock prices reduced the probability of recession to very low levels. The low point was achieved at the stock market peak, in August 1987, when the probability of recession was only about 5 percent. After climbing to 14 percent in September, the probability of recession shot up to 88 percent after the crash in October. Thus, the probability of recession as determined by stock prices was certainly increased by the crash. Since stock prices subsequently fell further and have yet to fully recover, the current probability of recession is even higher, 98 percent as of May 1988. But as we have seen, probabilities of a downturn exceeding 90 percent have turned out, more often than not, to be false signals of recessions. Thus, while it may be too early to tell whether stock prices will accurately predict the next recession, it would not be too surprising if even this strong signal turned out to be false.[8]

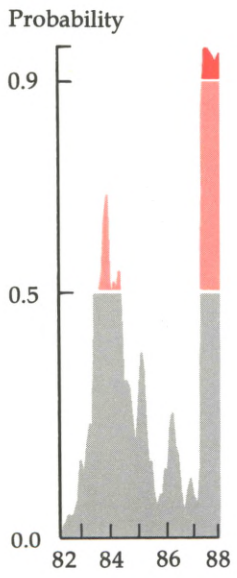
A BROADER INDICATOR SENDS A CLEARER SIGNAL

Because stock prices may move for reasons

[8]In a recent article, Joe Peek and Eric S. Rosengren, "The Stock Market and Economic Activity," Federal Reserve Bank of Boston *New England Economic Review* (May/June 1988) pp. 39-50, suggest that real stock prices are more reliable than nominal prices in predicting economic slowdowns. Applying the Neftci rule to real stock prices (measured as the S&P 500 divided by the CPI), however, did not improve the stock market's recession predictions.

FIGURE 5

Probabilities of Recession S&P 500 1983 — Present



unrelated to the economic fundamentals, the information that these prices provide may be noisy. Our statistical analysis certainly indicates this. But many other economic statistics are subject to the same criticism. For example, measures of the money stock may exhibit this noise problem as well. Dramatic changes in the public's demand for money, such as those that occurred during the period of deposit deregulation in the early 1980s, can distort the signal the money supply provides about the economy's future direction.[9]

Because any single economic statistic is subject to idiosyncratic movements that may not have broad economic implications, analysts usually look at several variables that convey information about the economy. It is in this spirit that the Index of Leading Indicators (ILI), computed by the Department of Commerce, was designed. This index is an average of many variables that seem to lead the business cycle, and it includes stock prices.[10] The hope is that this index averages out the disturbances specific to each statistic and retains the information that each statistic provides about the overall economy.

Does a broad-based approach, as summarized by the Index of Leading Indicators, perform any better by the Neftci standard? The answer seems to be yes. Figure 6 (p. 12) is comparable to Figure 4, except that the ILI replaces the S&P 500 in computing the probabilities of recession. The results are encouraging. Just by comparing Figures 4 and 6, we see that the peaks in the probabilities provided by the ILI are sharper than those provided by stock prices.[11] A closer look at the results reveals that a clearer signal is provided by such an index that combines several indicators. With a .50 critical probability, the ILI anticipated all seven of the postwar recessions and sent only four false signals. Choosing the higher .90 critical value reduced the number of false signals to two, but at the cost of two unanticipated recessions. Finally, the range of lead times seems narrow enough for the ILI to provide a useful signal; lead times ranged from two to 15 months with the .50 critical value and from zero to eight months with the .90 cutoff.

"Sure," someone might say, "but what has this

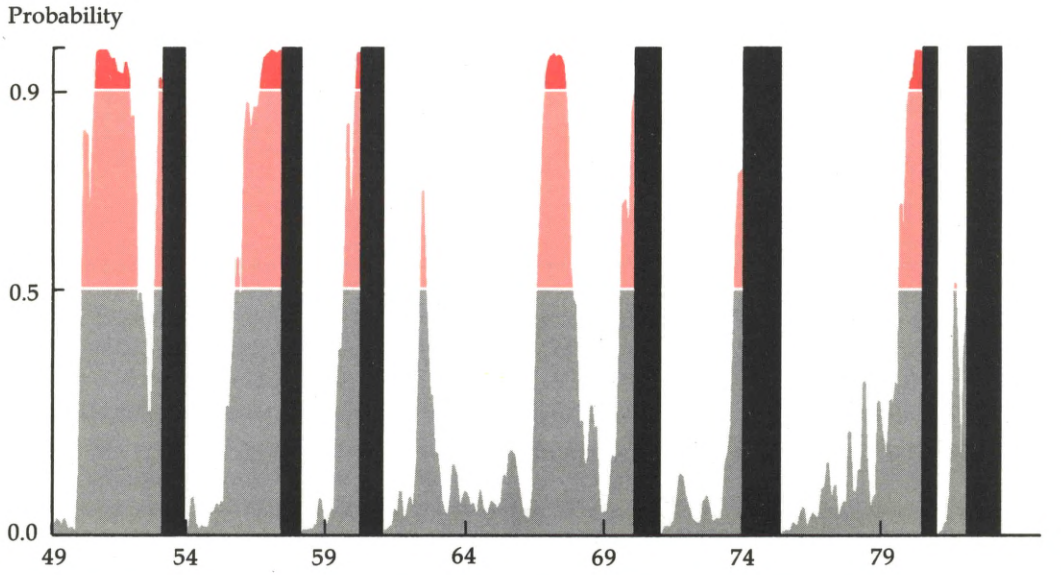
[9]See Herbert Taylor, "What Has Happened to M1?" this *Business Review* (September/October 1986) pp. 3-14, for a discussion of the deterioration of the relation between M1 and future GNP movements.

[10]Gary Gorton, "Forecasting With the Index of Leading Indicators," this *Business Review* (November/December 1982) pp. 15-27, describes the Index of Leading Indicators in more detail and discusses its usefulness.

[11]Stock prices are clearly a superior leading indicator with respect to timeliness. In particular, stock prices are observed instantaneously and are not subject to revision. The Index of Leading Indicators, like several other indicators, is observed with a one-month lag and is subject to several revisions.

FIGURE 6

Probabilities of Recession Leading Indicators 1949 — 1982



index done for me lately?" Figure 7 shows the probabilities of recession generated by the ILI since December 1982. Like stock prices, the ILI generated some false recession signals early on in the current expansion. But the important difference between the ILI and stock prices is in the recent behavior of both. While the likelihood of a recession is almost certain if we use stock prices as a leading indicator, the likelihood is much smaller using the ILI. Although the probability of a recession based on the ILI increased after October 1987, it remained below even the .50 critical value. The probability based on the ILI peaked at 45 percent in January 1988 and has since fallen to 31 percent in May.[12] In contrast, the probability based on stock prices soared above the .90 critical value and has remained there. Given the relative performance of these two indicators in the past, the prediction from the Index of Leading Indicators seems more reliable.

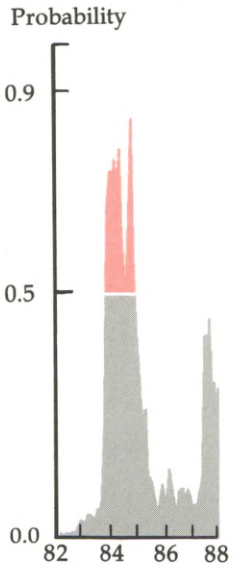
CONCLUSION

While economists are always looking for clues about the economy's future course, no indicator has proven infallible in its predictions. Sometimes an indicator will fail to signal an upcoming recession. Sometimes it will send false signals. Stock prices have proven to be a particularly unreliable leading indicator in recent years, and the stock market crash of 1987 may prove a telling example. Movements in stock prices do seem to offer some information about the economy's future. But our analysis suggests that a combination of various indicators, such as the Index of Leading Indicators, provides more reliable signals of future economic activity.

[12]Based on preliminary data released June 29, 1988.

FIGURE 7

Probabilities of Recession Leading Indicators 1983 — Present



APPENDIX

Estimating the Probability of Recession

The Neftci approach to estimating the probability of recession from observing a selected indicator, such as a stock price index, builds on two assumptions. The first is that the indicator is always operating under one of two regimes: an upturn regime, during which we are more likely to see increases in the indicator, or a downturn regime, during which we are more likely to see the indicator decline. The second assumption is that the probability of the indicator being in its downturn regime is related to the probability of the economy as a whole going into a recession.

The analyst begins computing the probability of an upcoming recession in the first month of the expansion. At that point the initial probability of a downturn in the indicator (and the economy) is equal to zero. Then, each month, as the analyst gets a new reading on the indicator, he revises his probability that the indicator (and hence the economy) is in its downturn regime by applying the Neftci rule:

$$\Pi_t = \{[\Pi_{t-1} + P(1-\Pi_{t-1})]p_t^d\}/\{[\Pi_{t-1} + P(1-\Pi_{t-1})]p_t^d + (1-\Pi_{t-1})p_t^u(1-P)\}$$

where Π_t = the conditional probability that the indicator is in the downturn regime;

p_t^u, p_t^d = the probability that the observed movement in the indicator came from the upturn regime and downturn regime, respectively;

P = the unconditional probability that a switch from an upturn regime to a downturn regime will occur in the current period.

This rule produces the best estimate of the probability that the indicator has entered its downturn regime. Salih Neftci shows that using this rule minimizes the average delay in signaling a downturn for a given critical value.[a] We use a procedure that is similar to that used by Francis Diebold and Glenn Rudebusch in implementing the Neftci rule.[b]

p_t^u and p_t^d are the probability densities for the event that an observed change in the indicator variable was drawn from the upturn regime and downturn regime, respectively. Estimation of these densities requires some judgment on the dating of the downturn and upturn regimes for the indicator variable. Because the expansions have lasted about four times as long as recessions, we define a downturn regime as one year (the shortest expansion in the sample) prior to the business cycle peak through three months prior to the business cycle trough. This dating captures the major movements in both the S&P 500 and the Index of Leading Indicators. Alternative dates for the regimes using shorter lead times did not alter the results. The probability densities, p_t^u and p_t^d, were assumed to be normally distributed using the mean and standard deviation of the monthly growth rates estimated for each regime. These parameters were estimated from the 1948-82 period. Thus, the Neftci probabilities for the period 1949-82 are analogous to within-sample predictions, and the probabilities for the period 1983-88 are analogous to out-of-sample predictions.

P is the unconditional transition probability, that is, the probability that a switch from a downturn regime to an upturn regime will occur in the current period given that it has not yet occurred. P is an unconditional probability because it is not based on the movement of the indicator variable. In Neftci's original application, this transition probability was determined by the length of the expansion because of an assumption that expansions "age" and become weaker. This assumption has recently been questioned and was not used in this application so that we might focus more sharply on the proposed indicators.[c] Instead, a constant transition probability of switching from the upturn to the downturn regime was used. This probability was estimated to be .029 by following the procedure outlined in J. Huston McCulloch.[d] Further, the hypothesis that this probability is a constant could not be rejected at usual significance levels.

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[a]For derivations of the Neftci rule, see Salih Neftci, "Optimal Prediction of Cyclical Downturns," *Journal of Economic Dynamics and Control* 4 (1982) pp. 225-41, and Francis X. Diebold and Glenn D. Rudebusch, "Scoring the Leading Indicators," Federal Reserve Board *Special Studies Paper No. 206* (1987). Carl J. Palash and Lawrence J. Radecki, "Using Monetary and Financial Variables to Predict Cyclical Downturns," Federal Reserve Bank of New York *Quarterly Review* (Summer 1985) pp. 36-45, use the Neftci rule to evaluate the leading indicator properties of other financial variables.

[b]Francis X. Diebold and Glenn D. Rudebusch, "Scoring the Leading Indicators."

[c]Studies that find that business expansions do not become weaker with age include J. Huston McCulloch, "The Monte Carlo Cycle of Business Activity," *Economic Inquiry* 13 (September 1975) pp. 303-21, Francis X. Diebold and Glenn D. Rudebusch, "Does the Business Cycle Have Duration Memory," Federal Reserve Board *Special Studies Paper No. 223* (1987), and Victor Zarnowitz, "The Regularity of Business Cycles," National Bureau of Economic Research *Working Paper No. 2381* (1987). This issue has not been settled, however; see Frank de Leeuw, "Do Expansions Have Memory?" Bureau of Economic Analysis *Discussion Paper 16* (1987).

[d]J. Huston McCulloch, "The Monte Carlo Cycle of Business Activity."

Private-Sector Decisions and the U.S. Trade Deficit

*Behzad Diba**

Many analysts have argued that the United States needs to correct its trade imbalance, but much of the commentary is rather vague in stating why. The conventional argument against trade deficits—that they create prosperity abroad at the expense of domestic industries and workers—does not seem relevant to the current U.S. experience. Although many U.S. manufacturing firms were hurt by the trade deficit's growth from 1982 through 1985, overall profits and capacity utilization at U.S. firms increased. And during 1986 and 1987, as the trade deficit continued to widen, even the manufacturing sector grew strongly. Moreover, the unemployment rate has been declining since 1982, despite the trade deficit, and most economists think it is about as low as it can go without risking a serious acceleration in inflation.

One reason the trade deficit might be harmful is that it may reduce the welfare of future U.S.

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generations. To pay for the excess of U.S. imports over U.S. exports, the current generation of Americans must either sell assets to foreigners or borrow from them. In the 1983-87 period, Americans increased their net indebtedness to the rest of the world by more than $500 billion, to pay for persistent and unprecedentedly large trade deficits. And since 1985, the total value of foreigners' claims on the U.S. economy has surpassed the total value of foreign assets held by Americans, for the first time in over half a century.

Some observers consider the recent increase in net U.S. indebtedness alarming because of the burden it will impose on future generations, who will have to consume less than they produce in order to service or to repay the current generation's foreign debt. But even with this debt, those future generations may nonetheless be able to consume more goods and have a higher standard of living than we do today, as long as we have used the borrowing opportunity to finance expanded productive investment.

The U.S. trade deficit is the outcome of many private- and public-sector decisions, in the United States as well as abroad. In particular, changes in private savings behavior in the U.S. have played a major role during the past few years. To evaluate the trade deficit's effects on the welfare of current and future generations, we must first understand the underlying decisions that have contributed to its emergence and persistence. But before turning to this question, we need to review some basic concepts from the national income accounts.[1]

PERSPECTIVES ON THE TRADE DEFICIT

There are several measures of a country's balance of international payments. One standard measure is the trade deficit, which is the difference between imports and exports of goods and services. We can view the trade deficit as the difference between the quantity of goods and services that a country uses up in a year and the quantity it produces—or, more technically, the difference between "gross domestic purchases" and "gross national product."

In the national income accounts, total U.S. purchases of goods and services are broken down into three categories:

1. personal consumption expenditures, which consist of household spending on goods and services;
2. gross private domestic investment, which is defined as business spending on plant, equipment, and inventories plus spending on new residential construction; and
3. government purchases of goods and services, which include the purchases of federal, state, and local governments.

The sum of these three categories of spending—which represents the *total purchases* of American households, businesses, and governments—is called gross domestic purchases. Gross national product (GNP), in contrast, is a measure of the *total production* of goods and services by American residents. Whenever gross domestic purchases exceed GNP—that is, whenever American households, businesses, and governments are collectively purchasing more goods and services than the nation is producing—the United States becomes a net importer of goods and services from other countries. In other words, the U.S. trade deficit is simply the difference between gross domestic purchases and GNP:

Trade Deficit = Gross Domestic Purchases - Gross National Product

Thinking of the trade deficit as the difference between domestic purchases and domestic output provides us with an important insight: any policy that aims to reduce the trade deficit must either accelerate the growth of domestic output or slow the growth of domestic purchases (or both). With the U.S. economy close to full em-

[1]The national income accounts are government statistics measuring the economy's output, income, and expenditures, which are broken down into various categories. They are published by the U.S. Department of Commerce in the *Survey of Current Business*.

ployment in 1988, any attempt to accelerate the growth of U.S. output would probably run into capacity constraints and cause inflationary pressures. Accordingly, a noninflationary policy aimed at reducing the trade deficit would have to involve slower growth of personal consumption, domestic investment, or government purchases.

Another measure of the imbalance in international payments is "net foreign investment in the U.S."[2] To the trade deficit, it adds the deficit resulting from unilateral transfers, which reflects items such as U.S. government grants and private gifts to foreigners. When U.S. imports exceed U.S. exports, foreign countries can use the proceeds from their trade surplus with the United States either to reduce their indebtedness to Americans or to acquire U.S. assets (such as bonds issued by U.S. companies or government agencies, or stocks of U.S. corporations). Similarly, unilateral transfers from the United States enable foreigners to reduce their indebtedness to Americans or to acquire U.S. assets.

Thus, the sum of the U.S. trade deficit and the U.S. deficit on unilateral transfers is matched by an increase in foreign claims on the United States or a decrease in U.S. claims on other countries—that is, by net foreign investment in the U.S. A positive value of net foreign investment in the U.S. would indicate that Americans sold assets to foreigners or increased their indebtedness to foreigners. According to the Commerce Department's estimate, net foreign investment in the U.S. totaled $156.9 billion in 1987.[3]

The "Saving-Investment" Identity. In the national income accounts, there is a relationship among net foreign investment in the U.S., private savings, domestic investment, and the government budget deficit. Most macroeconomics textbooks present the derivation of this relationship, referred to as the "saving-investment" identity.[4] The idea behind the identity is easy to understand even without looking at the derivation. When the need for funds to finance domestic business investment and the U.S. budget deficit exceeds the flow of private savings from American households and businesses, then Americans must borrow from foreigners or sell existing assets to foreigners in order to raise part of the needed funds. Borrowing from or selling assets to foreigners constitute foreign investment in the U.S. Accordingly, net foreign investment in the U.S. is always equal to the government budget deficit (for all levels of government, combined) plus domestic investment minus private savings:

Net Foreign Investment in the U.S. =
Government Budget Deficit +
Private Domestic Investment -
Private Savings

We can think of the government budget deficit as the public-sector counterpart of net foreign investment in the U.S. and of the gap between private domestic investment and private savings as its private-sector counterpart.

The saving-investment identity provides a framework for analyzing the links between the trade deficit and the relevant private- or public-sector decisions. If Americans increase domestic investment but do not save more to finance the additional investment, then net foreign investment in the U.S. must rise. An example of domestic investment being financed by foreign

[2]The concept of "net foreign investment in the U.S." (by foreigners) used here coincides with "net foreign investment" (by Americans in other countries) as reported in the U.S. national income accounts, but with the signs reversed. In the balance of payments accounts, the conceptual counterpart of "net foreign investment in the U.S." is the "U.S. current account deficit."

[3]This figure is obtained by dropping the minus sign in front of the "net foreign investment" figure reported in the *Survey of Current Business* (May 1988) p. 11. See Footnote 2 above. All numbers cited are from the May 1988 issue.

[4]See, for example, Robert E. Hall and John B. Taylor, *Macroeconomics* (New York: W.W. Norton & Company, 1986) pp. 34-38.

investment in the U.S. would be the building of a new auto plant that is financed by selling bonds to foreigners. Similarly, if private savings fall or if the government budget deficit increases while domestic investment remains unchanged, the identity implies that net foreign investment in the U.S. must rise. An example of a decline in savings matched by a rise in net foreign investment in the U.S. would occur if households paid for increased spending by liquidating foreign assets.

Net foreign investment in the U.S. rose steadily from about -0.5% of GNP in 1980 to about 3.5% of GNP in 1987 (Figure 1). The rise was notable in historical perspective. Between 1950 and 1979 there were only six years in which net foreign investment in the U.S. was positive, and even in those years its magnitude never rose above 0.7% of GNP. From 1981 to 1983 the rise in net foreign investment in the U.S. reflected a sharp increase in the government budget deficit, which increased from 1% of GNP in 1981 to about 3.8% of GNP in 1983.

But budget deficits did not by themselves account for the steady rise in net foreign investment in the U.S.; the steady rise also reflected the fact that the difference between domestic investment and private savings rose steadily from -3.5% of GNP in 1982 (indicating that private savings exceeded private investment) to 1% of GNP in 1987.

WHY DID NET FOREIGN INVESTMENT IN THE U.S. RISE?

The saving-investment identity tells us that net foreign investment in the U.S. must always

FIGURE 1

Net Foreign Investment in the U.S. and Its Counterparts as a Percentage of GNP

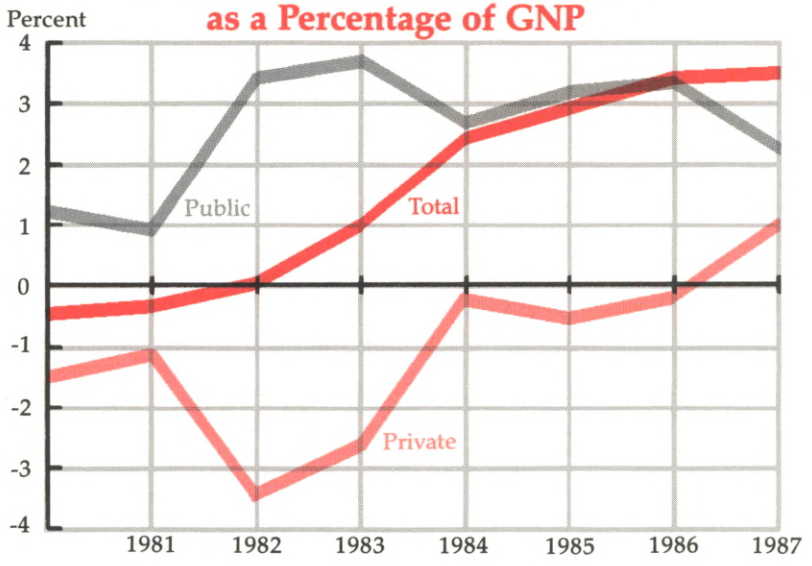


Figure 1 shows net foreign investment in the U.S. and its private- and public-sector counterparts as percentages of GNP. The private-sector counterpart is the difference between gross private domestic investment and gross private savings; the public-sector counterpart is the total government budget deficit (on a national income accounting basis).

equal the sum of its public- and private-sector counterparts. But it tells us nothing about the economic forces maintaining this equality. For net foreign investment in the U.S. to be positive, Americans must be induced to liquidate their foreign assets and/or foreigners must be induced to increase their holdings of U.S. assets. What were the inducements behind the net foreign investments in the U.S., and the associated trade deficits, in the 1980s?

A partial answer may be that foreigners wished to accumulate U.S. assets because they came to view the United States as a "safe haven" for their investments. The safe haven story says that the pro-investment image of the Reagan administration, in conjunction with the debt crises in some less developed countries, generated a flow of funds seeking the safety of U.S. assets. The safe haven story, however, is at best a partial explanation for the inflow of foreign capital to the U.S. in the 1980s. If it were the whole story, we would expect real, or inflation-adjusted, interest rates to fall in the U.S. as foreigners competed with each other to lend to Americans. In fact, real interest rates rose sharply in the United States relative to other industrial countries' in the early 1980s.[5]

The increase in U.S. real interest rates could by itself account for the capital inflows, regardless of the verdict on the safe haven story. The high yields of U.S. assets could have made foreign assets seem relatively less attractive, both to Americans and to foreigners, and thus given rise to the net foreign investments in the U.S. during the 1980s. To increase their holdings of U.S. assets, foreigners would first try to buy dollars in the foreign exchange market, which would cause the dollar to appreciate. The stronger dollar in turn would reduce U.S. exports and increase U.S. imports, leading to a rise in the trade deficit and allowing the desired increase in net foreign investment in the U.S. to take place.

But what caused the increase in U.S. real interest rates? Partial answers are easy to come by. Late in 1979, the Federal Reserve embarked on a course of tight monetary policy to reduce the high inflation rates of the 1970s. This policy quickly translated into high real interest rates, especially in 1980 and 1981. Moreover, the growing government budget deficits (depicted in Figure 1 as the public-sector counterpart of net foreign investment in the U.S.) implied a sharp increase in the government's need to borrow, particularly after 1981, which also helped raise interest rates. The combination of tight money and large fiscal deficits is a textbook recipe for high interest rates. But this combination does not fully solve the puzzle of the U.S. experience in the 1980s. Changes in private savings and investment behavior also played a role.

Private Savings and Investment in the U.S. An explanation that focuses solely on the combination of tight money and large budget deficits fails to account for the changes in private savings and domestic investment that occurred in the United States during the 1980s. Consider the textbook scenario about the effects of an increase in interest rates caused by a monetary contraction or by an increase in the budget deficit. The higher interest rates would constitute a greater reward for saving and therefore would stimulate private savings.[6] More importantly, the higher interest rates would discourage domestic investment.

A typical course of events would run as follows. The fiscal and/or monetary policy changes would first raise interest rates on Treasury

[5]For more detailed discussions of real interest rate fluctuations in the 1980s, and of economists' explanations for these fluctuations, see Stephen A. Meyer, "Trade Deficits and the Dollar: A Macroeconomic Perspective," this *Business Review* (September/October 1986) pp. 15-25, and Olivier J. Blanchard and Lawrence H. Summers, "Perspectives on High World Real Interest Rates," *Brookings Papers on Economic Activity* 2 (1984) pp. 273-334.

[6]Numerous empirical studies, however, suggest that increases in interest rates do not have a large effect on private savings. For a discussion of the relevant literature, see Robert H. DeFina, "The Link Between Savings and Interest Rates: A Key Element in the Tax Policy Debate," this *Business Review* (November/December 1984) pp. 15-21.

securities and thereby reduce the yield spread between normally higher yielding corporate bonds and bonds issued by the U.S. government. This change in relative yields would curb the demand for corporate bonds, causing their yields to rise as well. This rise in interest rates in turn would curb domestic investment by making it more expensive for business firms to borrow. The high interest rates would also make corporate equities seem comparatively less attractive to asset holders. The resulting lackluster stock market also would make it difficult for businesses to raise funds for financing investment projects.

But the typical course of events outlined above is markedly different from the actual U.S. experience (illustrated in Figures 2, 3, and 4). Private savings (as a percentage of GNP) declined fairly steadily after 1981, and domestic investment (as a percentage of GNP) rose sharply from 1982 to 1984 (Figure 2). Between 1980 and 1982, the yield spread between corporate Aaa and Treasury bonds was on the rise (Figure 3)—that is, corporations with the highest credit rating were willing to pay large premiums in order to borrow, in contrast to the typical course of events. The sharpest increases in the yield spread occurred late in 1981 and early in 1982. Finally, the S&P 500-stock index rose steadily from 1982 to 1987 (Figure 4). These figures show the actual U.S. experience to be the opposite of what the textbook scenario would lead us to expect.

These data are consistent with the view, expressed in the *Economic Report of the President* for 1985, that the strong demand for dollar assets during the first half of the 1980s reflected the attractiveness of investment opportunities in the United States. That corporations were willing to borrow at very high interest rates until late 1982 (Figure 3) suggests that they had noticed their attractive investment opportunities at an early stage. The surge in corporate interest rates subsided only after the booming stock market (Figure 4) had made it easy to raise funds via new equity issues. The stock market boom after 1982 suggests that asset holders came to share businesses' enthusiasm about the investment outlook. In sum, the rapid rise in domestic investment from 1982 to 1984 was apparently due to more attractive investment opportunities offered by the U.S. economy. It also is one cause of the rise in net foreign investment in the U.S.

What caused the attractive investment opportunities offered by the U.S. economy?

FIGURE 2

Private Savings and Domestic Investment as a Percentage of GNP

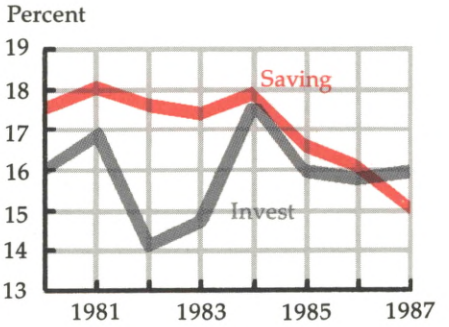


FIGURE 3

Yield Differential Between Corporate Aaa and Long-Term Treasury Bonds

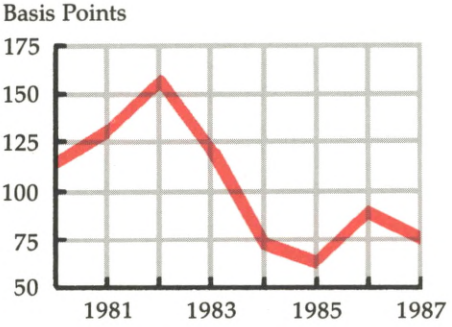
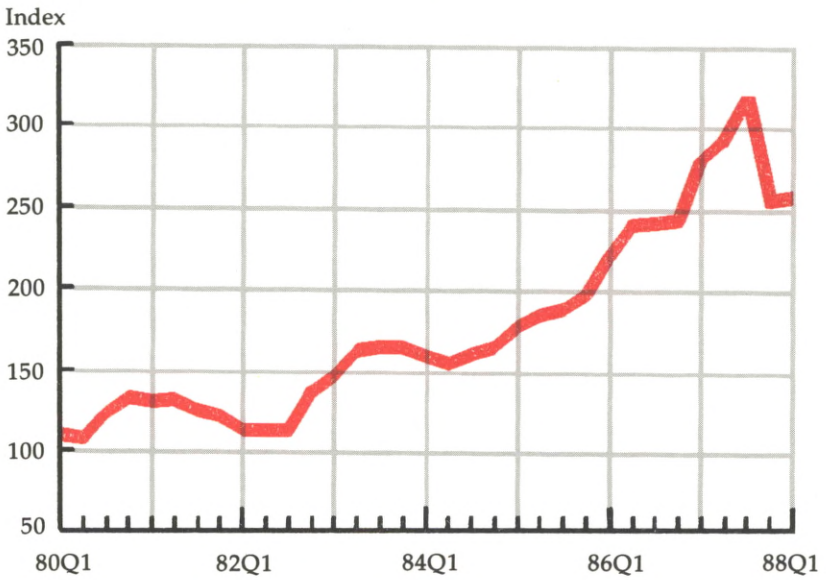


FIGURE 4

S&P 500-Stock Index



Several answers come to mind. First, aided by expansionary fiscal and monetary policies after mid-1982, the U.S. economy seemed likely to recover from the recession much faster than other industrial economies. Domestic investment has a general tendency to increase as the economy recovers from a recession; in 1982 this general tendency was probably accentuated by the fact that investment prospects in other industrial countries seemed likely to remain mediocre. Second, the Economic Recovery Tax Act of 1981 gave business firms substantial new investment incentives, which were only partially reversed in 1982.[7] Finally, the success of the Fed's earlier anti-inflationary policy seems to have convinced the financial markets that the economic expansion begun in 1982 could last a long time without rekindling inflation.

While strong growth of investment spending contributed to the growing gap between private investment and savings in the 1980s, and thus to the trade deficit, so too did a drop in private savings. We have seen several reasons why U.S. domestic investment rose in the early 1980s, but an explanation of the decline in private savings is harder to come by.[8] Private savings is the sum of two components: personal savings (the saving done by households) and business savings (composed of retained earnings and depreciation

[7]For a discussion of the effects of the 1981 and 1982 Tax Acts on investment incentives, see Stephen A. Meyer, "Tax Policy Effects on Investment: The 1981 and 1982 Tax Acts," this *Business Review* (November/December 1984) pp. 3-14.

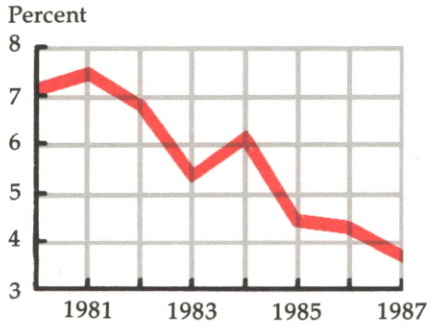
[8]For a discussion of trends in U.S. savings rates and the problems of finding an explanation for them, see Lawrence Summers and Chris Carroll, "Why Is U.S. National Saving So Low?" *Brookings Papers on Economic Activity* 2 (1987) pp. 607-42. Also see F. Gerard Adams and Susan M. Wachter (eds.), *Savings and Capital Formation: The Policy Options*, proceedings of a conference sponsored by the Savings Forum and the Federal Reserve Bank of Philadelphia (Lexington Books, 1985).

allowances). Of the two components, business savings remained fairly stable during the 1980s, rising from 12.5% of GNP in 1980 to 13.5% by 1984, then declining back to 12.3% by 1987. But personal savings dropped sharply, from a rate of about 7.5% of disposable personal income in 1981 to about 3.8% in 1987 (Figure 5). This decline in the personal savings rate during the 1980s is notable; between 1950 and 1979, it averaged 7.2% and did not fall below 5.7% in any year.

Why did American households decide to save a smaller fraction of their disposable income—or, equivalently, to consume a bigger fraction? Economists have no definite answer. Some claim, however, that the stock market boom increased the value of household net worth and made people feel wealthy enough to raise their consumption expenditures faster than their incomes were rising.

Even if we cannot answer the question of why the personal savings rate declined, we can focus on the critical question of whether the decline had a quantitatively large effect on net foreign investment in the U.S. A simple thought experiment will give a grasp of the magnitudes involved. Suppose the personal savings rate in 1987 had been 7.2% (its 30-year average) rather than the actual 3.8%. Personal savings in 1987 then would have been $229 billion instead of the actual $120 billion. Assuming for our thought experiment that domestic investment, business savings, and the government budget deficit had remained at their actual levels, the saving-investment identity implies that net foreign investment in the U.S. would decrease by the same $109 billion amount as personal savings increased. That is, instead of the actual 1987 net foreign investment figure of about $157 billion, the figure in the thought experiment would be $48 billion. Since net foreign investment in the U.S. represents an inflow of funds into the United States to match the sum of the trade deficit and the deficit on unilateral transfers, this sum also would have been $109 billion smaller if the private savings rate had been 7.2% in 1987 and everything else had stayed the same.

FIGURE 5
Personal Savings as a Percentage of Disposable Personal Income



It is, of course, difficult to say precisely how net foreign investment in the U.S. would have differed if the personal savings rate had not declined; we don't know what changes in domestic investment, business savings, or the budget deficit would have accompanied a hypothetically higher personal savings rate. But a $109 billion improvement in net foreign investment and in the trade deficit is essentially the same as what we would get if we assumed, in our thought experiment, a balanced budget for federal, state, and local governments while leaving private savings and domestic investment unchanged. Thus, the change in private savings behavior is as important as changes in government budget deficits when it comes to understanding the magnitude of U.S. trade deficits in the 1980s.

ARE TRADE DEFICITS NECESSARILY UNDESIRABLE?

A trade deficit is undesirable only to the extent that its underlying causes are considered undesirable. Our discussion suggests that at various times during the 1980s, the causes of the U.S.

trade deficit included tight monetary policy, the fiscal deficit, the reluctance of households to maintain a high savings rate, and the attractiveness of investment opportunities in the United States. Economics does not provide a clear-cut answer as to the desirability of a trade deficit that reflects so many diverse factors—mainly because some of these factors can benefit the current generation of Americans at the expense of future generations.

Suppose, for example, that American households choose to accumulate foreign debt to finance imports in order to increase their consumption. This increase in the current generation's consumption will force future generations of Americans to reduce their consumption relative to their incomes because they will have to spend part of their incomes to service the debt. Economics provides no clear answer when it comes to evaluating the gains of the current generation vis-a-vis the losses of future generations; it is a social and political issue.

In some cases, however, economics provides us with a reasonably clear-cut answer. Consider, for example, the rise in net foreign investment in the U.S. from 1982 to 1984 and suppose that, as argued above, it largely reflected the attractiveness of investment opportunities in the United States. Since the high yields of these U.S. investments failed to raise private savings in the United States, we can presume that the current generation of Americans preferred not to sacrifice their current consumption in exchange for the future rewards of larger domestic investment. Moreover, had the United States somehow avoided running the 1982-84 trade deficits, foreigners would have been worse off because they would have had to invest their savings in less profitable projects in other countries.

Would future generations of Americans be better off if the United States had somehow avoided running the 1982-84 trade deficits? Probably not; without the deficits, domestic investment would have been lower, and future generations would lose the income from some of the investment projects. To see if future generations would be better or worse off without the 1982-84 trade deficits, we would have to compare the interest payments on the foreign funds borrowed during those years to the income from the investment projects made possible by the inflow of foreign funds. If American business firms exercised good judgment in choosing their investment projects, the income from the projects should (on average) be large enough to pay off the foreign creditors and leave a surplus for the firms—which will be at least partly owned by future generations of Americans. That profits of American corporations have grown rapidly during the past five years suggests that the investment projects have generated such a surplus; that surplus is extra income that will allow increased consumption for future generations.

The preceding example illustrates some general principles. Trade balance fluctuations are necessary whenever asset holders wish to adjust their asset portfolios. They can serve to allocate global savings to the most promising investment opportunities. An increase in the trade deficit that finances increased domestic investment, as opposed to consumption or government purchases, does not impose a burden on future generations. Therefore, to arrive at a simple measure of how a trade deficit will affect the welfare of future generations of Americans, we should look at the change in net foreign investment in the U.S. in comparison to the change in domestic investment. In other words, we should use the *gap* between domestic investment and net foreign investment in the U.S. as a measure of the trade deficit's impact on future generations' welfare. If that gap does not narrow, then a growing trade deficit will not make future generations worse off.

But even this measure is quite crude because it implicitly assumes that future generations do not benefit from borrowing abroad to finance current government purchases. In fact, they benefit from current government expenditures that constitute public investment in creating parks, highways, and other infrastructure. Unfortunately, in practice we have no straight-

forward way of classifying government expenditures into "public investment" and "public consumption." In many instances, the appropriate classification is not even conceptually clear. Expenditures on a military buildup, for example, may or may not represent a valuable investment in national security and technology that will increase the welfare of future generations.

CONCLUSION

The U.S. trade deficit is the outcome of both public- and private-sector decisions in the United States and abroad. Focusing only on the trade deficit masks the various factors that contributed to the U.S. trade deficit in the 1980s. In particular, the trade deficit's sharp increase in the early 1980s partly reflected an investment boom in the United States that was not matched by an increase in domestic savings and was not necessarily undesirable. What might be cause for concern is that after the investment boom subsided, the trade deficit did not narrow; instead, it was sustained by a decline in private savings and by large government budget deficits.

The ultimate desirability of the government expenditures that accompanied the budget deficits, or of any particular allocation of consumption between current and future generations, cannot be judged on economic grounds alone. However, assuming that concern about the trade deficit is warranted, simple economic reasoning has several implications for how the required trade adjustment should be achieved. First, given the likely inflationary consequences of any attempt to generate substantially faster growth of U.S. output, the adjustment to the trade balance must involve slower growth of domestic purchases. Second, because slower growth of domestic investment would benefit neither current nor future generations, the required slowing in the growth of domestic purchases must come from temporarily slower growth of either government purchases or consumer spending.

We have seen that a return of the personal savings rate to a historically more "normal" level could be as effective in reducing the trade deficit as eradication of the combined government budget deficits would be. So those who consider the trade deficit alarming, and who also are pessimistic about the prospects for a sharp reduction of government budget deficits, can still hope for a rebound in the personal savings rate. In fact, since the stock market crash of October 1987, the personal savings rate has rebounded some, rising from 2.3% in the third quarter of 1987 to 3.8% in the second quarter of 1988. The increase in the savings rate implies slower growth of consumer spending, which, as long as a recession is avoided, should be nothing but good news to those concerned about the trade deficit.

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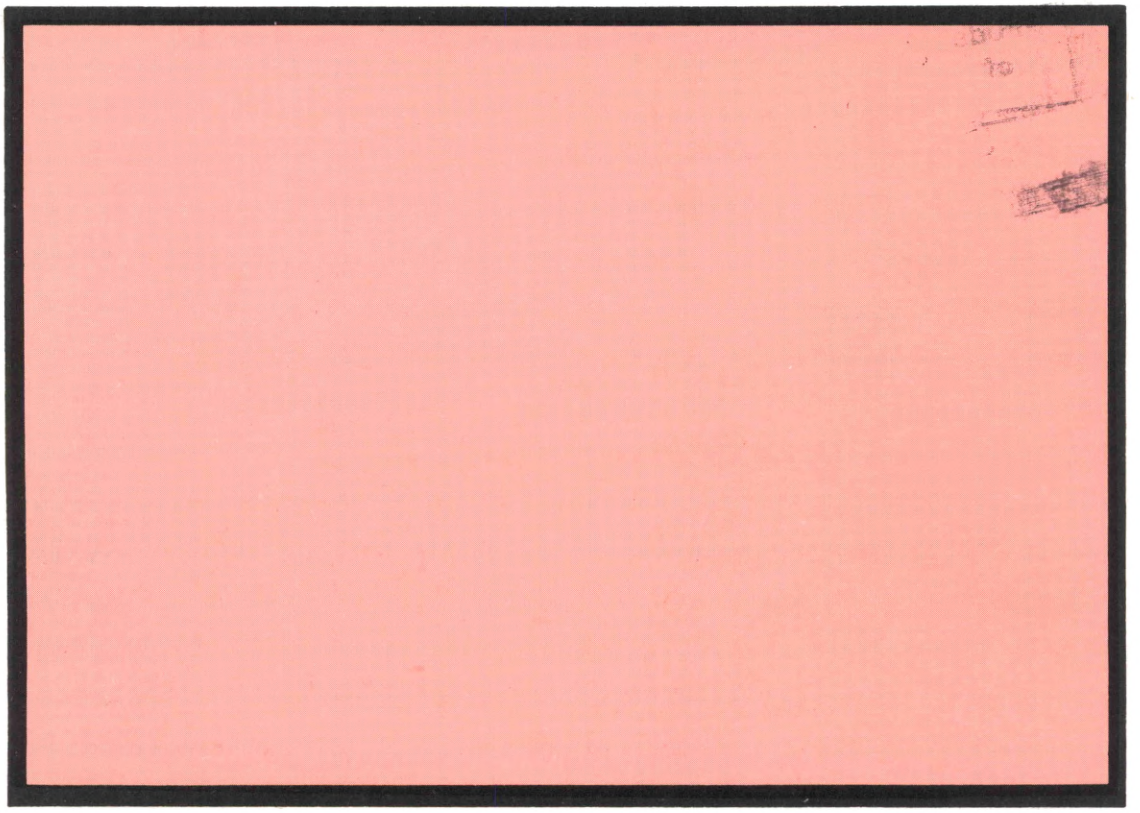

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