

Forecasting Consumer Spending: Should Economists Pay Attention to Consumer Confidence Surveys?

By C. Alan Garner

The invasion of Kuwait in August 1990 took virtually all Americans by surprise. Rising oil prices in the second half of the year and uncertainty about a possible Mideast war dramatically weakened consumer confidence in domestic business conditions. Many analysts believe the decline in consumer confidence worsened the U.S. recession. But after the Allied victory in the Persian Gulf War, consumer confidence rebounded strongly, leading some analysts to predict an early end to the recession.

The question at issue is whether consumer confidence surveys warrant such predictions. Some economists believe consumer confidence can reliably predict future consumer spending and thus the course of the economy (Langer). Others are more skeptical, arguing "consumers cannot spend confidence" (Lieberman).

This article argues that consumer confidence indexes are seldom very useful in forecasting economic performance, although they may be useful in exceptional instances like the Persian Gulf conflict. The first section explains the channels through which confidence may affect consumer spending and shows how previous studies have reached differing conclusions about the usefulness of confidence surveys. The second section develops some guidelines for making judgments about the economy on the basis of confidence indexes.

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Consumer Confidence and Spending Decisions

Many economists believe consumer spending depends not only on current income and household wealth but also on consumers' uncertainty about their future personal finances. Consumer confidence

surveys are intended to reflect consumers' changing attitudes about the business conditions and job prospects that determine their future finances. But economists have found it difficult

to show conclusively that confidence measures can predict consumer spending and thus help forecast the economy.

Channels of influence

Traditional economic theory suggests that consumer spending depends on such economic variables as income and prices. But recent discussions have identified psychological channels of influence as well. According to the psychological consumption theory, consumers spend in relation to their confidence about future personal finances (Katona 1975).

Developers of consumer confidence surveys propose that a diverse set of factors may influence consumer confidence (Katona 1976). Some of these factors cannot be quantified—for example, the Persian Gulf War or President Kennedy's assassination. Thus, fluctuations in consumer confidence cannot be explained solely by consumers' reactions to publicly announced economic statistics. Consumer attitudes are formed instead by a social learning process depending as much on conversations between neighbors over the backyard fence as on government statistical releases.

A primary channel by which consumer confidence affects the economic outlook is believed to be consumer purchases of durable goods, such as automobiles and refrigerators.¹ Durable goods purchases are often discretionary in that they can be postponed if economic conditions are unfavorable. For example, a family can repair its present car rather than buy a new one if family finances are strained or job prospects are uncertain. Durable goods

purchases thus depend on both willingness and ability to buy.

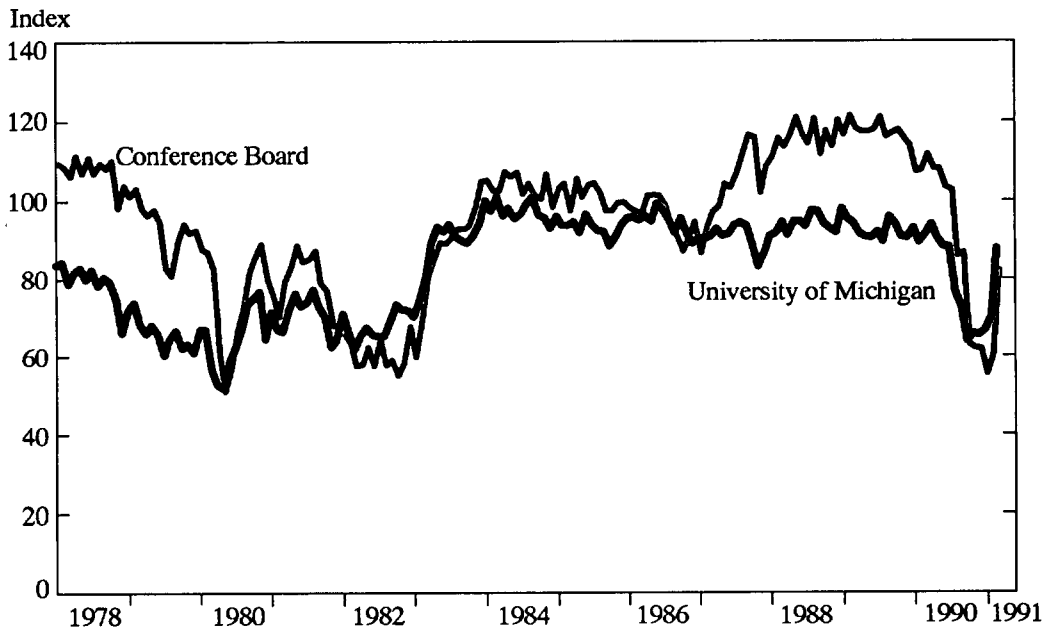
Recent research has attempted to reconcile the traditional and psychological views of consumption by reinterpreting consumer confidence within the life-cycle theory of consumption. Life-cycle theory asserts that consumption depends on expected lifetime resources, including current and future labor income and household wealth (Modigliani and Brumberg). If current household income is high relative to expected future income, the household may decide to save a large part of current income and use the savings to consume more in the future. Like psychological theorists, life-cycle theorists thus believe that current consumption depends on expectations about the future.

When consumer confidence worsens, purchases of consumer durable goods are likely to bear the brunt of any reduction in consumer outlays. Greater concern about future personal finances will cause consumers to save more in preparation for possible bad times. When consumer confidence is low, consumers believe financial distress is more likely in the future. As a result, they want to hold more liquid assets that can easily be converted into money to buy necessities or pay off debts. In such circumstances, consumers are less likely to purchase durable goods because such goods cannot be converted quickly into cash without a large loss in value.²

Measures of consumer confidence

Economic theory thus suggests that decreases in confidence may reduce consumer spending, particularly purchases of durable goods. Empirical evidence is needed, however, to test whether such effects really exist and are economically important. Two major measures of consumer confidence are

Chart 1
Measures of Consumer Confidence



available for such testing. Both measures are derived from large-scale surveys of U.S. households.

The first measure is the University of Michigan's Index of Consumer Sentiment. This index was developed by Katona and his coworkers at the university's Institute for Social Research. The index combines responses to five questions about the survey participants' personal financial situations and their views on general business conditions. Two of the questions refer solely to the present. The three others are forward-looking questions that ask about expected conditions over the next one to five years.

The second measure of consumer attitudes is the Conference Board's Consumer Confidence Index. This index is similar in construction to the Michigan index, being a summary of

responses to five questions about current and expected future conditions (Linden). The Conference Board, however, asks explicitly about the respondents' job and income prospects rather than the Michigan survey's vaguer notion of "financial situation." And the Conference Board asks survey participants about expectations over the next six months, a shorter period than in the Michigan survey.

Because the surveys differ, the two measures of consumer confidence do not always move together (Chart 1). While both indexes frequently rose or fell at the same time from January 1978 to March 1991, the Conference Board index fluctuated over a wider range than the Michigan index.³ Moreover, the two indexes often reached their peaks or troughs at different times. For example, the Michigan index reached a low point in October 1990,

but the Conference Board index did not bottom out until January 1991. Because the indexes sometimes give differing information about consumer confidence, both are examined in the empirical work later in the article.

Previous empirical studies

Empirical evidence is needed to determine whether consumer confidence actually influences spending. Confidence measures might not help to explain consumer spending if the surveys do not accurately reflect consumer attitudes. Or the measures might have little value to forecasters and policymakers if changes in confidence merely reflect macroeconomic variables, such as income and unemployment, which can be used directly to predict consumer spending.

Most studies of the relationship between consumer confidence and spending have tested whether a confidence index adds explanatory power to statistical consumption equations. The Michigan index has been used more often than the Conference Board index in such studies because it is available over a longer period. Early studies used a wide range of consumer spending models. More recent studies have often used life-cycle consumption equations relating consumer outlays to income and household wealth.⁴

Several studies have concluded that confidence indexes have little or no value in explaining consumer purchases of durable goods. Hymans found the Michigan index normally had little value in explaining consumer purchases of automobiles or nonauto durable goods, although large changes in confidence did help explain automobile purchases. Burch and Gordon (1984, 1985) also found the Michigan index had little explanatory power and argued that stock prices and the unemploy-

ment rate are equally useful to forecasters and policymakers.

In contrast, other studies have concluded that consumer confidence indexes have some value in predicting consumer purchases. Juster and Wachtel found the Michigan index did a surprisingly good job of explaining automobile sales over certain periods. Economists at Data Resources Incorporated (DRI) also concluded that consumer confidence indexes have forecasting value (Kelly). As a result, the Michigan index is an important explanatory variable in the consumption equations of DRI's U.S. macroeconomic model. And Throop found that consumer confidence helped explain changes in consumer spending that were left unexplained by life-cycle equations without a confidence measure.

Reasons for differing conclusions

Empirical studies have reached differing conclusions because testing the predictive value of consumer confidence indexes raises difficult statistical issues. Isolating the effect of consumer confidence on durable goods purchases is difficult because confidence is closely related to other economic variables that also may affect consumer spending. For example, an increase in household income might raise both consumer confidence and consumer purchases. Even if confidence had no direct effect on spending, consumer confidence indexes might still help predict consumer purchases by indirectly reflecting the change in income. But if forecasters and policymakers take household income directly into account, consumer confidence might have no additional predictive value.

Previous studies have shown consumer confidence is closely related to many macroeconomic variables that could be important determinants of consumption. Lovell found

that over 90 percent of the variation in the Michigan index could be explained by the inflation rate, the unemployment rate, stock prices, and the previous value of consumer confidence. He concluded that low levels of confidence in the early 1970s were due to economic conditions rather than to non-economic events, such as the Vietnam War or the Watergate political scandal.

Mishkin (1978) argued that consumer confidence seems useful in predicting consumption primarily because confidence is a stand-in for more important household balance-sheet variables. A higher level of household debt increases the chance of future financial distress, causing consumers to cut back on purchases of illiquid durable goods. But a higher level of household assets reduces the chance of future distress, allowing consumers to buy more durable goods. Mishkin showed the University of Michigan's index is closely related to these balance-sheet variables.

When household assets and liabilities were included in the consumption equation, Mishkin found the Michigan index had much less predictive value. The explanatory power of the confidence index fell sharply when balance-sheet variables were added to an equation for total spending on consumer durable goods. And the confidence index had no predictive value in separate equations for automobile purchases and nonauto durable goods purchases when balance-sheet variables were present.⁵

Previous empirical studies of consumer confidence have disagreed partly because these studies had different information sets—sets of macroeconomic variables used to explain and predict. Some studies related consumer spending to consumer confidence and only one or two other information variables. Others, like Mishkin's, had larger information sets containing such variables as household debt and assets.

Previous studies also have differed in the time lags of the statistical models, the number of periods between the consumption variable being explained and the variables in the information set. Some studies explained consumption in the current period with information only from the current and immediately preceding periods. Other studies included information from several previous periods—for example, measures of household income for several preceding quarters.

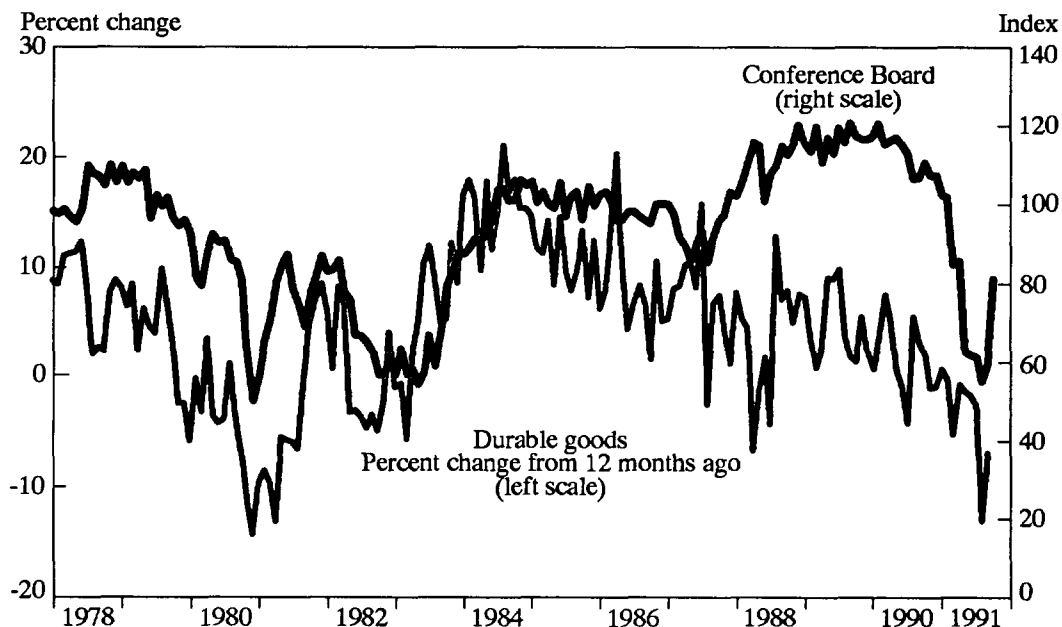
Finally, a possible reason why previous studies have disagreed is that some changes in confidence may be more useful than others in predicting future consumer spending. For example, the large drop in confidence at the beginning of the Persian Gulf conflict may have discouraged consumer spending, yet small declines in confidence may have little or no effect. As noted previously, Hymans found large changes in confidence were more useful in predicting automobile purchases. But most studies did not consider whether abrupt changes in confidence have greater predictive value. As a result, studies covering periods with several abrupt changes in confidence might be more likely to find confidence measures useful than studies covering periods with few large changes.

Drawing Inferences from Consumer Confidence

Because previous empirical studies have disagreed about the usefulness of consumer confidence indexes, this section presents some new evidence on the predictive value of such indexes. The goal is to suggest some guidelines to forecasters and policymakers for drawing inferences about the economic outlook from consumer confidence measures. The empirical analysis focuses on consumer purchases of durable goods because economic theory implies consumer confidence is likely to have its

Chart 2

The Conference Board Index and Durable Goods Purchases



greatest effect on durable goods purchases. The analysis is based on revised data for consumer spending and other macroeconomic variables rather than the initial estimates released by government statistical agencies.⁶

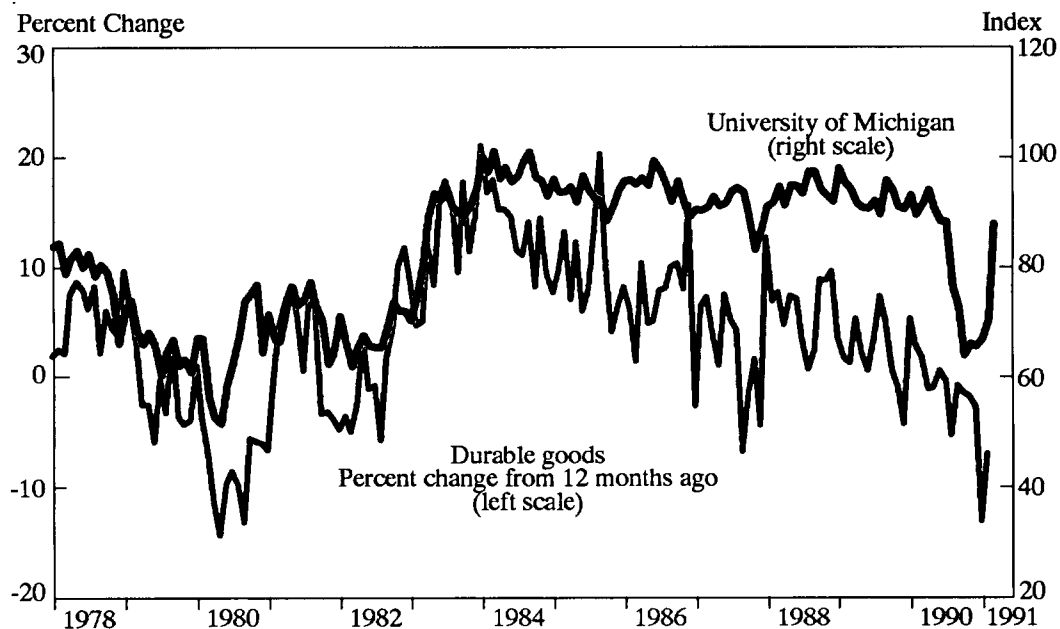
Guideline 1: Stand-alone value

Can consumer confidence indexes, by themselves, give dependable forecasts of consumer spending? If so, the indexes can be said to have stand-alone value. Such a question may be particularly important to small businesses that need to forecast consumer spending but cannot afford to develop elaborate data bases or statistical models. If confidence indexes have stand-alone value, such measures would provide a simple, inexpensive way for businesses to forecast durable goods purchases.

Graphical analysis. Graphical analysis suggests that consumer confidence indexes are not good stand-alone indicators of future consumer spending. Chart 2 shows the Conference Board index and the percentage change in durable goods purchases since June 1977.⁷ Consumer confidence was not a reliable indicator when the economy recovered from recession in the early 1980s. After declining in late 1981 and early 1982, real consumer spending on durable goods rose nearly 2 percent over the year ending in September 1982. But the Conference Board index did not give a clear signal of the recovery in durable goods purchases. The confidence index rose temporarily to 63 in July but then fell to 54 in October, after a sustained recovery in durable goods purchases was already under way.

The Conference Board index was also not

Chart 3
The Michigan Index and Durable Goods Purchases



a good stand-alone indicator of durable goods purchases during the long expansion in the 1980s. As Chart 2 shows, confidence rose to 106 in 1984 and then began drifting downward. The growth rate of durable goods purchases also slowed gradually after the initial rebound from recessionary levels. But the Conference Board index began rising sharply in 1987 and reached record highs in 1989, even though growth in durable goods purchases continued to slow. In fact, consumer spending on durable goods declined 4 percent over the year ending in December 1989, even though confidence remained extremely high by historical standards.

Graphical analysis also shows the University of Michigan's confidence index is not a reliable stand-alone indicator of consumer spending. The Michigan index has often moved

in the same direction as the growth rate of durable goods purchases (Chart 3). But the confidence index has not provided a consistent advance warning of changes in consumer spending. And like the Conference Board index, the Michigan index did not reflect the sustained slowing of durable goods purchases during the 1980s.

Correlation coefficients. Correlation statistics confirm that consumer confidence indexes are not good stand-alone indicators of durable goods purchases. A correlation coefficient measures the degree to which two variables move together, taking the value 1.0 if there is a perfect positive relationship and zero if the variables are unrelated.

The correlations between the Conference Board index and consumer spending on durable goods indicate a weak and unreliable relation-

Table 1

Tests of Stand-Alone Value: Correlation Coefficients Between Durable Goods Spending and Confidence Indexes

Lead Time* (months)	Conference Board Index		Michigan Index	
	Correlation Coefficient	t†	Correlation Coefficient	t†
(1)	(2)	(3)	(4)	(5)
0	.07	.83	.12	1.47
1	.00	-.01	.10	1.21
2	.01	.08	.07	.88
3	.00	-.01	.06	.76
4	-.02	-.26	.06	.75
5	-.07	-.83	.03	.39
6	-.08	-1.04	.03	.36

* The lead time is the number of months by which the confidence index precedes the change in durable goods purchases. A lead time of zero means the confidence index and durable goods purchases are from the same month.

† The statistic tests whether the corresponding correlation coefficient is different from zero. None of the correlations differs significantly from zero at the 5 percent level.

ship. Table 1 gives correlation coefficients in column 2 with the Conference Board index leading consumer spending by zero to six months. The correlation coefficients are small, ranging from 0.07 when the lead time is zero, to -0.08 when the lead time is six months. In addition, the table presents t statistics in column 3 testing whether the correlations between consumer confidence and durable goods purchases are statistically significant—that is, whether the coefficients are statistically different from zero. These tests show the correlations are not statistically significant.

The results are similar for the Michigan index. Although the correlations in column 4 are consistently positive, the coefficients are always small. For example, the largest correlation coefficient between the confidence index and growth in durable goods purchases is only 0.12. And based on the t statistics in

column 5, none of the correlations involving the Michigan index is statistically significant.⁸

The small correlations and lack of statistical significance support the view that confidence indexes have no stand-alone value for predicting durable goods purchases. Thus, a first guideline for forecasters and policymakers emerges: Consumer confidence indexes are not reliable as stand-alone indicators of consumer spending and thus should not be used as a decision maker's sole—or even primary—forecasting tool.

Guideline 2: Complementary value

Given that consumer confidence measures cannot stand alone as a forecasting tool, do such indexes have value as part of a larger forecasting process? Confidence measures can be said to have complementary value if they

Table 2

Tests of Complementary Value: F Statistics on Confidence Indexes in Equations Relating Durable Goods Spending to Confidence Index and Other Variables

Confidence index	Equations include past durable goods purchases	Equations include additional economic variables
(1)	(2)	(3)
Conference Board	2.55*	1.38
University of Michigan	2.86*	1.09

* Statistically significant at 5 percent level.

Note: Statistical significance indicates the confidence index is useful in predicting durable goods purchases. For further details on these tests, see endnotes 9 and 10.

can be combined with other macroeconomic information to produce more reliable forecasts of consumer spending.

Consumer confidence measures might not have stand-alone value because confidence indexes reflect both economic and psychological factors. Changes in these different factors could from time to time cancel out, causing confidence indexes to have no predictive value. But statistical tests can control for the economic factors by including macroeconomic variables in the consumption relationship. As a result, the confidence indexes might have complementary forecasting value because of the psychological factors.

Preliminary results hint that confidence indexes may have some complementary value in predicting consumer spending. The simplest way to control for economic effects on consumer confidence and spending is to include past values of durable goods purchases in the information set. Such past values can be interpreted as a stand-in for slowly evolving macroeconomic fac-

tors affecting consumers. Changes in durable goods purchases were thus regressed on past changes in durable goods purchases as well as past values of consumer confidence.⁹ The preliminary results are summarized in column 2 of Table 2. The tests find both confidence indexes to be statistically significant and, thus, useful in predicting durable goods purchases.

But a better statistical test finds that consumer confidence indexes have little complementary value to forecasters and policymakers. Past changes in durable goods purchases are an imperfect stand-in for changes in macroeconomic variables. A better procedure is to include additional economic variables directly in the forecaster's information set. Past values of real disposable income, the consumer price index, and the unemployment rate were added to the regression equations.¹⁰ As column 3 of Table 2 shows, tests with these additional variables never found the confidence measures to be

useful in predicting durable goods purchases.

Such results suggest a second guideline for forecasters and policymakers: Confidence indexes have little complementary value when used in a forecasting process with other macroeconomic variables.

Guideline 3: Value in exceptional situations

The first two guidelines state that confidence indexes are not useful as stand-alone indicators of consumer spending and that such indexes have little complementary value when combined with other economic variables. But the results on which these guidelines are based are average results for the overall period from the late 1970s to the present. Could consumer confidence indexes have greater forecasting value in exceptional situations?

The Persian Gulf crisis provides an excellent opportunity for testing the predictive value of confidence indexes in exceptional circumstances. Had the Gulf crisis been widely anticipated, uncertainty might have risen before the actual invasion. As a result, consumer spending might have weakened, and past macroeconomic data might have foreshadowed further declines in consumer spending. But in actuality, past economic data probably did not reflect the greater uncertainty because the invasion surprised nearly all U.S. households. The abrupt decline in confidence after the invasion thus provided potentially useful information to forecasters about the reactions of consumers.

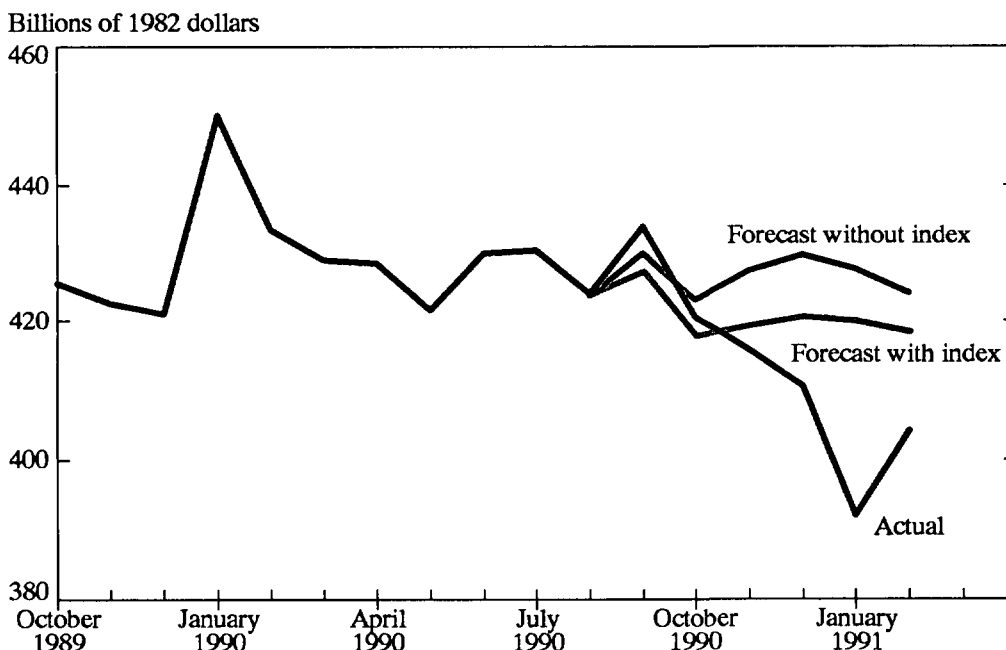
To examine the predictive value of confidence measures during the Persian Gulf crisis, forecasts of durable goods purchases were produced with three Bayesian vector autoregressive models (BVARs). Such models express each variable in the model in terms of its own past values and the past values of the

other variables in the model.¹¹ The first BVAR did not contain any consumer confidence measure, the second contained the Conference Board index, and the third contained the Michigan index. All three BVARs included two consumption variables—real purchases of durable goods and real purchases of non-durable goods and services. Each BVAR also contained the Standard and Poor's 500 common stock price index, the unemployment rate, real disposable income, the price of imported crude oil, the consumer price index, and the six-month commercial paper rate.¹²

Consistent with the previous tests, a forecasting exercise with the BVARs found that including consumer confidence did not improve forecast accuracy under average, or ordinary, circumstances. The three models were estimated through December 1987 and used to forecast six months ahead. Actual and predicted values were compared to calculate the forecast errors. Another six months of data were then added to the sample period, and the process was repeated to produce another six-months-ahead forecast. Five forecasts were generated in this way, with the final set of forecasts covering the first half of 1990.

The BVARs including consumer confidence were actually less accurate under ordinary circumstances. The forecast accuracy of the models can be measured by the mean absolute forecast error, which is the average prediction error without regard to sign. The BVAR with no consumer confidence measure had a mean absolute forecast error of \$10.6 billion for six-months-ahead predictions of real durable goods purchases. In contrast, the BVAR with the Conference Board index had a mean absolute forecast error of \$12.4 billion, and the BVAR with the Michigan index had a mean absolute forecast error of \$16.7 billion. Including consumer confidence in the model thus did not improve forecast accuracy under

Chart 4
Durable Goods Purchases during the Persian Gulf Conflict



ordinary circumstances—as would be expected based on the earlier tests.¹³

The empirical results were quite different in the exceptional circumstances surrounding the Persian Gulf crisis. The three models were re-estimated over the period ending in August 1990. Forecasts of durable goods purchases were then produced for the period from September 1990 to February 1991. Chart 4 compares the forecasting accuracy of the BVAR with the Conference Board index and the BVAR with no confidence index. Although neither model predicted the sharp decline of consumer spending in late 1990, the model with consumer confidence was closer to the mark. The BVAR containing the Michigan index similarly outperformed the model with no consumer confidence measure.¹⁴

One should not conclude from the Persian Gulf results that consumer confidence measures will be useful in all exceptional circumstances. The stock market collapse in October 1987 is a case in point. Although consumer confidence indexes fell sharply, the predictive value of these indexes was mixed. The three BVARs were estimated through October 1987 and used to predict durable goods purchases over the next six months. Although the BVAR with the Conference Board index was slightly more accurate than the BVAR with no confidence measure, the BVAR with the Michigan index was slightly less accurate.¹⁵

Consumer confidence indexes were presumably more useful after the Kuwait invasion because the invasion was an unanticipated noneconomic event. In contrast, the

stock market collapse was an economic event that may have been partially anticipated.¹⁶ Other macroeconomic variables may have already reflected the uncertainties associated with the large decline in stock prices. Thus, the abrupt decline in confidence may have provided forecasters and policymakers with little new information.

These results produce a third guideline for forecasters and policymakers: Consumer confidence indexes may be useful in exceptional instances where confidence changes abruptly because of unanticipated noneconomic events.

Conclusion

Consumer confidence is receiving greater attention lately because of the U.S. economic recession and sharp fluctuations in confidence caused by the Persian Gulf crisis. Economists disagree, however, about the usefulness of confidence measures in assessing the economic outlook. This article presents new empirical evidence to suggest some guidelines for using consumer confidence indexes in

economic forecasting and policymaking.

Three general guidelines are proposed. First, confidence indexes are not reliable stand-alone indicators of durable goods purchases under ordinary circumstances. As a result, confidence indexes should not be used as primary forecasting variables. Second, confidence measures ordinarily have little complementary value when used in a forecasting process with other macroeconomic variables. And third, confidence measures may be useful in exceptional instances where confidence changes abruptly because of unanticipated noneconomic events.

To the extent that the recent rebound in confidence is due to a faster than expected end to the Persian Gulf War, the third guideline suggests that consumer spending might be stronger in the months ahead than it otherwise would be. But forecasters and policymakers must be cautious in interpreting this rebound because consumer spending also will continue to reflect such negative macroeconomic factors as higher unemployment and weak disposable income growth.

Endnotes

¹ Another channel by which consumer confidence may affect the economy is home purchases. For example, the University of Michigan's confidence index is a determinant of housing activity in the Data Resources Incorporated model of the U.S. economy. This article, however, looks only at consumer purchases of durable goods.

² Purchases of consumer durable goods can be viewed as a form of saving, even though government statisticians classify such purchases as consumption. When a household owns a durable good, its true consumption in any year is the services from that good, not the entire initial value of the purchase. Part of the initial purchase price is really an investment in a household asset that will yield consumer services in the future. But when consumers become more uncertain about the future, they channel their savings toward more liquid assets instead of highly illiquid durable goods (Mishkin 1976).

³ The monthly levels of the two confidence indexes have a correlation coefficient of 0.75. The correlation coefficient measures the degree to which the two indexes move together. The correlation coefficient would be 1.0 if the two series had a perfect positive relationship and zero if the series were unrelated.

⁴ This section does not present a comprehensive review of previous empirical studies. Other studies of the predictive value of consumer confidence indexes include Adams, Burch and Stekler, Friend and Adams, Fuhrer, Mueller, and Thomas.

⁵ Mishkin's findings have limited practical implications for forecasters and policymakers, however, because statistics on household assets and liabilities are not available on as timely a basis as the confidence indexes. Moreover, household balance sheet data may be revised substantially after their initial release.

⁶ Statistics on such macroeconomic variables as consumption and disposable income are revised for years after their initial release. As a result, the initial estimates available to forecasters and policymakers are presumably less accurate than the revised statistics used for empirical testing in this and other studies. Consumer confidence measures, in contrast, are never revised, leaving open the possibility that they might have more predictive value in practical forecasting situations than in empirical tests using revised macroeconomic data.

⁷ The empirical work in this article is based on monthly data. As a result, the Conference Board index was available from June 1977 to March 1991. Before June 1977, the Conference Board survey was conducted on a

bimonthly basis. The Michigan index was available from January 1978 to March 1991. Before January 1978, the Michigan survey was conducted on a quarterly basis. Results with quarterly data over a longer period will be reported in a future Federal Reserve Bank of Kansas City working paper.

⁸ Rao and Miller explain the t test in Table 1. For all of the statistical analysis except the charts, growth in durable goods purchases is the change from the previous month at an annual percentage rate. Growth in durable goods purchases was also regressed on a constant and either 6 or 12 past values of a confidence index. An F statistic was then computed to test whether past values of the confidence index help jointly to predict consumer spending. The F tests did not reject the hypothesis that past values of consumer confidence have no predictive value.

⁹ These tests are called Granger causality tests because the tests were proposed by Granger. However, there are problems with interpreting these tests as indicating causation in any deeper sense (Jacobs, Leamer, and Ward). As a result, this article views such tests only as indicating predictive usefulness relative to a particular information set.

The Granger regressions included six lagged values of each explanatory variable. As a result, the sample period for regressions with the Conference Board index was from December 1977 to February 1991, and the sample period for regressions with the Michigan index was from July 1978 to February 1991.

¹⁰ The confidence measures and the unemployment rate were expressed as levels. All other explanatory variables were annual percentage changes. Similar results were obtained when the regressions included 12 lagged values of each explanatory variable. The results of Granger tests with other consumer spending variables will be reported in a future working paper.

¹¹ Hakkio and Morris provided a general introduction to vector autoregressions. Todd discussed forecasting with Bayesian VARs.

¹² The BVARs contained 12 lagged values of each explanatory variable. Each equation also included a constant term. The unemployment rate, the six-month commercial paper rate, and the confidence measures were entered as levels. The other variables were entered in logarithmic form. Real variables were measured in constant 1982 dollars.

¹³ The differences in mean absolute error for the three BVARs are small relative to consumer spending. Real

purchases of durable goods were between \$400 billion and \$450 billion annually from 1988 to 1990. The BVAR with no confidence index also had a slightly better record over forecast horizons of one to five months.

¹⁴ All three BVARs predicted stronger consumer spending than actually occurred during the Persian Gulf crisis. The model with no confidence index had a forecast error of \$20.4 billion for a six-months-ahead prediction. The model with the Conference Board index had a \$14.7 billion error, while the model with the Michigan index had a \$19.3 billion error.

¹⁵ All three BVARs predicted weaker durable goods purchases than actually occurred over the six months after the stock market collapse. The model with no confidence measure had a forecast error of \$27.5 billion

for a six-months-ahead prediction. The models with the Conference Board index and the Michigan index had errors of \$21.6 billion and \$30.8 billion, respectively.

¹⁶ Economists still disagree about the causes of the stock market crash. But stock prices were actually declining before October 1987. And prior to the crash, some market analysts were predicting further declines in stock prices because prices were high by historical standards relative to corporate earnings. Such predictability of stock prices is inconsistent with a leading theory of stock market behavior, the efficient markets hypothesis. But recent financial research severely challenges this theory, implying that stock prices are somewhat predictable (Fortune).

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