

What Role Does Consumer Sentiment Play in the U.S. Macroeconomy?

The economy is mired in recession. Consumer spending is weak, investment in plant and equipment is lethargic, and firms are hesitant to hire unemployed workers, given bleak forecasts of demand for final products. Monetary policy has lowered short-term interest rates and long rates have followed suit, but consumers and businesses resist borrowing. The conditions seem ripe for a recovery, but still the economy has not taken off as expected. What is the missing ingredient?

Consumer confidence. Once the mood of consumers shifts toward the optimistic, shoppers will buy, firms will hire, and the engine of growth will rev up again. All eyes are on the widely publicized measures of consumer confidence (or consumer sentiment), waiting for the telltale uptick that will propel us into the longed-for expansion. Just as we appear to be headed for a "double-dipper," the mood swing occurs: the indexes of consumer confidence register 20-point increases, and the nation surges into a prolonged period of healthy growth.

Does the U.S. economy really behave as this fictional account describes? Can a shift in sentiment drive the economy out of recession and back into good health? Does a lack of consumer confidence drag the economy into recession? What causes large swings in consumer confidence? This article will try to answer these questions and to determine consumer confidence's role in the workings of the U.S. economy.

Jeffrey C. Fuhrer

Senior Economist, Federal Reserve Bank of Boston. Thanks to Richard Kopcke and Stephen McNees for helpful comments, and to Meeta Anand for helpful research assistance.

I. What Is Consumer Sentiment?

Consumer sentiment, or consumer confidence, is both an economic concept and a set of statistical measures. The definitions of the statistical measures are unambiguous; these indexes are based on consumers' responses to specific questions about current and expected economic conditions, both personal and national. The economic concept is a bit

more slippery. Standard theories of consumer behavior attribute fluctuations in consumption expenditures to current and expected fluctuations in income, wealth, and interest rates, with no independent role for fluctuations in consumers' confidence.¹ Thus, while measures of confidence can be described in detail, the precise role of confidence in influencing consumers' decisions is difficult to pin down.

Most work by professional economists recognizes (and sometimes attempts to clarify) the confusion surrounding the theoretical basis for an interest in consumer sentiment. In early work on the predictive value of consumer sentiment, Friend and Adams (1964) and Adams and Green (1965) see little justification for an independent role for sentiment; they essentially sidestep the issue of why consumer sentiment might help predict subsequent consumer expenditures, and instead proceed directly to test whether it does. They find that, for the most part, the information in measures of consumer sentiment overlaps the information in standard government statistics on employment and financial conditions. In its most recent publication (1992), the Survey Research Center (SRC) at the University of Michigan is careful to point out that the importance of the Michigan surveys derives from the "important influence of consumer spending and saving decisions in determining whether the national economy slips into recession or is propelled toward recovery and growth." They argue that consumers' optimism or pessimism primarily affects the *timing* of decisions to purchase homes, vehicles, and other durables.

The popular press is considerably less clear on the matter. Considering only newspaper reports, the average reader might conclude that consumer sentiment is the primary driving force behind economic fluctuations. This article will provide evidence that this view of consumer sentiment's influence stands at odds with the historical behavior of the sentiment indexes, consumption expenditures, and the theoretically predicted determinants of consumption.

The Statistical Measures

Consumer confidence or consumer sentiment is measured via surveys of consumers. Two organizations, the Conference Board and the SRC at the University of Michigan, survey households each month, asking a variety of questions, and compile the answers into indexes that measure the level of confidence relative to a base period.²

The Conference Board distributes surveys by mail to approximately 5,000 households each month, with an average response of about 3,500. Survey participants are asked to provide qualitative responses to questions about current general business conditions in their area, expected business conditions six months from now, current job availability in their area, expected job availability six months from now, and expected total family income six months from now. The most-watched Conference Board indexes—the consumer confidence index and the expectations index—average the responses to all five of these questions, and to the three questions about expected economic conditions, respectively.

The Michigan survey of consumer sentiment is a monthly telephone survey of about 500 households. Participants are asked to provide qualitative responses to questions about current family financial conditions, expected financial conditions one year from now, expected general business conditions during the next twelve months, expected business conditions during the next five years, and current buying conditions for large household appliances. The index of consumer sentiment averages the responses to all five of these questions, and the index of consumer expectations averages the responses to the three questions about expected economic conditions. The Michigan survey also asks dozens of other questions about consumers' attitudes about inflation, housing market conditions, automobile market conditions, labor market conditions, and so on.

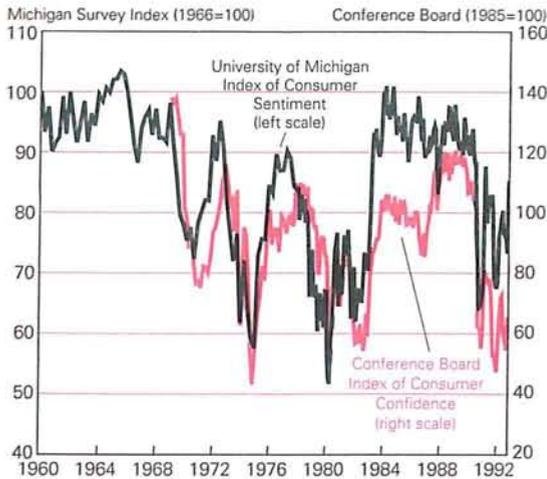
As indicated in Figure 1, large changes in one sentiment index are generally mirrored in the other index; rarely do the indexes disagree, and then only for small changes. From this point on, this article's references to consumer sentiment data, unless otherwise noted, will mean the Michigan index. None of

¹ Changes in measures of consumer confidence might reflect shifts in underlying tastes; however, it is unlikely that consumers' taste shifts are coordinated at business cycle frequencies in the aggregate, or that taste shifts would coincide with (or cause) shifts in aggregate income and spending. Another possibility is that measures of confidence might reflect consumers' uncertainty. Hall and Wilcox (1992) explore this possibility and find some evidence that higher uncertainty is correlated with lower confidence. However, they do not show whether the consumers' uncertainty is uniquely reflected in sentiment, or whether the uncertainty component is correlated with current or subsequent movements in spending.

² Others (for example, Sindlinger and ABC/*Washington Post*) perform surveys of consumer attitudes, but the results are either not available on a continuous basis, discontinued, conducted irregularly, or not paid much attention. This study will consider only the Conference Board and Michigan surveys.

Figure 1

Consumer Sentiment Indexes



the qualitative results reported below depends on the choice of index, however.

II. Popular Theories of the Role of Consumer Sentiment

Consumer sentiment is often portrayed as a fundamental driving force in the economy. When consumers are confident, the economy surges, and when consumers are timid, they pull the economy down with them. It is not hard to find newspaper accounts that have pointed to sentiment as the cause of a recession: "... a sharp drop in confidence could ... ignite a recession" (see "Confidence Index Plunges" 1990). Others suggest that sentiment is critical to recovery: "The economy will not be convincingly in a recovery until there is a marked improvement in the consumers' spirits" (Greenhouse 1992). This article will attempt to distinguish more carefully the roles that have been assigned to consumer sentiment, as reported in the pages of *The New York Times* and *The Wall Street Journal* over the years from 1973 to 1992. These two newspapers were chosen because they are widely read and because they draw from a wide variety of sources, from

academic and business economists to policymakers and newspaper columnists. Having identified a number of a priori plausible theories that describe the role of consumer confidence, this study will then attempt to determine which of the various roles attributed to consumer sentiment can be confirmed or denied by the historical data on sentiment, consumption, and the more traditional determinants of consumption.

(1) *Sentiment independently causes economic fluctuations.* Consider an article in *The New York Times* that appeared shortly after the Iraqi invasion of Kuwait in August of 1990 (Uchitelle 1990). The article directly blames "frightened Americans" for "pushing the United States into a recession." This statement, taken by itself, might simply mean that confidence dropped as consumers faced falling incomes, diminished borrowing power, and a higher risk of unemployment. However, the article goes on to rule out this interpretation, claiming that plunges in consumer confidence have set off recessions in the past, as American consumers have "cut back suddenly on purchases, even though they had the income and the borrowing power to keep on buying" (italics added). Thus, under this interpretation, it is not declining income or borrowing power, but the independent effect of diminished confidence that spurs spending reductions.

(2) *Sentiment accurately forecasts economic fluctuations.* A number of articles in the *Times* and the *Journal* suggest that measures of consumer sentiment serve as superior forecasters of subsequent economic activity. In other words, sentiment may not be the proximate cause of the recession or expansion, but it is a reliable forecaster. For example, a *New York Times* article in April of 1990 contends that the forecasting record of the Michigan index implies that consumers who participate in the Michigan survey are "particularly adept at predicting broad trends, anticipating with high probability changes in unemployment rates by an average of nine months ahead of time, in interest rates by six months, and in inflation by three months" (Hershey 1990). The article goes on to document the poor regard in which sentiment is held in academic circles, but counters that the roughly 100 corporate sponsors who "use the information to help plan ... production runs and ... marketing and investment" seem to be happy with the forecasting performance of the index. Earlier in the life of the Michigan survey, however, questions that explicitly asked about consumers' spending plans were included. After several studies found little correlation between what consumers said they would spend and what they actually spent, the questions were

dropped from the survey (see Burch and Werneke 1975).

(3) *Sentiment captures consumers' forecasts of economic fluctuations.* Regardless of whether the sentiment indexes provide accurate forecasts of future activity, the sentiment indexes may still be of interest because they provide an accurate reflection of consumers' forecasts of future economic events. Regardless of how well consumers understand the economy, or how accurate their forecasts have been, if the sentiment indexes reflect consumers' expectations, they may well help explain consumer spending behavior. It is difficult to refute the logic of this argument, but it holds testable empirical implications. After all, if consumers' expectations deviate from an objective assessment of the economy, and if their spending decisions depend on their expectations, then the sentiment measures should help forecast current and subsequent consumer spending, even after taking into account the most recent data that might normally form the basis of an objective assessment of the future path of the economy. This possibility will be explored below.

(4) *Sentiment reflects current, respondent-specific economic conditions.* Another defense of the importance of sentiment is that measures of sentiment may register information about the economy that has not

Consumer sentiment is often portrayed as a fundamental driving force in the economy.

yet been reflected in publicly available economic statistics. The *New York Times* article cited above suggests that consumers "may not know the latest figures for . . . GNP, but they know that a neighbor has lost his job or that paychecks aren't stretching as far as they once did." Thus, knowledge of incipient changes in the local workplace, for example, may be reflected uniquely in the measures of consumer sentiment. This view of sentiment seems reasonable, and given the lag time in receiving government statistics on aggregate activity, suggests a potential role for sentiment in forecasting. Financial market indicators are available almost continuously, however, and they may also reflect emerging trends in the economy as they occur. Section III will test the hypothesis that

measures of sentiment provide important information about the current state of the economy that cannot be found in financial market indicators.

(5) *Sentiment reflects only current, widely known economic conditions.* A final perspective on the role of sentiment is that it simply reflects current prevailing economic conditions that are already widely known. For example, a *Wall Street Journal* article in April of 1975 suggested that "declining interest rates . . . [in part] have lifted consumer confidence . . . from the record lows of the fourth quarter" (quoted in Murray 1991). As will be shown later, a significant fraction of the movements in the consumer sentiment index can be explained by observations of widely disseminated measures such as the latest statistics on GNP growth, the rate of inflation in the CPI, the rate of unemployment, and interest rates. This perspective casts sentiment as a passive, rather than an active player in the economy. Sentiment may provide the consumer's summary of well-known economic facts, but it contains little in the way of independent information, and it is unlikely to act as an independent force in recessions or expansions.

A New Role for Sentiment in the 1990s?

Some recent articles suggest that sentiment has played a new and expanded role in the last two years. One interpretation of the cause of the 1990-91 recession, for example, holds that the Iraqi invasion of Kuwait raised the specter of the oil price shocks of the 1970s, shook consumers' confidence in the strength of the economy, and caused consumers to hold back on discretionary purchases. *The New York Times* suggested that the 1990-91 recession might have been "the first in memory that can be attributed to a case of nerves," and that "when the economy stumbled, psychology was the main culprit" (Nasar 1991b).³ Whereas in previous recessions, sentiment was an important factor, a contributing factor, a catalyst, or a tag-along, in this recession, according to this interpretation, it was the cause.

One problem with this interpretation is that if confidence were really the only cause of the recession, then a rebound in confidence should have pulled us out of recession. In fact, several newspaper articles reported (after jumps in the Michigan survey

³ Subsequent analyses have blamed the recession on other problems, ranging from the cutbacks in defense spending to overbuilding in commercial real estate and a credit crunch in the wake of bank restructuring.

in March and June of 1991) the opinion of some economists that confidence was "in the range where we can see a revival of consumer spending and . . . the economy" ("Consumers' Survey Shows Sharp Jump in Confidence" 1991). The logic seemed right: if sentiment got us in, sentiment could get us out of the recession.

Unfortunately, it did not work out that way. Despite the tremendous rebound in confidence in the first half of 1991, the economy never really took off in 1991-1992.⁴ Real GDP grew at an anemic 0.9 percent in the second half of 1991, and only in the second half of 1992 has real activity begun to show signs of life. So even if sentiment was the cause, it turned out not to be the cure.

It could be that sentiment is behaving differently now than it has in past business cycles. However, only a few quarters of data are available to test this hypothesis, and a casual analysis of these quarters provides mixed evidence. The next section presents some statistical evidence bearing on the question of whether sentiment is more tightly linked to current or subsequent consumption expenditures now than it has been over the last 30 years.

III. Evidence on the Role of Consumer Sentiment

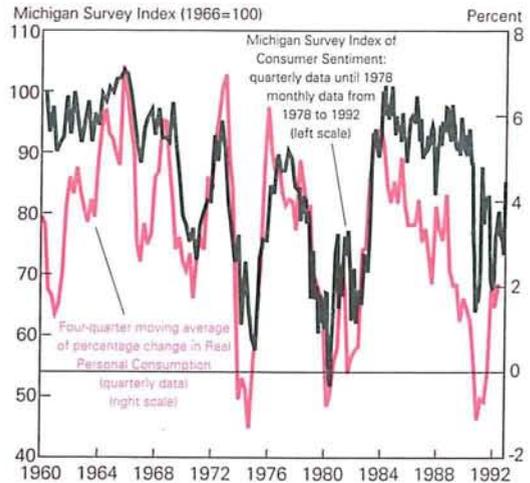
As suggested in theory (5), one view of consumer sentiment is that it largely reflects, rather than determines, current and expected economic conditions. To illustrate this point, consider Figure 2. The top panel of Figure 2 displays the Michigan index of consumer sentiment, plotted with a four-quarter moving average of the growth rate in consumption. The correlation is impressive: sizable swings in consumption are often accompanied, and sometimes preceded, by swings in sentiment. However, the correlation between real disposable personal income and consumption growth, shown in the bottom panel, is equally impressive. Does sentiment merely reflect the health of income growth? Once the growth rate in disposable income is known, how much more information does the sentiment index provide?

What Makes Consumer Sentiment (Up)Tick?

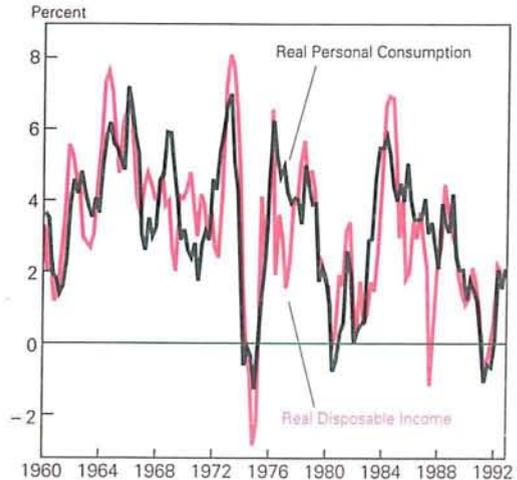
One difficulty in understanding what makes sentiment tick is that sentiment is not measured in isolation: the combined state of financial markets, labor markets, product markets, and policy is never

Figure 2

Index of Consumer Sentiment and Growth Rate of Personal Consumption



Four-Quarter Moving Average of Percentage Changes in Personal Consumption and Disposable Income



exactly the same at one time as it is at another. As a result, one cannot simply look at a confidence number and infer the state of underlying economic con-

⁴ Although the trough of the recession is dated in the spring of 1991, GNP grew at an average of 1.6 percent between 1991:II and 1992:II.

ditions. Confidence, like other economic statistics, must be interpreted in context. For example, a confidence index could register the same value when inflation is low and unemployment is high as when inflation is high and unemployment is low. This study will try to provide a rough approximation of the factors that simultaneously influence consumer sentiment in a simple regression model.

Quarterly regressions of sentiment on broad macroeconomic aggregates for the last 30 years confirm the casual observations discussed above: sentiment tends to rise as income rises, as the unemployment rate falls, as inflation falls, and as real rates of interest fall. Roughly 70 percent of the variation in sentiment can be explained using these variables, suggesting that a large part of sentiment simply reflects consumers' knowledge of general macroeconomic conditions. Table 1 reports the results from a simple regression of sentiment on real disposable income (YD), unemployment (U), inflation (π), and a short-term real interest rate (the lag of the three-month Treasury bill rate, r , less the current inflation rate, π). The average error made by the regression equation is about 6 index points. This regression equation may be viewed as summarizing the long-run or trend relationship between sentiment and broad macroeconomic aggregates.⁵ More of the behavior of sentiment may be explained by taking advantage of the fact that short-run changes in the index of consumer sentiment appear to move so as to maintain the long-run relationship reported in Table 1. The simple "error-correction" equation⁶ shown in Table 1 finds that changes in consumer sentiment are correlated with the discrepancy between last quarter's sentiment and the long-run value for sentiment predicted by the regression equation in Table 1. The t -statistic on the cointegrating discrepancy is -3.9 , and this simple equation explains about 11 percent of the variance of the change in sentiment.

Taking the long-run and the error-correction regressions together, it can be seen how well the underlying determinants of sentiment explain the movements in sentiment over the past 30 years. Figure 3 displays the Michigan index of consumer sentiment and the fitted values from the combined simulation of these two equations.⁷ Overall, the equation fits extremely well; movements in income, unemployment, inflation, and interest rates explain most of the swings in sentiment. The equation cannot, of course, explain *all* of the variation in sentiment; some "idiosyncratic" variation remains. The largest errors in predicting sentiment occur around

Table 1
A Cointegration/Error-Correction Model of Consumer Sentiment

Cointegration equation:

$$\text{Sentiment}_t = 104.8 + .0055\text{YD}_t - 1.55\text{U}_t - 4.28\pi_t - 1.33(r_{t-1} - \pi_t) + u_t$$

Sample: 1960:I-1990:IV

$\bar{R}^2 = .72$

Standard error of regression = 6.2

Augmented Dickey-Fuller test for stationarity of $u_t = -5.4$

Error-correction equation:

$$\Delta\text{Sentiment}_t = -.19 - .30u_{t-1} \quad (.077)$$

Sample: 1960:II-1990:IV

$\bar{R}^2 = .11$

Standard error of regression = 5.0

Variable Definitions:

- Sentiment: Michigan overall index of consumer sentiment
- YD: Real personal disposable income
- U: Civilian unemployment rate
- π : Annual rate of inflation in personal consumption deflator
- r : 3-month Treasury bill rate

business cycle turning points. For example, the model would have overpredicted sentiment in some quarters and underpredicted in others during the 1974-75 recession, seriously underpredicted during the 1980-82 recession(s) and the ensuing recovery, and grossly overpredicted over the past year and one-half. Thus, while sentiment clearly mirrors economic conditions, as suggested in theory (5), not all of its movements are explicable with broad macroeconomic aggregates. The following sections will consider whether the idiosyncratic variation in sentiment is correlated with current or subsequent activity, or reflects "mood swings" that are never translated into economic decisions.

⁵ Univariate tests for order of integration indicate that the sentiment index is borderline stationary, whereas income, unemployment, inflation, and the real interest rate are nonstationary. Thus this regression equation could be interpreted as a cointegrating regression. The ADF statistic indicates that the regression error u_t is stationary, so that the regression qualifies as a cointegrating relationship among sentiment and its fundamental determinants.

⁶ See Fuhrer (1992) for more details on cointegration/error-correction modeling.

⁷ The standard error from the combined equations is about 5 index points.

Figure 3

Fitted and Actual Values for Index of Consumer Sentiment



Does Sentiment Foreshadow the Future?

The most interesting hypotheses about consumer sentiment (theories (1) to (4)) suggest that measures of sentiment may help us forecast the future. The results presented above show that only a small fraction of the information in sentiment is unique to sentiment. However, the information in sentiment beyond that contained in other macroeconomic measures may allow us to improve our forecasts of economic activity, for two reasons. First, as suggested by theories (1) and (3), a direct link could exist between the independent information in sentiment and actual subsequent consumption spending; that is, consumers could spend more next month simply because they feel better today, *independent of their income, borrowing conditions, and employment prospects*. Second, as in theories (2) and (4), consumers may know about emerging labor market or product market conditions before they are reflected in government releases. If so, consumer responses to sentiment surveys will reflect this knowledge about employment and income prospects, so that the sentiment index could signal changes in income and employment (and thus consumption) before they

appear in government data releases. Thus, knowing about consumer sentiment could provide an information advantage in forecasting consumption. In either case, using sentiment in a forecasting model may improve forecast performance for both the current quarter and for subsequent quarters.

Tests of the Forecasting Power of Consumer Sentiment⁸

This section will consider simple tests of the forecasting power of consumer sentiment. The regressions will attempt to isolate the independent contribution of the Michigan index in a simple forecasting equation. All the tests are based on reduced-form forecasting models, rather than structural models, for two reasons. First, it is unclear in what way sentiment would enter a structural model of consumer spending. Second, consumer sentiment is given the benefit of the doubt by not restricting it to enter a consumption equation in the precise form suggested by consumer theory. Allowing sentiment to enter unrestricted in a non-structural forecasting equation gives the index the best chance to demonstrate its forecasting power.

Consider simple forecasting regressions of the form

$$\Delta C_t^i = b_0 + \sum_{j=1}^4 b_j X_{t-j} + \sum_{k=1}^4 c_k S_{t-k} + \varepsilon_t \quad (1)$$

where ΔC_t^i denotes the quarterly growth rate in consumption component i , X_{t-j} is a set of forecasting variables other than sentiment observed at lag j , S_{t-k} is the Michigan consumer sentiment index observed at lag k , and b_0 is the average rate of growth when all of the forecasting variables are also at their average values. These simple forecasting equations are used to test for both the *statistical* and the *economic* importance of sentiment in forecasting consumption and its components. Sentiment might be statistically significant if it consistently improved forecasts in every period, even if only by a bit. It would be economically significant if it consistently improved forecasts by a considerable amount, substantially lowering the average forecast error. Statistical significance by itself is of primarily academic interest,⁹ whereas economic

⁸ The results in this section are taken from Carroll, Fuhrer, and Wilcox (1993).

⁹ If consumer sentiment predicts a statistically significant

Table 2
Does Sentiment Help Predict Consumption Growth?

Consumption Component	Lags of Sentiment Alone		Lags of Sentiment, Income, and Consumption	
	R ²	Joint Significance	Improvement in R ²	Joint Significance
Total	.12	.000	.05	.005
Goods excluding Motor Vehicles	.14	.000	.04	.015
Motor Vehicles	.04	.000	.10	.000
Services	.06	.028	.05	.023

significance would suggest that sentiment plays an important role in the working of the economy that cannot be ignored by either academic or business economists.

Table 2 presents the results from estimating this simple forecasting equation for several components of consumption. The regressions are estimated on quarterly data from 1954 to 1990. The measure of economic significance is the increase in the regression R², that is, the fraction of the variance of the dependent variable explained by adding lags of the sentiment index to a baseline regression. The measure of statistical significance is the probability value for the F-statistic that tests the joint significance of the coefficients c_k in equation (1). The numbers in the second of each pair of columns in the table show the probability that the coefficients estimated for sentiment in the forecasting equation deviate from zero purely due to chance. A value near zero indicates high statistical significance for sentiment in that equation.

The first set of columns of Table 2 presents results from regressions that include only lags of sentiment and a constant. The second set of columns presents results from adding four lags of the Michigan index to a baseline regression that includes four lags of the growth in the consumption component, four lags of the growth in real disposable personal income, and one lag of the log discrepancy between total real consumption and real disposable income to the lags of sentiment.¹⁰ The incremental improve-

portion of future consumption growth, this may contradict the simple life-cycle permanent-income hypothesis of consumption behavior. See Fuhrer (1992).

¹⁰ The idea behind the log discrepancy is that when consumption deviates significantly from income, it must eventually grow more slowly in order to come back in line with income. Thus if last period's consumption were significantly higher than last period's

ment in R² in this second set of regressions measures the independent contribution of sentiment in the forecasting equation, once the history of income and consumption is known.

Generally, these forecasting equations behave as expected, and are consistent with the results presented in Table 1 and Figure 2. Sentiment alone explains a statistically significant and sizable fraction of total consumption growth and its components. As expected, the forecasting power attributed to sentiment decreases as the information in other variables is included in the regression. The exception is consumption of motor vehicles, for which the contribution of sentiment to R² actually rises upon inclusion of the other forecasting variables. Overall, while sentiment appears to explain a statistically significant portion of subsequent consumption growth, the economic significance of the forecasting power added by sentiment seems modest at best, especially in light of the attention that sentiment receives in the popular press. On average, including the last four quarters of data on sentiment (once last quarter's income and consumption are known) helps to explain about 5 percent of the variation in next quarter's consumption growth. For example, if the variance of consumption growth were 1, adding lags of the Michigan index to a simple forecasting equation would explain an additional 0.05 beyond what is explained by lags of income and consumption.¹¹

Does this forecast improvement afforded by sentiment derive from a direct link between sentiment

income, one would expect this period's consumption growth to be smaller, other things being equal.

¹¹ In the forecasting equations displayed in Table 2, income and consumption typically explain from 10 to 15 percent of the variation of subsequent consumption growth.

and consumption growth, or from the ability of sentiment to predict determinants of consumption better than the other forecasting variables in the regression equations? Given the small amount of forecast improvement provided by sentiment, this question is primarily of academic interest. However, Carroll, Fuhrer, and Wilcox (1993) explore this question in a forthcoming article. They find, on the whole, little evidence of a direct channel from sentiment to subsequent changes in consumption growth. Instead, they find that sentiment helps predict consumption because it predicts future income growth, which is strongly correlated with future consumption growth. Thus the evidence on the forecasting ability of the Michigan index is broadly consistent with theory (2), but not with theories (1) and (3).

Can Sentiment "Forecast the Present"?

While sentiment exhibits only modest success in predicting economic activity in *future* quarters, that does not rule out an important role in gauging the *current* state of the economy, as suggested in theory (4). One of the virtues of the consumer sentiment indexes is that they are available with almost no time lag. The Michigan index of consumer sentiment, for example, is typically released at the end of the month for which data are collected. Statistics that measure real output, inflation, and employment are released

Sentiment's value derives from its timeliness and its reflection of emerging economic conditions; its current forecasting value is primarily of statistical, not economic significance.

weeks after the end of the reporting month or quarter. Thus, relative to many statistical releases, the sentiment indexes have an edge in timeliness.

Sentiment is not the only economic variable for which rapid reporting is available, however. Measures of financial activity, such as interest rates, stock prices, and commodity prices, are available on an almost continuous basis. Participants in the financial markets are generally thought to make trades based

both on market-specific information and on their assessments of the current and future course of the economy. As a result, movements in short- and long-term interest rates and other financial asset yields could provide up-to-the-minute information about the state of the economy. Thus the information in consumer sentiment must be assessed relative to the information that is available in financial data.

The basic framework used here to assess the incremental value in contemporaneous observations of consumer sentiment is a vector autoregression (VAR), a set of regression equations that explains the variation in each variable using the lags of that variable and lags of the other variables in the system.¹² The variables in the vector autoregression will be partitioned into variables that are observable contemporaneously, such as financial market data and consumer sentiment, and variables that are observed only with a lag, such as real consumption and the unemployment rate. Equation 2 represents the vector autoregression as a set of regressions of the vector of variables X_t on k lags of X_t . The errors made by the regression equations are denoted by ϵ_t .

$$X_t = \sum_{i=0}^k A_i X_{t-i} + \epsilon_t \quad (2)$$

The VAR framework in equation (2) facilitates the distinction between the expected value of an economic variable and the news or surprise in an economic variable. The expected value— $\sum A_i X_{t-i}$ —is just the forecast for the current value of a variable made by the VAR equations using all the information up to and including the previous period. The news in an economic variable— ϵ_t —is the difference between the realized value and the expected value: it is the piece of today's realization that could not be predicted using last period's information.

If, historically, the news in contemporaneously observable variables has been correlated with the news in observation-delayed variables—if the covariance matrix of ϵ_t has significant off-diagonal entries—

¹² This exercise uses Johansen's cointegration/error-correction vector autoregressive framework to allow for the possibility of multiple cointegrating vectors among the variables in the system (Johansen and Juselius 1990). The cointegration/error-correction methodology used here differs from Hall and Wilcox (1992) in that (1) this methodology allows multiple cointegrating vectors among all of the variables in the data set, and (2) no particular normalization is imposed on any of the cointegrating vectors. Hall and Wilcox implicitly impose the normalization that the magnitude of the coefficient on the consumption variable is unity.

then current observations on contemporaneously observable variables can be used to improve the forecasts of observation-delayed variables. For example, if an unexpected increase (or "news" relative to last period's forecast) in a short-term interest rate has on average been accompanied by an unexpected decrease in inflation, then a current observation of a higher-than-expected interest rate would lead to a downward revision of the forecast of inflation. On average, taking advantage of the correlations among the forecast errors in the vector autoregression will improve the accuracy of the forecasts of observation-delayed variables, lowering the average forecast error.¹³

Measures of improvement in forecast accuracy are computed for both quarterly and monthly data. The quarterly data set spans the period from the first quarter of 1960 to the second quarter of 1992. The observation-delayed variables include total real personal consumption expenditures (PCE), real consumption expenditures on nondurable goods and services, the real stock of consumer durable goods, real disposable personal income, and the rate of inflation in the personal consumption deflator. Contemporaneously observable variables include the 3-month Treasury bill rate, the 6-month commercial paper rate, the 30-year BAA corporate bond rate, and the Michigan index of consumer sentiment.¹⁴

Estimating the vector autoregression with four lags of each variable yields a model that explains much of the variation in the variables with no discernible serial correlation remaining in the estimated residuals.¹⁵ Thus the residuals from the estimated VAR should provide a reasonable approximation to the "news" in the variables.

The top panel of Table 3 summarizes the results from this exercise. For each of the five observation-delayed variables, the table indicates the percentage reduction in the average forecast error obtained when the contemporaneous observation on sentiment is included, when the contemporaneous observations on the financial variables are included, and when all contemporaneously observable variables are included. To put the improvements due to contemporaneous data in perspective, the last column displays the reduction in the standard error that is attributable to all of *last quarter's* observations.

The reductions from the inclusion of sentiment are of the same order of magnitude as the reductions in one-quarter-ahead forecast improvement shown in Table 2. For example, if the average error made in forecasting total personal consumption expenditures

using only lagged data is 1 percent, including the current observation on sentiment would reduce that error to 0.96 percent. The reduction is statistically significant, as indicated by the asterisks, but seems economically unimportant. However, current observations on the financial variables also fail to yield much incremental improvement in forecast performance. They reduce the standard error of forecast by 1 to 3 percent, depending on the forecast variable.

The last column of the top panel provides a measure of the importance of partial current-quarter information relative to the information in all of last quarter's data. If we exclude last quarter's data from the vector autoregression, we increase the forecast standard error by as much as 36 percent. Thus one conclusion to draw from the reduced-form forecasting equations is that the incremental value in any contemporaneous data—sentiment or financial—is relatively small compared to the information in the lagged data.

Table 3 also displays the same statistics for the quarterly sample that excludes the 1990s. If the information value in sentiment is greater in the 1990s than in the rest of the sample, as suggested in some of the newspaper articles cited above, then the percentage improvement in forecasting performance ought to be noticeably worse in the pre-1990 sample.¹⁶ However, the forecast improvement in the pre-1990 sample is about the same as the improvement in the sample

¹³ Denoting the observation-delayed data by x_d and the contemporaneously observable data by x_o , the updated forecast error-covariance matrix is computed as

$$V(x_{d,t}|x_{o,t}) = V(x_{d,t}) - \text{Cov}(x_d, x_o) V(x_o)^{-1} \text{Cov}(x_d, x_o),$$

which is equivalent to the variance-covariance matrix estimate that arises from regressing observation-delayed residuals on contemporaneously observable residuals.

¹⁴ The interest rates are not constrained to enter in the form of risk or term spreads. This allows the cointegrating vectors in the Johansen vector autoregression to freely estimate the weights on interest rates, rather than imposing and testing this restriction on the more general model. The bill rate and the commercial paper rate enter with opposite signs and nearly equal magnitudes in all of the cointegrating vectors. Note also that neither commodity prices nor exchanges rates have been included in this analysis. Thus the results have been biased in favor of finding current-period predictive power for sentiment.

¹⁵ The maximum eigenvalue and trace statistics suggest the presence of seven cointegrating vectors among the nine variables, leaving two common unit roots. Other than the cointegrating restrictions, only one other restriction is imposed on the system. The p-value for the restriction that the error-correction coefficients for the Treasury bill rate are zero is 0.39, so this restriction is imposed on the quarterly data model.

¹⁶ With more observations in the 1990s, it would be possible to directly test the forecast improvement on this subsample. However, with 36 lags to estimate in the VAR, it is simply not possible to perform this exercise.

Table 3
Percentage Reduction in Forecast Standard Errors from Inclusion of Selected Variables

Quarterly Data				
Observation-Delayed Variable	Current Data			Last Quarter's Data
	Sentiment Observation	Financial ^a Variables	All Contemporaneous Variables	
1962:I-1992:II				
Total Real Personal				
Consumption Expenditures	4.1**** ^b	.9	5.3	23.4
Nondurables and Services	3.2***	1.6	5.4	30.3
Durables	2.5***	2.2	4.6	36.4
Disposable Income	.8	3.3	4.3	29.3
Inflation Rate	6.4***	3.4	9.0	12.6
1962:I-1989:IV				
Total Real Personal				
Consumption Expenditures	3.9***	1.5	5.1	25.8
Nondurables and Services	4.5***	1.1	5.2	34.0
Durables	1.4*	2.1	3.5	35.0
Disposable Income	3.0***	3.4	7.0	26.7
Inflation Rate	6.4***	4.6	10.4	10.8
Monthly Data				
Observation-Delayed Variable	Current Data			Last Quarter's Data
	Sentiment Observation	Financial Variables	All Contemporaneous Variables	
January 1979-September 1992				
Total Real Personal				
Consumption Expenditures	2.3***	4.3	6.4	
Nondurables and Services	2.4***	2.0	4.3	
Industrial Production	1.1**	3.5	4.4	
Disposable Income	.0	1.8	1.9	
Inflation Rate	.0	1.4	1.5	
January 1979-December 1989				
Total Real Personal				
Consumption Expenditures	.2	1.3	1.5	
Nondurables and Services	4.7***	1.7	6.1	
Industrial Production	1.6**	10.1	10.7	
Disposable Income	.1	2.6	2.6	
Inflation Rate	1.6**	3.8	4.4	

^aBecause several financial variables are included in the vector autoregression, statistical significance is not reported here. Overall, the three-month Treasury bill rate is the most consistently significant variable in the quarterly regressions; the 6-month commercial paper and the 6-month Treasury bill rate are the most significant in the monthly regressions. The other financial variables are generally insignificant.

^bAsterisks indicate significance at the 10%(*), 5%(**), or 1%(***) level.

including the 1990s: sentiment provides more improvement for nondurable goods and services consumption and disposable income, slightly less for total personal consumption expenditures and durable goods. Thus no compelling evidence is found to

suggest that sentiment has become a more reliable forecaster in the 1990s.

The second panel of Table 3 presents results for a parallel exercise using monthly data. The Michigan sentiment index is recorded monthly only beginning

in 1978. This requires a shortening of the sample, after accounting for lags, to begin in January of 1979. The observation-delayed variables in the monthly exercise include total real personal consumption expenditures, real consumption expenditures on non-durable goods and services, the industrial production index, real disposable personal income, and the rate of inflation in the monthly PCE deflator. Contemporaneously observed variables include the 3-month Treasury bill rate, the 6-month Treasury bill rate, the 6-month commercial paper rate, the 10-year Treasury constant maturity rate, and the Michigan index of consumer sentiment.¹⁷ Generally speaking, the results for the monthly exercise broadly confirm those from the quarterly exercise. Sentiment provides a bit of improvement in forecast performance, once financial variables are known, but its economic significance is slight. Its performance relative to financial variables is worse than in the quarterly data, but overall, contemporaneous data provide only modest improvement in forecast performance. Comparing the top panel to the bottom panel, it appears that sentiment is a better contemporaneous predictor of total monthly personal consumption expenditures in the period that includes the 1990s than it was in the pre-1990 period, but that its predictive abilities for consumption of nondurable goods and services, as well as for other measures of real activity, have deteriorated in the most recent years.¹⁸

Overall, these results support theory (4): sentiment's value derives from its timeliness and its reflection of emerging economic conditions. However, its current forecasting value is primarily of statistical, not economic significance.

¹⁷ The Johansen vector autoregression included six to eight lags of each variable, and the maximum eigenvalue and trace statistics suggested seven cointegrating vectors among the nine variables. No restrictions on the cointegrating vectors or error-correction coefficient matrix were imposed.

¹⁸ Many of the articles in *The New York Times* and *The Wall Street Journal* suggest that fear of unemployment is an important determinant of movements in the overall sentiment indexes. One question in the Michigan consumer survey asks specifically whether respondents expect unemployment to be higher, or lower, or remain the same over the next 12 months. Substituting an index based on the responses to this question for the overall sentiment index used in Table 3 yields somewhat smaller improvements in monthly forecast performance than those presented above. Including both the expected unemployment index and the overall index improves the forecast performance of industrial production and inflation a bit (1.4 percent and 2.7 percent, respectively).

¹⁹ The test regressions are run in levels form; however, because last period's level is assumed to be known, the standard error for the level is equivalent to the standard error for the rate of growth from last period to this period.

IV. Conclusions

The evidence presented above considerably narrows the field of potential roles for consumer sentiment in the U.S. macroeconomy. The evidence suggests that:

- Most of the variation in the Michigan index can be explained by fluctuations in widely disseminated data on broad macroeconomic aggregates, in accord with theory (5). However, some idiosyncratic information remains in sentiment.
- Whatever the economic interpretation attributed to sentiment, the independent information in sentiment plays a relatively small role in explaining subsequent variation in consumption expenditures. Estimates of the ability of sentiment to predict the next quarter's consumption expenditures suggest that at best, sentiment might reduce the average forecast error in consumption growth by about 5 percent.¹⁹
- Similarly, the information in contemporaneous observations on sentiment provides only modest forecast improvement. Knowing the current month's or quarter's sentiment index reduces the forecast error by 2 to 3 percent on average. However, sentiment performs no worse by this metric than contemporaneously observable financial market variables. The improvement to forecast performance afforded from all the contemporaneously observable indicators is quite small relative to the improvement due to observations of last quarter's data.
- Interestingly, although the economic and practical significance of sentiment appears to be relatively small, its predictive ability has been systematic over the last 30 years, and is thus statistically significant.
- Little evidence is available to suggest that sentiment constitutes an *independent* source of economic fluctuations, effectively ruling out theories (1) and (3). Carroll, Fuhrer, and Wilcox (1993) find that its predictive power, small but significant, most likely derives from respondents' knowledge about emerging employment and income prospects that is revealed later in government statistical releases, as suggested in theories (2) and (4).
- The evidence suggests that sentiment is no more closely linked to expenditures in the 1990s than it has been in the previous 30 years. The large drop in both sentiment and consumption in late 1990 may have strengthened the statistical link,

but the large false signal in early 1991 probably weakened it just as much.

Overall, sentiment appears to play a small but interesting role in the macroeconomy. The independent information in sentiment is small relative to the information it shares with broad macroeconomic aggregates, but that information appears to be corre-

lated with current and subsequent aggregate activity. Sentiment's predictive power is economically modest, but statistically significant and thus reliable. Finally, sentiment's predictive power arises primarily from its ability to forecast real income, rather than from a direct link between consumption and the independent information in sentiment.

References

- Adams, F. Gerard and Edward W. Green. 1965. "Explaining and Predicting Aggregative Consumer Attitudes." *International Economic Review*, vol. 6, pp. 275-93.
- Batchelor, Roy and Pami Dua. 1992. "Survey Expectations in the Time Series Consumption Function." *Review of Economics and Statistics*, vol. 74, no. 4, pp. 598-606.
- Burch, Susan W. and Diane Werneke. 1975. "The Stock of Consumer Durables, Inflation, and Personal Saving Decisions." *Review of Economics and Statistics*, vol. 57, pp. 141-154.
- Carroll, Christopher, Jeffrey Fuhrer, and David Wilcox. 1993. "Does Consumer Sentiment Predict Household Spending? If So, Why?" *The American Economic Review*, forthcoming.
- "Confidence Index Plunges." 1990. *The New York Times*, November 16.
- "Consumers' Survey Shows Sharp Jump in Confidence." 1991. *The New York Times*, July 3.
- Friend, Irwin and F. Gerard Adams. 1964. "The Predictive Ability of Consumer Attitudes, Stock Prices, and Non-Attitudinal Variables." *Journal of the American Statistical Association*, vol. 59, pp. 987-1005.
- Fuhrer, Jeffrey. 1992. "Do Consumers Behave as the Life-Cycle/Permanent-Income Theory of Consumption Predicts?" *New England Economic Review*, September/October, pp. 3-14.
- Garner, C. Alan. 1991. "Forecasting Consumer Spending: Should Economists Pay Attention to Consumer Confidence Surveys?" Federal Reserve Bank of Kansas City *Economic Review*, May/June, pp. 57-71.
- Greenhouse, Steven. 1992. "Consumer Confidence Plummets: Senators Implore Greenspan to Act." *The New York Times*, February 26.
- Hall, Brian and James Wilcox. 1992. "Consumer Sentiment: Causes and Effects." (Harvard University and University of California at Berkeley, respectively.) Working paper, February.
- Hershey, Robert D., Jr. 1990. "Recession Coming? Ask the Consumer." *The New York Times*, April 4.
- Johansen, Søren and Katerina Juselius. 1990. "Maximum Likelihood Estimation and Inference on Cointegration, with Applications to the Demand for Money." *Oxford Bulletin of Economics and Statistics*, vol. 52, pp. 169-209.
- Katona, George. *Psychological Economics*. New York: Elsevier Scientific Publishing Co., Inc.
- Leeper, Eric. 1992. "Consumer Attitudes: King for a Day." Federal Reserve Bank of Atlanta *Economic Review*, vol. 77, no. 4, pp. 1-15.
- Murray, Alan. 1991. "Clouded by Gloom: Can Attitude Be Everything?" *The Wall Street Journal*, November 4.
- Nasar, Sylvia. 1991a. "Confidence Indexes Show Brighter Consumer Outlook." *The New York Times*, March 21.
- . 1991b. "A Better Economic Mood. Many Say the Gulf Crisis Shook Confidence and Foresee a Recovery as Hope Revives." *The New York Times*, April 3.
- Throop, Adrian. 1991. "Consumer Confidence and the Outlook for Consumer Spending." *Weekly Letter*, Federal Reserve Bank of San Francisco, vol. 19, July.
- . 1992. "Consumer Sentiment: Its Causes and Effects." Federal Reserve Bank of San Francisco *Economic Review*, No. 1, pp. 35-59.
- Uchitelle, Louis. 1990. "Consumer Confidence in Worrisome Drop." *The New York Times*, August 30.
- University of Michigan, Survey Research Center. 1992. "Survey of Consumers, November 1992."