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Consumer Sentiment: Its Causes and Effects

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This paper finds that consumer attitudes, as reflected in surveys of consumer sentiment, have a significant influence on household purchases of durable goods. Normally, consumer sentiment moves with current economic conditions and bears a stable relationship to a few economic variables. At times of a major economic or political event like the Gulf War, however, consumer sentiment can move independently from current economic conditions. At such times it provides useful information about future consumer expenditures that is not otherwise available.

The 1990-91 recession has been widely attributed to a collapse of consumer confidence following Iraq's invasion of Kuwait and the military response of the United States and its allies. Similarly, military victory for the allies was generally believed to have dispelled the gloom about prospects for jobs and business, thus helping to lead the economy out of the recession. Consistent with this hypothesis, the Index of Consumer Sentiment constructed by the Survey Research Center at the University of Michigan dropped by a record amount beginning in August 1990, at the time Kuwait was invaded. With the successful completion of the war, the index then surged back to its pre-recession level in March 1991. In April, however, it dropped again and made no significant improvement through the summer, as the economic recovery turned sluggish. It therefore appeared to respond to both political and economic events.

This is not the only episode in which swings in consumer sentiment have been tied to the business cycle. The Michigan index generally has led other business cycles, and three of its components are specifically included in the Commerce Department's Index of Leading Economic Indicators. Therefore, changes in consumer sentiment could have been instrumental in triggering earlier recessions as well. Alternatively, however, sentiment ordinarily may be just a reflection of economic conditions that generally precede or coincide with a recession, without necessarily being an independent cause of downturns.

This paper analyzes the causes and effects of consumer sentiment as measured by the University of Michigan survey index.[1] It addresses the following interrelated set of questions. To what degree does consumer sentiment affect consumption spending? To the extent that it does, is consumer sentiment generally an independent factor in creating fluctuations in consumption spending, and, therefore, business as a whole, or does it usually simply respond to economic adversity, thereby reinforcing but not initiating business cycles? When swings in consumer sentiment occur, what specific economic variables are they related to and are such relationships stable? Finally, can the influences on spending that are captured by sentiment be predicted from readily available economic variables, or is

actual survey data on consumer sentiment necessary for making the most accurate forecast of consumer spending?

In Section I of the paper, earlier work on the role of consumer sentiment in consumer spending is reviewed. The role of sentiment in affecting consumer spending on durables, as well as nondurables and services, is then examined empirically in Section II. The relative significance of the individual components that go into the overall index is analyzed here as well. Section III then examines the extent to which consumer sentiment can be explained by current economic variables. Section IV compares the ability of the index of sentiment and the current economic variables that are related to it to improve the accuracy of forecasts of expenditures on consumer durables. The recent Persian Gulf War is a prime example of a situation in which consumer sentiment may have been driven by something other than current economic conditions—for example, by expected repercussions on future economic conditions or perhaps just by mass psychology. Therefore, this episode is examined separately. Finally, Section V provides a summary and some conclusions.

It is found that changes in consumer sentiment normally are caused by purely economic factors and that consumer sentiment usually bears a stable relationship to just a few economic variables. As a result, consumer sentiment usually is just a reflection of economic adversity or prosperity, reinforcing rather than initiating business cycles. At times of an unusual event like the Gulf War, however, consumer sentiment can move independently from current economic conditions. Therefore, the additional information that it provides is of some usefulness in forecasting expenditures on consumer durables. Finally, the relative importance of the index's different questions in measuring overall consumer attitudes, and hence their effect on durables purchases, differs during times of a major shock like the Gulf War from normal times.

I. Background

The use of surveys to measure consumer sentiment was pioneered by George Katona and his associates at the University of Michigan in the 1950s. The rationale for such surveys is provided by the discipline of psychological economics. According to psychological economics, a household's response to a change in income or wealth depends upon its attitudes at the time. Thus, consumer expenditures depend not only on an ability to buy but also a willingness to buy.[2]

In contrast, in standard economic theory households are assumed to react uniformly to changes in income or wealth at different points in time. Although changes in attitudes may matter for individual households, these individual differences are assumed to cancel out for the economy as a whole. But the law of large numbers applies to economic situations only if random factors prevail. If the same factor influences very many people in the same direction at the same time, deviations add up instead of canceling out. An obvious systematic factor that could produce relatively uniform reactions is the acquisition of new information through the mass media.

Katona argued that the attitudes that enter into consumer sentiment are more than simply a reflection of the current state of the economy. Therefore, they are not necessarily related to current economic variables in any stable way. Attitudes may be influenced by political and economic events that are nonquantifiable. Also, similar economic or financial developments may be perceived differently under different circumstances. Katona's point is that, while a purely mechanistic view of consumer behavior sometimes may be correct, it is not necessarily and not always correct. Particularly at turning points, consumer willingness to buy may be an important and unpredictable independent factor determining spending. If so, survey measures of consumer sentiment could contribute importantly to both forecasts of consumer spending and an understanding of consumer behavior.

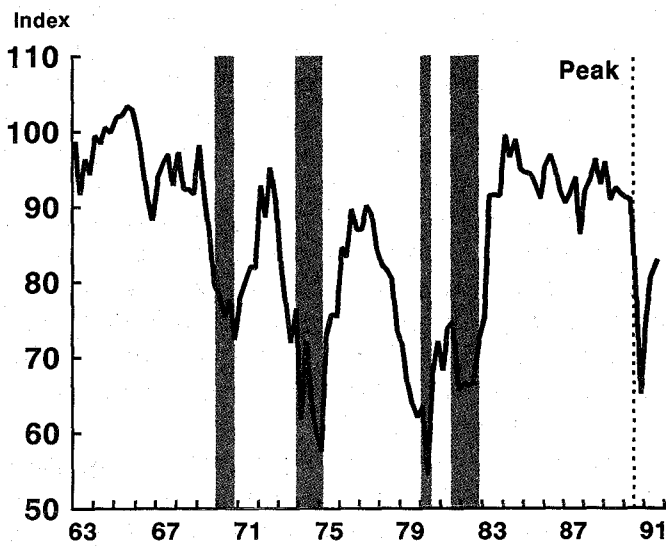
As part of this study, we examine the importance of some of the individual questions in the index of sentiment for explaining consumer spending. Since 1955 the Michigan Index of Consumer Sentiment (ICS) has contained five questions, with equal weight. They are:[3]

1. "We are interested in how people are getting along financially these days. Would you say that you (and your family living there) are better or worse off financially than a year ago?"
2. "Now looking ahead—do you think a year from now you (and your family living there) will be better off financially, or worse off, or just about the same as now?"
3. "Now turning to business conditions in the country as a whole—do you think that the next 12 months will have good times financially, or bad times or what?"
4. "Looking ahead, which would you say is more likely—that the country as a whole will have continuous good times during the next 5 years or so, or that we will have periods of widespread unemployment or depression, or what?"
5. "About the big things people buy for their homes—such as furniture, a refrigerator, stove, television, and things like that. Generally speaking, do you think now is a good or a bad time for people to buy major household items?"

As shown in Chart 1, the ICS tends to follow a cyclical pattern, with a strong tendency to lead economic downturns and a lesser tendency to lead upturns. An Index of Consumer Expectations (which is one of the 12 series in the Commerce Department's Index of Leading Economic Indicators), based on forward looking questions 2, 3, and 4, tends to lead both downturns and upturns; the Current Conditions Index (CIND) based on questions 1 and 5 leads downturns and some, but not all, upturns (Chart 2). The correlation matrix in Table 1 shows that there is a high intercorrelation among the responses to these five questions, with the exception of question 5. This question asks

Chart 1

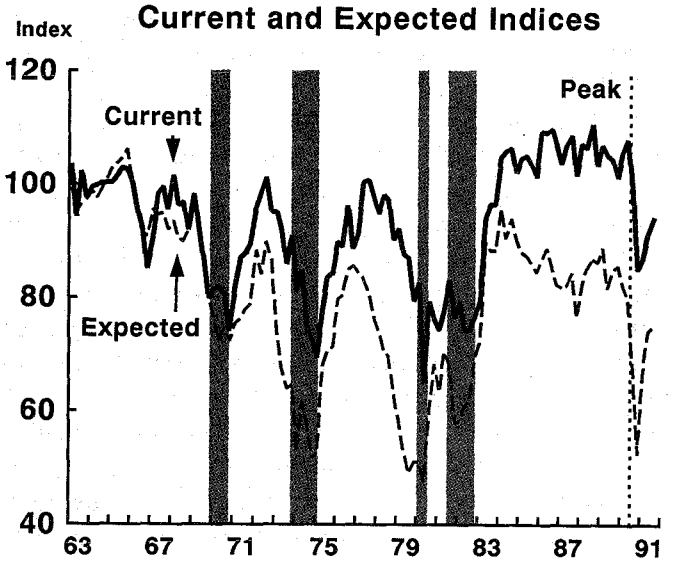
Index of Consumer Sentiment (ICS)



Shaded areas indicate periods of economic recession.
The dotted line denotes the peak of the 1990 recession.

Chart 2

Current and Expected Indices



Shaded areas indicate periods of economic recession.
The dotted line denotes the peak of the 1990 recession.

Table 1

Correlations Among Components of Index of Consumer Sentiment

		Personal Finances		Business Conditions		Buying Conditions
		Current	Expected	12 Mo.	5 Yrs.	
Personal Finances	Current	1.0				
	Expected	.823	1.0			
Business Conditions	12 Months	.790	.874	1.0		
	5 Years	.753	.851	.958	1.0	
Buying Conditions		.758	.547	.578	.523	1.0

directly about household attitudes with respect to the purchase of major household items. The correlations between question 5 and all others are between .5 and .75, while the intercorrelations among the others range from .75 to .95.

Three main views on consumer sentiment have emerged in the literature.[4] The first is the original one of Katona. In this view, sentiment is an important predictor, along with income, of spending on discretionary items like consumer durables. However, in this view consumer sentiment is not believed to be well represented by responses to any single question or to bear any stable relation to aggregate economic variables. As a result, a survey of a set of questions is deemed necessary in order to make accurate forecasts of consumer spending on durable goods, particularly at turning points. A second view is that sentiment mainly measures optimism or pessimism about future economic conditions.[5] Contemporary theories of overall consumption and saving strongly emphasize economic agents' perceptions of the current environment and expectations of its future. Thus, in "life-cycle" or "permanent income" theories of consumption, current spending on nondurables and services, as well as on durables, depends importantly on expected future income. The index of sentiment may provide a better measure of this than conventional modeling based on past observations of incomes.

Yet a third view is that the most useful aspect of the index of sentiment is a measurement of the uncertainty or risk, associated with the likelihood of job loss and/or severe income loss and attendant financial distress.[6] Although this probability is likely to be correlated to some extent with current or expected economic conditions, it affects consumer spending through different channels. A higher probability of financial distress would lead an individual household to save more in liquid form and less in illiquid form, so that liquid assets are available to cover a possible future short fall in future income. The most effective way to do this would be to postpone expenditures on consumer durables rather than on nondurables and services. In this view, the most important dimension of the index of sentiment is its measurement of confidence or mistrust, rather than optimism or pessimism. It is possible, however, that household perceptions of uncertainty or risk can be measured equally well, or better, by economic variables.

The rest of the paper attempts to discriminate among these three views. We first focus on whether the index of sentiment, or its components, provides useful information for predicting consumer spending on either durables or nondurables and services that is not contained in the usual empirical models of consumer behavior. We next examine whether measures of sentiment can be easily modeled with readily available economic data. Finally, we ask whether sentiment or its components, contain information for forecasting consumer spending that is not contained in other economic data.

II. Effects of Consumer Sentiment

In modern consumption theory, households are viewed as making a conscious attempt at achieving a preferred distribution of consumption over their lifetime, subject to the size of the economic resources expected to accrue to them. Friedman's (1957) permanent income hypothesis views consumption as a function of an anticipated long-term measure of income, equal to the expected yield on human and nonhuman wealth. The life cycle theory of Modigliani and his colleagues takes this idea one step further, allowing for the consumption of nonhuman wealth towards the end of a household's lifetime.[7] In both theories consumption refers not to current expenditures on consumer goods, but rather to the current flow of utility from consumer goods, including the existing stock of consumer durables. For simplicity, Friedman's permanent income approach is adopted here.

In the permanent income framework, consumer expenditures on nondurables and services are simply a function of permanent income. However, expenditures on consumer durables usually are viewed as following a stock-adjustment process. The desired stock of consumer durables depends upon permanent income and interest rates, and possibly also on attitudes measured by the index of consumer sentiment. Expenditures on durables in any period then become some fraction of the difference between desired and actual stocks.

Earlier studies have found that consumer sentiment significantly affects expenditures on consumer durables.[8] Using the permanent income framework, estimates of a model of expenditures on durables that uses polynomial distributed lags (a PDL model) for the period 1963.Q1 through 1990.Q4 are:

$$\underset{(-12.5)}{\text{LGCD} = -6.71} + \underset{(9.75)}{1.49\ \text{LYDP}} + \sum_{i=1}^{3} a_{-i}\text{ICP}_{-i} + \sum_{i=0}^{4} b_{-i}\text{ICS}_{-i}$$

$$+ \underset{(1.12)}{.104\ \text{LKCD}_{-1}} + \underset{(1.40)}{.146\ e_{-1}}$$

$$\sum_{i=1}^{3} a_{-i} = \underset{(-8.45)}{-.0116} \qquad \sum_{i=0}^{4} b_{-i} = \underset{(9.43)}{.00311}$$

$$\bar{R}^2 = .996 \qquad \text{S.E.} = .0235 \qquad \text{D.W.} = 2.02$$

and

$$LGCD = \underset{(-15.3)}{-6.75} + \underset{(12.3)}{1.55}\, LYDP + \sum_{i=1}^{3} a_{-i} ICP_{-i} + \sum_{i=0}^{4} b_{-i} CIND_{-i}$$

$$+ \underset{(.220)}{.0168}\, LKCD_{-1}$$

$$\sum_{i=1}^{3} a_{-i} = \underset{(-6.13)}{-.00808} \qquad \sum_{i=0}^{4} b_{-i} = \underset{(12.3)}{.00418}$$

$\bar{R}^2 = .997$ S.E. = .0215 D.W. = 1.99

where

LGCD = log of expenditures on consumer durables
LYDP = log of permanent income[9]
ICP = six-month commercial paper rate
ICS = index of consumer sentiment
CIND = current conditions component of ICS
LKCD = log of stock of consumer durables.

The *t*-statistics (in parentheses) indicate a high degree of statistical significance of the consumer sentiment index (ICS). In addition, the current conditions component (CIND) of the index actually has somewhat more explanatory power than the overall index. (Each of the questions in CIND contributes about equally to its explanatory power.) A one-point change in CIND is estimated to move expenditures on consumer durables by 0.4 percent in the same direction over a period of four quarters. About half of this effect occurs in the contemporaneous quarter. Since CIND can swing as much as 30 points between the peak and trough of the business cycle, sentiment thus appears to be able to move spending on durables as much as 12 percent over a relatively short period.

Earlier studies of the causes and effects of consumer sentiment have been subject to two potentially serious econometric problems, however. These are the interpretation of contemporaneous correlations and the possibility of "spurious" relationships between time dependent variables. A common solution to the first problem of "simultaneity" is to specify some variables as exogenous that affect other variables but are not affected by them. These exogenous variables can then be used either as instruments to proxy endogenous independent variables or as independent variables in reduced form equations. A difficulty with this procedure, however, is that it is not always clear what variables are truly exogenous in a macroeconomic system.

The second problem of "spurious" regressions arises from the fact that variables that have random time trends may appear to be correlated in finite samples, even though there is no true relationship between them.[10] Although the low estimated serial correlation in the errors of the above PDL model of consumer durables suggests that likelihood of spurious correlation due to random time trends is low, simultaneity bias still may exist. Also, previously estimated models of consumer sentiment generally do have highly serially correlated errors.

A Vector Error Correction Model

This study uses a "vector error correction" model to avoid these problems. In such a model, all variables are treated as potentially endogenous. Moreover, tests are made to ensure stationarity in the variables in order to avoid "spurious" regressions.[11] In addition, because the change in any variable is assumed to be a function of its own past changes as well as past changes in other variables, a vector error correction system is a natural vehicle for generating *ex ante* forecasts that use only information available prior to the forecast period. The variables we initially consider in this framework are the log of expenditures on consumer durables (LGCD), the log of spending on nondurables and services (LCNS), the log of personal disposable income (LGYD), interest rates as represented by the six-month commercial paper rate (ICP), and a measure of consumer sentiment either (ICS or CIND).

The change in any variable is assumed to be a function of its own past changes as well as past changes in the other variables, with lags of one to four quarters being chosen. The change in any variable also is assumed to respond to an "error correction" term equal to the lagged difference between the variable and its estimated equilibrium value. A nominal interest rate, rather than a real one, is used because of the importance of liquidity constraints for households.[12] Theoretically, the lagged stock of durables might also be included, but as in the PDL regressions it turned out to be statistically insignificant. The reason is that, although a larger stock of durables reduces the difference between desired and actual stocks, it also generates more replacement investment, and the two effects on investment spending tend to cancel each other out.

The stationarity tests that were performed are described in Appendix A, as is the construction of the error correction term. A "general-to-simple" modeling strategy was employed in which insignificant variables were dropped from the model. The final equations of the estimated vector error correction system are shown in Table 2. In the equation for consumer durables, the error correction term is highly significant, whether the overall index of sentiment (ICS) or just the current conditions component (CIND) is used to measure sentiment, as shown in equations 1a and 1b. Since the error correction term is stationary, the usual distribution for the *t*-statistic applies, easily indicating significance at the 1 percent level or better. Moreover, sentiment contributes significantly to the importance of the error correction term.[13]

Similar to the results with the PDL model, the use of CIND produces a lower standard error for the durables equation and a larger estimated response of durables expenditures to sentiment. Also, there are significant effects of lagged changes in both interest rates and sentiment on changes in expenditures on consumer durables using CIND, but not ICS. Recall that CIND contains the responses to one question that asks directly about household attitudes with respect to the purchase of major household items, as well as responses to another question that is highly correlated with those for the remaining questions in the overall index of sentiment. As a result, CIND appears to contain all the useful information in ICS for explaining expenditures on durables.

Interestingly, short-run changes in spending on durables (DLGCD) are more closely related to changes in spending on nondurables and services (DLCNS) than to changes in disposable income (DLGYD), as the latter is insignificant in both equations 1a and 1b in Table 2. This is consistent with the permanent income hypothesis, in which spending on nondurables and services is proportional to permanent income. If the desired stock of durables depends upon

Table 2

Estimated Vector Error Correction System

Sums of Coefficients on Lagged Changes in Independent Variables and Coefficient on Error Correction Term (E.C.)
(1963.Q1–1990.Q4)

	Dependent Variable	Independent Variables: Constant	ΔLGCD	ΔLCNS	ΔLGYD	ΔICP	ΔICS	ΔCIND	ΔU	E.C.	$\bar{R}^2$	S.E.
1a.	ΔLGCD	−.00758 (−1.22)	—	2.380	—	—	—	—	—	−.601 (−8.44)[a]	.42	.0267
1b.	ΔLGCD	−.00578 (−.906)	—	2.296 (3.37)[b]	—	−.0011 (−3.39)[b]	—	−.003 (4.41)[a]	—	−.796 (−7.28)[a]	.48	.0254
1c.	ΔLGCD	−.00150 (−.186)	−.584 (2.50)[c]	2.92 (2.10)[d]	—	−.0232 (4.46)[a]	—	—	−.0374 (2.32)[d]	−.315 (−3.22)[a]	.36	.0278
1d.	ΔLGCD	−.00395 (−.594)	—	2.194 (2.72)[c]	—	−.0242 (5.54)[a]	—	−.00318 (2.91)[b]	—	−.671 (−6.36)[a]	.42	.0266
2.	ΔLCNS	.003307 (−2.97)[a]	—	0.552 (4.71)[a]	—	−.0015 (3.18)[b]	—	—	—	—	.17	.00476
3.	ΔLGYD	.00066[b] (−.306)	—	1.075 (4.07)[a]	—	—	—	—	—	—	.13	.00916
4.	ΔICPQ	.04299 (−.375)	—	—	—	.0437 (4.39)[a]	—	—	—	—	.13	1.173
5a.	ΔICS	−.132 (−.294)	—	—	—	−3.07 (7.12)[a]	0.0846 (2.291)[c]	—	—	—	.20	4.726
5b.	ΔCIND	.695 (−.452)	—	—	—	−3.616 (7.29)[a]	—	−.150 (6.23)[a]	—	—	−.25	4.682

Levels of Significance (F-Statistic for lagged changes and *t*-statistic for constant and error correction term (E.C.))
[a]Significant at 1%
[b]Significant at 2.5%
[c]Significant at 5%
[d]Significant at 10%

permanent income, then purchases of durables should be more closely related to the current consumption of nondurables and services than to current income in the short run. In the longer run, however, income should become a better measure of permanent income, which is consistent with the greater significance of disposable income than spending on nondurables and services in the error correction term.

The error correction term does not play a significant role in explaining changes in any of the variables besides expenditures on durables. This is consistent with the strong response of durables expenditures to sentiment, leaving no significant adjustment to be done elsewhere. The change in spending on nondurables and services (eq. 2) is found to depend only on past changes in the consumption of nondurables and services and past changes in interest rates; and it is not influenced by consumer sentiment in any way. This result is not consistent with a rational expectations version of the permanent income hypothesis in which consumption responds only to new information about permanent income, and hence is a random walk unrelated to past values of any variables.[14] But it is consistent with a modified version of the rational expectations version permanent income hypothesis, in which adjustment costs prevent an instantaneous response to permanent income.

The finding that consumer sentiment significantly influences expenditures on consumer durables, but not spending on nondurables and services, suggests that consumer sentiment is something other than just a better measure of perceptions of permanent income. The important thing that it seems to measure is the perception of uncertainty, or risk, and the corresponding probability of financial distress. If the probability of financial distress is high, at the margin households should prefer to hold liquid assets and consume the income from them on nondurables and services, rather than holding illiquid consumer durables. They would therefore allocate their consumption away from the satisfaction provided by illiquid consumer durables and towards nondurables and services. However, greater uncertainty and risk also should lead to precautionary increases in the overall saving rate, causing a decline in total consumption. The effects on expenditures on nondurables and services appears to be approximately offsetting, leaving them roughly unchanged.[15]

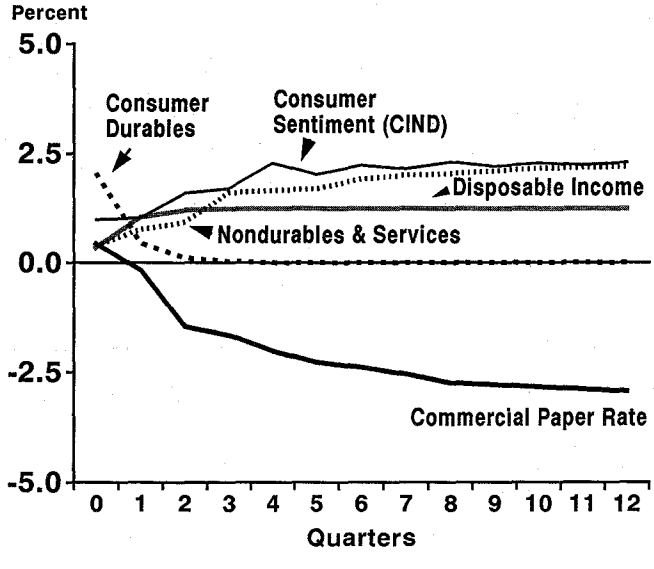
Current changes in disposable income (eq. 3) are found to be significantly related only to past changes in the consumption of nondurables and services. This too is consistent with a modified rational expectations version of the permanent income hypothesis. If expectations are forward-looking, then future changes in income should be related to past changes in spending on nondurables and services.[16] Current changes in the commercial paper rate (eq. 4) are found to be significantly related only to past changes in itself. Changes in either of the sentiment indexes (eqs. 5a and 5b) are related only to own past changes and past changes in the commercial paper rate. Thus, changes in sentiment cause changes in spending on durables, in a statistical sense, and are not caused by them.

Response of Durables Purchases to Sentiment and Other Factors

Next we examine how spending on consumer durables responds to shocks to sentiment, as well to the other variables. These shocks are set equal to the standard deviation of the disturbances to each variable over the sample period.[17] A disturbance to the system of first difference equations is temporary. But its effect on the level of spending on durables generally is permanent. Chart 3 shows that the effect on the level of durables expenditures of an "average" shock to the current component of consumer sentiment (CIND) is about as large as the effect of a shock from the commercial paper rate or from spending on nondurables and services. Thus, consumer sentiment is truly an important determinant of spending on durables, on a par with other factors that usually are thought to be important. The effect of a shock to disposable income on purchases of durables is somewhat smaller. Finally, the response of consumer durables to a shock to durables themselves affects durables purchases only temporarily. This occurs because a disturbance to durables is gradually eliminated through the response of durables expenditures to the error correction term.[18]

Chart 3

Dynamic Response of Consumer Durables to an Increase in:



We have thus established that consumer sentiment is a statistically significant variable for explaining purchases of consumer durables. Also, disturbances to consumer sentiment are important relative to other variables in explaining the overall variation in expenditures on consumer durables. The next question is the usefulness of sentiment in making actual *ex ante* forecasts of durables purchases. For a preliminary answer, this vector error correction system (either eq. 1a or 1b and eqs. 2-5, Table 2) was estimated over an initial sample period, here chosen to be 1963.Q1-1975.Q4. Next the estimated system was used to make a forecast of spending on durables one, two, four, and eight quarters ahead. Then the system was reestimated using data from the initial sample plus the quarters just forecast. The "new" system was used to generate a new set of forecasts. Forecasting errors over the period 1976.Q1 to 1989.Q4 for systems using either no measure of sentiment (dropping eq. 5 and sentiment from eq. 1), or the ICS (using eqs. 1a and 5a) or CIND (with eqs. 1b and 5b) measures of sentiment, were then compared with those of a naive model that forecasts future expenditures simply on the basis of its trend rate of growth. These comparisons are shown in Table 3.

Even without including a sentiment variable, the estimated vector error correction system forecasts expenditures on consumer durables more accurately than a naive model does. The root-mean-squared forecasting error is reduced by 25 to 40 percent, depending on the forecast horizon (line 2 versus line 1, Table 3). Including the simple model of ICS (eqs. 1a and 5a, Table 2) in the system changes these forecast errors by relatively small amounts. It raises the two-quarter-ahead root mean squared error slightly, lowers the four-quarter-ahead error slightly, and reduces the eight-quarter-ahead error by 20 percent (line 3 versus line 2, Table 3). But substituting the simple model of the CIND (eqs. 1b and 5b, Table 2) measure of consumer sentiment in the system lowers the root mean squared error by 12 to 35 percent, depending on the forecast horizon (line 4 versus line 2, Table 3). Thus, for this period the inclusion of consumer sentiment improves the accuracy of *ex ante* forecasts of durable purchases markedly, but primarily only if the current conditions component of sentiment (CIND) is used.

Table 3

Out of Sample Root Mean Squared Errors in Forecasting lnGCD

	1976.Q1–1989.Q4 Quarters Ahead			
	1	2	4	8
1. Naive	.035	.046	.070	.127
Vector Error Correction System				
2. Without Sentiment	.034	.042	.052	.077
3. Basic Model with ICS	.034	.045	.048	.061
4. Basic Model with CIND	.031	.037	.043	.050

III. Causes of Consumer Sentiment

This section addresses the issue of the underlying explanation of consumer sentiment and its important current conditions component. Is sentiment mainly a psychological or anticipatory variable that is not easily explained by current economic variables? Or is the sentiment index basically just filtering current economic data? In the previous section, it was found that changes in consumer sentiment, or in the current conditions component of it, could be forecast fairly well by past changes in interest rates and past changes in sentiment itself. But if a better economic explanation of consumer sentiment could be found, better forecasts of durables spending might be obtainable. Alternatively, if the sentiment index filters the relevant economic variables poorly and also does not contain any important purely psychological component, better forecasts might be obtained by using those variables directly. We examine these issues next.

The Traditional Approach

There is little consensus in previous studies on the set of economic variables that might best explain consumer sentiment. However, one of the most coherent earlier approaches is Mishkin's "liquidity hypothesis" (1976, 1977, 1978). This hypothesis focuses on the illiquidity of consumer durables, which creates a loss for consumers if they try to sell durables (or borrow against them) in an emergency. As a result, consumers who expect not to be able to pay their bills readily would prefer holding liquid assets rather than illiquid consumer durables. In effect, the opportunity cost of holding consumer durables increases substantially when consumers get into financial trouble. Thus, as the probability of financial distress increases, consumers lower their demand for durables. As discussed earlier, the evidence of a positive response of spending on durables to movements in consumer sentiment, in contrast to the lack of response of nondurables and services, is consistent with this view. It suggests the important thing that consumer sentiment measures is perceptions of the

probability of financial distress, rather than perceptions of permanent income.

Mishkin argues that, besides depending upon the expected level and variance of income, the probability of financial distress should vary positively with the consumer's debt and negatively with his holdings of financial assets. When indebtedness is high, the consumer has large contractual payments for debt service that increase the likelihood of financial distress, thus decreasing the demand for consumer durables. In contrast, larger holdings of financial assets increase the consumer's buffer against bad times, and so increase the demand for consumer durables. Thus, consumer sentiment (ICS) should be positively correlated with real financial assets of households (FIN) and negatively correlated with their indebtedness (DEBT) at the beginning of the quarter. It should also be positively correlated with transitory income (YDT), which acts as a proxy for upside or downside risk.[19] Also, inflation in consumer prices (DLCPI) tends to affect consumer sentiment adversely because it is usually associated with greater uncertainty.[20] An updated estimate (sample period 1963.Q1-1990.Q4) of Mishkin's model of ICS is:

$$\begin{aligned} ICS = {} & 78.6 + .746\ FIN - 1.94\ DEBT + .169\ YDT \\ & (9.21)\ (2.61)\ (-2.17)\ (4.41) \\ & - 3.33\ DLCPI + .708\ e_{-1} \\ & (-6.01)\ (9.99) \end{aligned}$$

$\bar{R}^2 = .885$ S.E. = 4.15 D.W. = 2.24

All of the variables have theoretically correct signs and significant *t*-statistics. Note also that the decomposition of the household balance sheet into its debt and financial assets components in the liquidity hypothesis is supported, since the absolute value of the estimated coefficient on debt is more than twice as large as on financial assets. The independent variables in this model could potentially affect ICS with a lag for two reasons. First, the impact of adverse conditions on consumer sentiment is likely to be stronger the longer these conditions have persisted. Second, the effect of economic conditions on sentiment may be "contagious," as consumers find out about the feelings of others. These effects, if they exist, could be captured by the inclusion of lagged ICS. But like Mishkin, we find that the lagged ICS is not significantly positive, suggesting an absence of lagged adjustment.

While Mishkin's model seems to work reasonably well as an explanation of consumer sentiment, other investigators have used a larger set of economic variables to explain sentiment.[21] These have included changes in stock prices, the unemployment rate and its change, the real price of oil and its change, and interest rates. All of these variables can be interpreted as measures of general economic uncertainty and risk, but without special emphasis on household balance sheet positions.

When these explanatory variables are added to Mishkin's model of ICS, lagged ICS becomes significant, and the significance of FIN, DEBT, and YDT evaporates. Of the remaining variables, the rate of inflation (DLCPI), the percent change in the S&P index of stock prices (DLSP), and the change in the unemployment rate (DU) are statistically significant in explaining ICS, with a significant degree of lagged adjustment. The current conditions component of sentiment (CIND) turns out to be well explained by this same set of variables as well as by the percent change in the real price of oil (DLPOIL), also with a significant degree of lagged adjustment. Thus, the preferred equations following the traditional approach for selecting the set of explanatory variables are:[22]

$$\begin{aligned} ICS = {} & 28.2 + 2.97\ DLCPI + 2.00\ DLSP \\ & (7.14)\ (4.99)\ (3.51) \\ & - 5.40\ DU + .710\ ICS_{-1} - .320\ e_{-1} \\ & (-5.22)\ (17.1)\ (3.13) \end{aligned}$$

$\bar{R}^2 = .967$ S.E. = 3.63 Significance level of LM test = .36

$$\begin{aligned} CIND = {} & 20.1 - 1.10\ DLCPI + .193\ DLSP - 9.60\ DLPOIL \\ & (6.15)\ (-2.38)\ (3.55)\ (-2.20) \\ & - 5.74\ DU + .798\ CIND_{-1} - .418\ e_{-2} \\ & (-5.82)\ (23.6)\ (4.22) \end{aligned}$$

$\bar{R}^2 = .876$ S.E. = 3.83 Significance level of LM test = .70

An Expanded Error Correction Model Approach

The equations for the levels of sentiment estimated by the traditional approach are potentially "spurious," however, due to possible correlations caused by random time trends. An indication that this is a possibility is that, in the absence of correction for serial correlation or the use of lagged dependent variables, the $\bar{R}^2$ is almost as high as the Durbin-Watson statistic.[23] This suggests that some of the independent variables are nonstationary and therefore possibly accidently correlated with consumer sentiment, the level of which is also nonstationary.

Even if some of these variables are nonstationary, however, so long as they are cointegrated with sentiment they can be used in level form in an error correction model.

Table 4

Expanded Error Correction Models of Consumer Sentiment

Summed Coefficients on Lagged changes in Independent Variables and Coefficients on Error Correction Term (E.C.) and Dummy Variables
1963.Q1–1991.Q4

Independent Variables		Dependent Variable ΔICS		ΔCIND	
Constant		−.119 (−.281)	.246 (.685)	.0905 (.218)	.235 (.620)
ΔICS		.481 (3.08)[b]	.229 (3.49)[b]	—	—
ΔCIND		—	—	.356 (−4.59)[a]	−.0424 (4.53)[a]
ΔICP		−1.93 (2.80)[b]	−2.33 (2.07)[c]	−3.40 (6.17)[a]	−3.19 (5.24)[a]
ΔU		—	—	−6.36 (4.03)[a]	−7.21 (4.16)[a]
E.C.		−.262 (−3.41)[a]	−.204 (−3.15)[a]	−.229 (−3.41)[a]	−.178 (−2.83)[a]
D72.1	Nixon wage and price controls	—	5.85[c] (1.52)	—	3.27 (.801)
D72.4		—	−11.2 (−2.98)[a]	—	−4.58 (−1.17)
D74.1-3	Oil embargo	—	−9.95 (−2.49)[a]	—	−2.98 (−1.27)[c]
D75.2-3		—	10.0 (2.50)[a]	—	9.34 (2.83)[a]
D80.2	Carter credit controls	—	3.81 (−.99)	—	−8.29 (−1.97)[b]
D80.3		—	11.0 (2.72)[a]	—	10.5 (2.35)[a]
D87.4	Stock market crash	—	−5.48 (−1.49)[c]	—	−5.61 (−1.43)[c]
D87.1		—	5.05 (1.37)[c]	—	5.64 (1.43)[c]
D90.3-4	Gulf War	—	−14.4 (−5.41)[a]	—	−9.87 (−3.45)[a]
D91.1		—	6.70 (1.66)[b]	—	—
D91.4	Post-Gulf War	—	−13.2 (3.37)[a]	—	−10.2 (−2.52)[a]
$\bar{R}^2$		.27	.55	.35	.51
S.E.		4.50	3.61	4.35	3.80

Levels of Significance (F-statistics for lagged changes and *t*-statistics for constant, E.C. term, and dummies)
[a]Significant at 1%
[b]Significant at 5%
[c]Significant at 10%

Therefore, we next examine the stationarity of the previous menu of independent variables and their degree of cointegration with consumer sentiment. This allows us to construct an error correction model that is free of spurious correlation.

The stationarity tests that were performed are described in Appendix B, as is the construction of the error correction term for models of sentiment. The only variables that are both nonstationary in levels and cointegrated with the two measures of consumer sentiment are the rate of inflation in consumer prices (DLCPI) and the civilian unemployment rate (U). Therefore, these variables are used to construct error correction terms for both ICS and CIND. However, other variables may contribute to short-run changes in sentiment. In conformity with a "general-to-simple" modeling strategy, error correction models (with 4 lags) using inflation and unemployment were first estimated, and insignificant lagged changes were dropped. The statistical significance of lagged changes in other variables then was tested. The final error correction equations for explaining both measures of consumer sentiment are shown in Table 4.

These expanded error correction models of sentiment confirm the importance of changes in interest rates, and changes in unemployment in the case of CIND, in conditioning short-run changes in sentiment. Changes in other variables, except lagged changes in sentiment itself, are insignificant. Also, a somewhat tighter fit is obtained for CIND than for ICS. This is not surprising. The current conditions component of sentiment should be more closely related to current economic variables than the expected conditions component. These expanded error correction models of sentiment are quite different from those obtained from the previous regressions in the levels of the variables. Stock prices and oil prices are not included as independent variables, but interest rates are, and the dynamics of the effects of inflation and unemployment on sentiment are more complex.

Table 5

Out of Sample Root Mean Squared Errors in Forecasting lnGCD

Vector Error Correction System	1976.Q1–1989.Q4 Quarters Ahead			
With ICS	**1**	**2**	**4**	**8**
1. Basic Model	.034	.045	.048	.061
2. Expanded Model of Sentiment	.034	.047	.054	.085
3. Actual Value of Sentiment	.034	.047	.059	.110
With CIND				
4. Basic Model	.031	.037	.043	.050
5. Expanded Model of Sentiment	.031	.038	.049	.069
6. Actual Value of Sentiment	.031	.038	.043	.079
With Economic Variables for Sentiment				
7. Actual Unemployment and Inflation, instead of Sentiment, in Durables Equation	.032	.038	.045	.059
8. Actual Unemployment and Actual CIND, instead of Sentiment in Durables Equation	.029	.035	.044	.081

IV. Relative Forecasting Power of Sentiment Indicators

The expanded error correction models of consumer sentiment improve the in-sample explanation of the change in sentiment significantly, raising the coefficient of determination by 35 to 40 percent compared with simpler earlier error correction models (Table 4 versus Table 2). But this improved modeling of sentiment does not carry over into any greater accuracy in forecasting spending on durables. As shown in Table 5, the accuracy in forecasting durables is worsened somewhat at all horizons with the expanded models of ICS and CIND, even though actual rather than forecasted values of inflation and unemployment are used (lines 2 and 5).[24] Furthermore, substituting actual survey values of ICS or CIND for predicted values in the durables equation does not improve the forecast of expenditures on durables either, but on the whole tends to worsen it (lines 3 and 6).

Thus, this evidence suggests that in the 1976 to 1989 period consumer sentiment generally did not have an important component that both helped to predict consumer spending on durables and was not stably related to current economic variables. Rather the opposite is suggested, namely, that as good or better forecasts of expenditures on durables might be obtained simply by using the economic variables that are related to sentiment directly in a forecasting equation for durables, rather than using survey values of sentiment. This possibility is examined by substituting the unemployment rate and the inflation rate for sentiment in the cointegrating equation for consumer durables (Table

A2). The corresponding error correction model of expenditures on durables (Table 2, eq. 1c) has a somewhat higher standard error and somewhat lower coefficient of determination than before. But the resulting forecasts of durables expenditures, using actual values of unemployment and inflation, are significantly more accurate than if the actual survey value of ICS is used (Table 5, line 7 versus line 3). Also, forecasting accuracy is about on a par with that using the actual survey value of the more powerful CIND measure of sentiment, being better at some horizons and worse at others (Table 5, line 7 versus line 6). This system also forecasts durables expenditures about as well as the system containing either the simple (line 4) or expanded (line 5) error correction models of CIND.

Finally, a combination of indicators measuring sentiment was tried. Both the unemployment rate and CIND were included in the cointegrating equation for consumer durables (inflation being omitted because it takes on the "wrong" sign), shown in Table A2. Forecasts using the resulting error correction model of expenditures on consumer durables (Table 2, eq. 1d), and actual values of unemployment and CIND, were not significantly more accurate than ones using either unemployment and inflation or CIND alone. As shown in Table 5, at less than a 4-quarter horizon, the forecast error using both economic variables and sentiment (line 8) is slightly smaller than when either is used alone, but at an 8-quarter horizon it is much larger.

Thus, over the 1976 to 1989 period, neither the overall index of consumer sentiment (ICS), nor the more powerful current conditions component (CIND), generally appears to contain any information not already contained in economic variables that is useful for forecasting expenditures on consumer durables. In particular, the substitution of unemployment and inflation for sentiment produces forecast errors that are at least as small as those using sentiment alone; and an even simpler model of sentiment based just on interest rates also produces forecast errors at least as small. Moreover, measuring consumer attitudes with a combination of a sentiment index and economic variables does not reduce forecast errors below those obtained by using economic variables alone.

The Gulf War and Consumer Spending

From August through October of 1990, the Michigan index of consumer sentiment recorded the biggest decline in any three-month period in its 44-year history; and over the next year it failed to recover fully. This decline was triggered by Iraq's invasion of Kuwait and the subsequent military response of the United States and its allies. As a result, consumer sentiment temporarily deviated from its normal relationship with economic variables.[25] As shown in Charts 4A and 4B, the expanded error correction models of consumer sentiment (estimated through 1990.Q2) fail to predict both the sharp declines in the ICS and CIND measures of consumer sentiment from 1990.Q2 to 1990.Q4 and the subsequent increases from 1990.Q4 to 1991.Q3, even though the actual values of the explanatory economic variables are used. While higher unemployment tended to depress the predicted value of sentiment in this period, falling interest rates and declining inflation worked in the other direction. The net effect is a predicted increase in the ICS measure of sentiment and only a small predicted decrease in the CIND measure. This is thus a clear case of sentiment moving independently from current economic

Chart 4A
Consumer Sentiment (ICS)

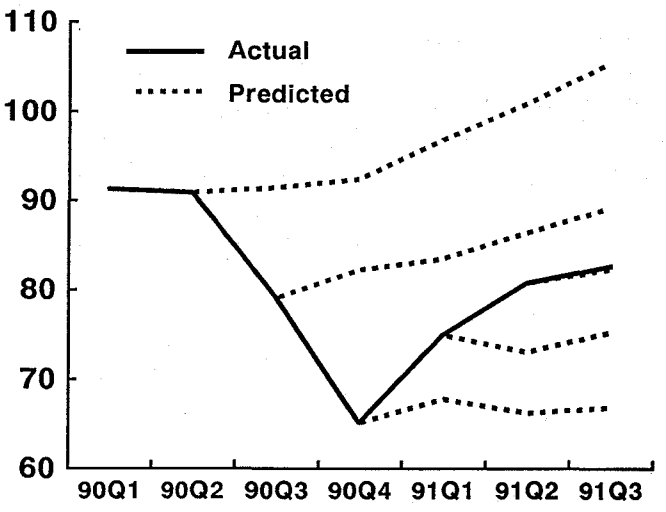
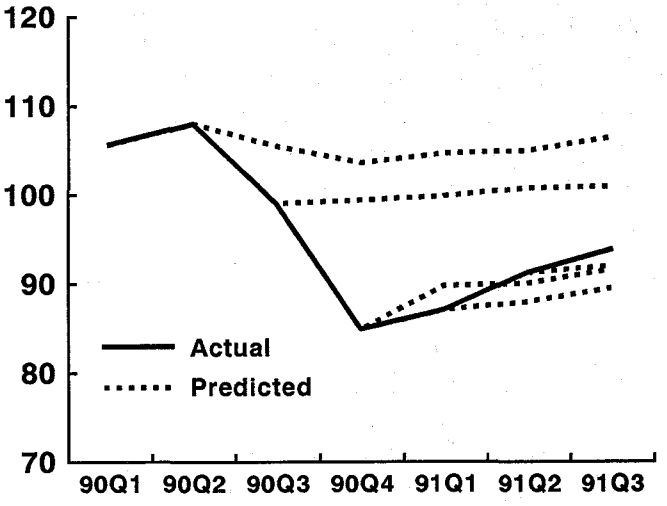


Chart 4B
Current Conditions Component of Consumer Sentiment (CIND)



conditions as the result of a major political event, and an exception to the overall results for the 1976 to 1989 period.

Whether the effect of consumer attitudes on expenditures is better measured by the indexes of sentiment or economic variables in this period is examined in Table 6. This shows the root-mean-squared errors in forecasting consumer expenditures on durables in the 1990.Q3 to 1991.Q3 period for models estimated through 1990.Q2. The evidence here very strongly suggests that when sentiment and economic variables diverge, consumer spending on durables tends to follow the path of sentiment.

In the first place, forecasts of durables purchases from the vector error correction system in this period have lower errors if sentiment is omitted entirely than if the economic variables usually explaining sentiment are employed. The errors with either the basic (lines 2 and 5) or expanded (lines 3 and 6) models of sentiment are both larger than without sentiment (line 1), as are the errors from using economic variables directly in the durables equation (lines 8 and 9). Thus, the economic variables that usually explain sentiment do not contribute at all to the accuracy of forecasts of durables purchases in this period.

Table 6

Out of Sample Root Mean Squared Errors in Forecasting lnGCD

Vector Error Correction System		1990.Q3–1991.Q3
1.	Without Sentiment	.072
	With ICS	
2.	Basic Model	.095
3.	Expanded Model of Sentiment	.100
4.	Actual Value of Sentiment	.044
	With CIND	
5.	Basic Model	.119
6.	Expanded Model of Sentiment	.129
7.	Actual Value of Sentiment	.057
	With Economic Variables for Sentiment	
8.	Actual Unemployment and Inflation, instead of Sentiment, in Durables Equation	.084
9.	Actual Unemployment and Actual CIND, instead of Sentiment in Durables Equation	.075

Second, forecast errors are reduced by 20 to 40 percent if the actual value of a sentiment index is used in the model, compared with using no measure of sentiment at all. Interestingly, also in this period the broad ICS index of sentiment gives lower forecast errors than the narrower CIND index covering only current conditions, which is the opposite of the results in the earlier 1976.Q1 to 1989.Q4 period. The likely reason is that a major economic or political event, such as the Gulf War, significantly alters expectations of economic conditions relative to perceptions of current economic conditions, whereas normally expected conditions tend to be fairly highly correlated with current conditions and do not add any significant information. This is indeed seen in Chart 2, where in 1990 the index of expected conditions drops significantly more than the index of current conditions.

The relative size and patterns of these forecasting errors for the 1990.Q3 to 1991.Q3 period are shown graphically in Chart 5A. The forecast of durables purchases from the vector error correction system that is based on the actual value of the overall ICS index turns down immediately, due to the sharp drop in expected conditions, and is roughly in line with the actual drop in purchases of consumer durables in the latter half of 1990. The forecast based on the actual value of the current conditions index (CIND) drops much more gradually; and the forecast based on actual unemployment and inflation shows a sustained increase in spending.

The accuracy of these forecasts depends in part on the ability of the vector error correction system to capture an unexpected decline in income, as well as on the effect of consumer attitudes on spending. So a more precise reading of the best measurement of consumer attitudes can be had by looking at the predictive accuracy of the durables equation alone, using actual values of all the independent variables. As shown in Chart 5B, this strongly confirms the accuracy of the overall ICS index of consumer sentiment in measuring consumer attitudes during the Gulf War. The forecast of durables purchases using the ICS index follows the actual pattern of spending quite closely. The forecast using the CIND current conditions component shows a small increase in spending, with the effects of declining interest rates tending to offset the effects of the relatively small decline in CIND. Finally, the durables equation that substitutes unemployment and inflation for a measure of sentiment forecasts even larger increases in spending because of large interest rate effects relative to the depressing effect of higher unemployment.

The 1990-1991 period was an exceptional one, in which consumer sentiment lost its anchor to current economic conditions. However, sentiment remains cointegrated with inflation and unemployment even if observations from this

period are included. This suggests that sentiment returned to its long-run relationship with these variables once the special circumstances associated with the Gulf War had dissipated. This, in fact, appears to have occurred by the second and third quarters of 1991, following the allied victory in March 1991, as evidenced in Charts 4a and 4b.

When the expanded error correction model of sentiment is estimated through 1990.Q3, instead of through 1990.Q2, it still *overpredicts* changes in ICS and CIND in future periods, suggesting that significant "unexplained" effects on sentiment still were present. Then, if the end point of estimation is moved up to 1991.Q1, the model significantly *underpredicts* the change in sentiment as euphoria associated with the military victory in March drove it up. By the second and third quarters of 1991, however, the special influence associated with the Gulf War appears to have gone. This is indicated by the fact that the economic model of sentiment forecasts changes in either ICS or CIND between the second to third quarter of 1991 with little error.

There actually have been several other periods when consumer sentiment similarly became temporarily detached from current economic conditions. Dummy variables were introduced into the expanded error correction models of both ICS and CIND to test for these influences. As shown in Table 4, the statistical significance of these dummy variables indicates that there were unusual effects on consumer sentiment during the Nixon wage and price controls, the 1973-74 oil embargo, the 1987 stock market crash, and the Carter credit controls, in addition to the period of Gulf War. The Nixon wage and price controls had a positive effect on sentiment, while all of the other events depressed sentiment.

V. Summary and Conclusions

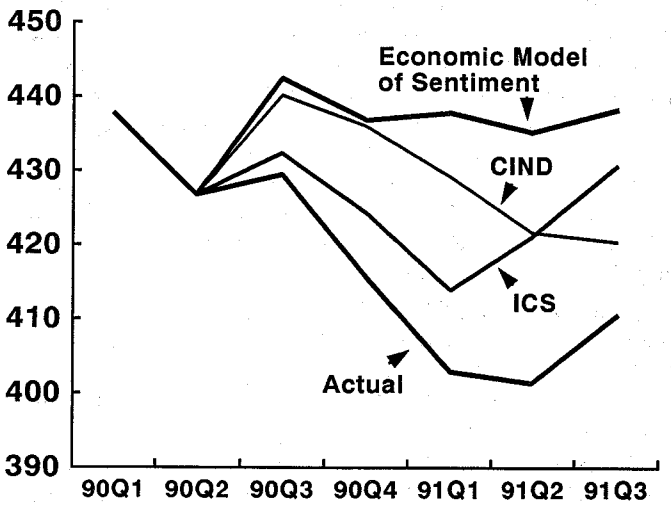
This paper has used error correction models to examine the causes and effects of consumer sentiment. It finds that movements in consumer sentiment cause changes in spending on consumer durables in a statistical sense at all times, but that expenditures on durables do not cause sentiment. Furthermore, expenditures on nondurables and services are not causally related to sentiment at any time, consistent with the hypotheses that sentiment measures the degree of uncertainty held by households, rather than just optimism or pessimism about the future.

In normal times, the important thing that consumer sentiment measures for forecasting durables expenditures is household perceptions of the current state of economy, including whether or not it is a good time to buy major household items. Ordinarily their perception of future economic conditions does not move very differently from their perceptions of current conditions, and so does not have any important additional effect on durables purchases. In fact, forecast errors normally are lower if only the current conditions component of the sentiment index is used, rather than the overall index. In addition, if economic variables such as the unemployment rate and inflation are substituted for the value of sentiment in a model

Chart 5A

Actual and Predicted Expenditures on Consumer Durables

Billions of 1982 Dollars

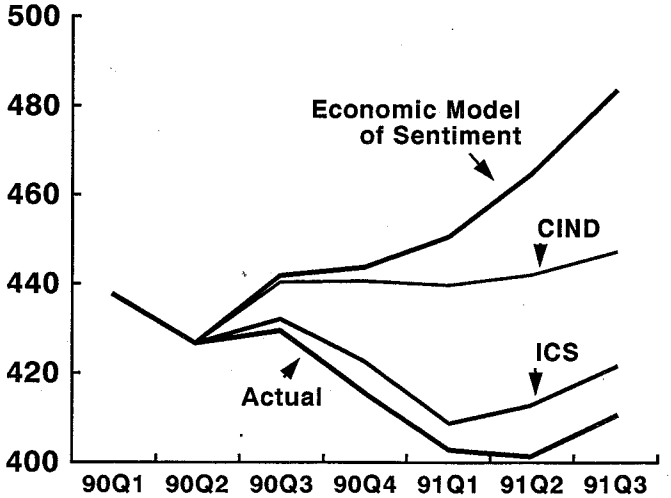


Predictions using vector error correction system, except for actual values of sentiment, unemployment and inflation.

Chart 5B

Actual and Predicted Expenditures on Consumer Durables

Billions of 1982 Dollars



Predictions using actual values of all independent variables in the consumer durables equation from the vector error correction system.

of durables expenditures, forecasts are usually at least as accurate as when only the current conditions component of the sentiment index is used.

This normal pattern tends to be reversed at times of an unusual economic or political event like the Persian Gulf War, however. Such an event can move expected economic conditions independently from current conditions, and the resulting change in consumer attitudes can significantly influence expenditures on durables.[26] As a result, forecasting errors using the overall index of sentiment are lower in such a period than if just the current conditions index of sentiment is used. Furthermore, because sentiment is affected by unusual factors in such a period, it becomes detached from current economic variables. As a result, economic models of sentiment break down, and the substitution of economic variables for sentiment in models of durables expenditures no longer produces superior forecasts.[27]

The practical ability to use the sentiment index for true *ex ante* forecasts of durables expenditures at the time of a major shock is limited, however, by the fact that the lag between the values of sentiment that are actually *known* and future expenditures is relatively short. A majority of the response is completed within two quarters and the full response takes about four quarters. In contrast, in normal times reasonably good *ex ante* forecasts of durables expenditures, using only information available prior to the forecast period, can be made over spans as long as eight quarters by modeling consumer sentiment with economic variables in a vector error correction system.

Endnotes

1. The Michigan index is available for a longer period than the alternative measure compiled by the Conference Board. In addition, preliminary tests showed it to be a better predictor of expenditures on consumer durables. See Throop (1991a).

2. A useful treatise on psychological economics is Katona (1975).

3. In compiling the ICS, for each question a "balance score" is calculated equal to the proportion of households giving favorable replies minus the proportion giving unfavorable replies, plus 100 (to avoid negative numbers). The balance scores to the individual questions are summed, and then divided by the base year figure (1966).

4. Strumpel, Morgan, and Zahn (1972) contains representative studies by leading economists and references to the rather large amount of literature on this subject.

5. This point of view is well represented by Tobin in Strumpel, Morgan, and Zahn (1972).

6. Juster and Wachtel (1972a, 1972b) have been consistent proponents of this view. Although Mishkin (1976, 1977, 1978) also argues that uncertainty is an important factor in consumer expenditures on durables, his work suggests that it is better captured by direct balance sheet measures than by consumer sentiment.

7. See Modigliani and Brumberg (1954), Ando and Modigliani (1963), Modigliani (1971), and Steindel (1981).

8. See, for example, Adams and Klein (1972) Juster and Wachtel (1972a and b), Dunkelberg (1972) and Shapiro (1972), as well as the consumption sector of the DRI model of the U.S. economy described in Eckstein (1983).

9. See endnote 19.

10. For further discussion of spurious correlations, see Hendry (1980) Granger and Newbold (1974), and Campbell and Perron (1991).

11. Overviews of vector error correction methodology are provided in Hendry (1986), Granger (1986), Hall (1986), Jenkinson (1986) and Engle and Granger (1987). See also the appendixes to this study.

12. See, for example, Wilcox (1989).

13. When the equations are estimated in unrestricted form, as in Table A3, the coefficients implied for the cointegrating vector are very close to the originals, providing a check on the original estimates. Also, *t*-statistics on the levels of ICS and CIND are 4 or more. Since the levels of ICS and CIND are nonstationary, although coefficient estimates are consistent the usual distribution for the *t*-statistic does not apply. A larger than normal t value, somewhere on the order of the Dickey-Fuller tests, is required for any level of significance. (On these points see Banerjee, et al. (1986) and Stock and Watson (1988). The *t*-statistics appear to be high enough to meet this test. Moreover, the indicated significance of ICS or CIND is roughly as high as that of interest rates, which clearly belong in the cointegrating vector.

14. Recent studies have found that consumption exhibits a lagged response to income in some degree, contrary to the rational expectations version of the permanent income hypothesis. As a result, changes in consumption would be related to past changes in consumption. See Hall (1978), Flavin (1981) and Nelson (1987).

15. The literature on the precautionary motive for saving includes Leland (1968), Sandmo (1970), Dreze and Modigliani (1972), Zeldes (1989), and Blanchard and Fischer (1989).

16. Campbell (1987), Cochrane (1990) and Trehan (1991) reach a similar conclusion.

17. Because errors in the different equations may be contemporaneously correlated, an assumption needs to be made about their causality. The common procedure is to order the variables so that errors in the equations that are ordered first affect the errors in the other equations, but are not affected by them. The "general-to-simple" modeling strategy that we employed provides a useful guide for such ordering. For example, interest rates and consumer sentiment affect spending on durables, but are not affected by that spending. Therefore, it seems reasonable to order interest rates and sentiment before durables purchases, so that disturbances to them affect durables but not vice versa. In accordance with this approach, the complete ordering that was used is ICP, CIND, LCNS, LGYD, LGCD.

18. These conclusions are relatively insensitive to the ordering of the variables. Two alternative orderings were tried. In the first, the initial ordering was reversed to give LGCD, LGYD, LCNS, CIND, ICP. In the second, CIND and ICP were interchanged in this reordering. In both alternatives, the response of durables purchases to shocks to sentiment was reduced compared with the response to interest rates, but still was at least half that of interest rates. The responses of durables to shocks to nondurables and services, income, and durables were affected to lesser degrees.

19. Transitory income (YDT) is defined as the difference between current income and permanent income (YPD), where YDP is calculated as $\sum_{i=0}^{15}(1-\alpha)\alpha^i(1+T)^iYD_{-i*}$. The parameter, α, was chosen to minimize the error in predicting spending on nondurables and services. It equals about 0.5.

20. Fisher (1981) and Taylor (1981) find a positive correlation between the level and variance of inflation over time in both the U.S. and OECD countries. A more recent paper with similar findings is Ball and Cecchetti (1990).

21. These studies include Adams and Green (1965), Hymans (1970), Lovell (1975), and Eckstein (1983, ch. 5).

22. Variables in change form are all one-quarter changes. The unemployment rate is adjusted for estimated changes in the full employment rate of unemployment over time due to demographic shifts.

Mishkin used a four-quarter change in consumer prices, as did we in updating his model of sentiment. However, these equations switch to a one-quarter change in consumer prices for DLCPI in order to be comparable with the results of the subsequent error correction model of sentiment. The insignificance of FIN, DEBT, and YDT and the significance of lagged ICS when other variables are added is not sensitive to whether DLCPI is measured as a one-quarter or four-quarter change.

23. A high $\bar{R}^2$ relative to the D.W. statistic is generally regarded as a possible indication of a spurious regression due to random time trends. See Campbell and Perron (1991). The $\bar{R}^2$ and D. W. statistics are .73 and 1.12, respectively, for ICS and .50 and .70 for CIND, in the absence of correction for serial correlation or the use of lagged dependent variables.

24. The vector error correction system actually forecasts better using predicted values of variables other than consumer sentiment rather than actual values. This appears to be attributable to the difficulty of measuring permanent income. Substituting actual for the predicted values of ICP improves the forecast of LGCD a little, while substituting actual for predicted values of LCNS and LGYD worsens it quite a lot.

25. Even including the period of the Gulf War, however, the measures of sentiment remain cointegrated with unemployment and inflation.

26. In fact, the decline in consumer and business confidence at the time of the Gulf War appears to have been the dominant impulse precipitating the recession that began in the summer of 1990. See Throop (1991b).

27. Garner (1991) examines some of these same issues. He finds, as we do, that sentiment ordinarily has little complementary value in forecasting consumer expenditures on durables when used with other macroeconomic variables. Although, he relates changes in durables purchases to the level of consumer sentiment in an ordinary regression, that finding is confirmed here by a richer error correction model.

Garner also considers the ability of a Bayesian vector autoregression (BVAR) model to forecast consumer purchases of durables in an exceptional circumstance like the war in the Persian Gulf, with and without using consumer sentiment. The BVAR model with sentiment slightly outperforms the version without sentiment in this period, but neither one comes close to predicting the sharp decline of durables purchases in late 1990. Garner concludes that consumer sentiment helps only slightly in forecasting durables purchases during the Gulf War. As emphasized in this study, however, the reason why the BVAR model with sentiment misses the sharp decline in spending on durables in this period is not that sentiment did not help to explain consumer purchases, but rather that in such circumstances the usual relationship between sentiment and macroeconomic variables broke down. As a result, the BVAR could not forecast the actual decline in sentiment that occurred, thus missing the decline in durables purchases as well.

Appendix A

In constructing a vector error correction system, one first determines whether levels or first differences of the variables are stationary (or trend-stationary as the case may be) by using the Dickey-Fuller test, as described in Fuller (1976). This test consists of regressing the first difference of the variable in question on its own lagged level plus a constant, a time trend, and lagged first differences as appropriate.[1] The null hypothesis that random disturbances permanently affect the level of the series—making it nonstationary—implies that the coefficient on the lagged level should be greater than or equal to zero.[2] The test-statistic is just the ratio of the estimate of the coefficient to its standard error, except that under the null hypothesis this statistic does not have the usual t distribution.[3]

Table A1 presents the results of this test for the levels and first differences of the logs of real spending on consumer durables (LGCD), real spending on nondurables and services (LCNS), and real disposable income (LGYD), as well as the levels and first differences of the six-month commercial paper rate (ICP), the index of consumer sentiment (ICS) and the current conditions component (CIND) of that index. In each case, three lags of the dependent variable are included to capture short-run dynamics.

Table A1 shows that in levels form the *t*-statistic (shown in parentheses) on the coefficient on the lagged level of the dependent variable does not exceed the critical value for any of the variables at even the 10 percent level of significance. So we cannot reject the hypothesis of nonstationarity for the level of the variable in all cases. By contrast, we can reject the hypothesis of nonstationarity for first differences at a 5 percent level of significance or less in all cases.

These results indicate that standard statistical tests of significance may be applied to regressions on these variables in first difference form because the first differences are stationary. Therefore, a natural representation is a vector autoregression in the first differences. However, this form throws away information about longer-run relationships between the levels of the variables that may in fact exist. Even though the levels of the variables are nonstationary, disturbances to them may be related, so they do not tend to drift apart in the long run. In this case they are said to be cointegrated.

We can test for the existence of such a long-run relationship by estimating an ordinary least squares regression and examining the residuals from this regression for stationarity. A finding that the residuals are stationary means that even though the variables in the regression are nonstationary, a linear combination of the variables is stationary. Moreover, if the residuals from this regression are added to the vector autoregression in the first differences as an "error correction" term, the residuals in those equations will continue to be stationary, and the usual statistical tests will continue to apply.

Table A2 shows the cointegrating vectors that are obtained by regressing LGCD on LCNS, LGYD, ICP, and a measure of consumer sentiment (either ICS or CIND). Using either measure of sentiment, both LCNS and LGYD have positive coefficients, the coefficient on ICP has the expected negative sign, and the coefficient on sentiment has the expected positive sign. The Dickey-Fuller test indicates stationarity in the residuals of the cointegrating vectors at a 5 percent level or better.[4] Therefore, the estimated error (actual less predicted) from the cointegrating regression can be included as an error correction term. When entered into the vector autoregressions, its estimated coefficients will indicate the extent to which LGCD, compared with other variables, responds to deviations from the estimated long-run relationship.

A vector error correction system tends to be overparameterized since all lags on all variables are included. Therefore, a "general-to-simple" modeling strategy was employed in which insignificant variables were dropped. On the basis of F tests, lagged changes in LGYD, ICP, and ICS are dropped when ICS is employed as the measure of consumer sentiment, while only lagged changes in LGYD are dropped when CIND is the measure used. Also, LCNS clearly is not a significant factor in the error correction term, since dropping it from the cointegrating vector has no effect on the standard error of the estimated equation for consumer durables; and the cointegrating vector that omits LCNS continues to pass the test for stationarity, as shown in Table A2. The resulting vector error correction system for explaining spending on consumer durables is shown in Table 2 in the text.

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[1] If lagged first differences are included, this is called the augmented Dickey-Fuller test.

[2] For example, in the simplest of time series processes, $x = px_{t-1} + e$, where e is a random error. If $p<1$, then a random disturbance will not permanently affect the level, so that x will be stationary. But if $p \geq 1$ the level of x will be permanently affected, and therefore x will be nonstationary.

Subtracting x_{t-1} from both sides, $\Delta x_t = -(1-p)x_{t-1} + e$. Thus, if $p<1$, then when Δx_t is regressed on x_{t-1}, the coefficient on x_{t-1} will be negative, indicating a stationary process. On the other hand, if $p=1$ (a unit root), the coefficient on x_{t-1} will be zero, and the process will be nonstationary. Similarly, if $p>1$ and $1-p>0$, the process also is nonstationary.

[3] Critical values of this statistic are tabulated in Fuller (1976).

[4] Significance levels for Dickey-Fuller test on cointegrating equations are tabulated in Engle and Yoo (1987).

Table A1

Augmented Dickey-Fuller Tests for Stationarity

(1963.Q1–1990.Q4)

$$\Delta x_t = \alpha + \beta t + \rho x_{t-1} + \sum_{i=1}^{3} \delta_i \Delta x_{t-i}$$

A. Tests on Levels of Variables

	LGCD	LCNS	LGYD	ICP	ICS	CIND
Constant	.549	.293	.462	.741	9.07	11.1
	(2.94)	(2.43)	(2.57)	(2.41)	(2.44)	(2.40)
Trend	.00151	.000293	.000454	—	—	—
	(2.65)	(2.14)	(2.17)			
Coefficient on lagged level of dependent variable	−.133	−.0441	−.0672	−.0866	−.109	−.120
	(−2.82)	(−2.37)	(−2.50)	(−2.44)	(−2.53)	(−2.43)

B. Tests on Differences of Variables

Constant	.0111	.00594	.00335	−.0430	−.262	−.111
	(2.63)	(3.39)	(2.98)	(.374)	(−.530)	(.224)
Coefficient on lagged level of dependent variable	−.918	−.755	−.458	−.957	−.743	−.910
	(−4.60)[a]	(−4.17)[a]	(−3.41)[b]	(−5.24)[a]	(−3.62)[b]	(−4.07)[a]

Notes:

Each regression contains three lags of the dependent variable.

Levels of Significance:
[a]Significant at 1%
[b]Significant at 5%

Table A2

Dickey-Fuller Tests for Cointegration

(1963.Q1–1990.Q4)

	Cointegration Equations: Dependent Variable is LGCD					
	With ICS		With CIND		With Unemployment and Inflation	With Unemployment and CIND
Constant	−7.14 (−56.0)	−7.12 (57.3)	−6.72 (63.5)	−6.69 (65.9)	−7.31 (−54.1)	−6.9 (−67.8)
LCNS	.0716 (.241)	—	.203 (.881)	—	—	—
LGYD	1.56 (5.52)	1.63 (96.0)	1.36 (6.18)	1.55 (98.2)	1.69 (92.1)	1.58 (98.2)
ICP	−.00632 (−3.98)	−.00628 (4.01)	−.00337 (−2.54)	−.00326 (−2.47)	−.00889 (−5.23)	−.00396 (−3.29)
ICS	.00286 (7.25)	.00289 (7.78)	—	—	—	—
CIND	—	—	−.00415 (11.8)	.00422 (12.2)	—	.00366 (10.9)
U	—	—	—	—	.0200 (−7.30)	−.00972 (−4.75)
DLCPI	—	—	—	—	1.82 (−3.09)	—
R^2	.991	.991	.994	.994	.990	.995
S.E.	.0377	.0374	.0303	.0302	.0382	.0276
Dickey-Fuller Test	5.62[a]	5.66[a]	4.27[b]	4.28[b]	−5.91[a]	−8.19[a]

Notes:

Levels of Significance
[a]Significant at 1%
[b]Significant at 5%

The Dickey-Fuller tests did not incorporate any lagged differences of the residual because they were not found to be significant.

Table A3

Unrestricted Estimation of Durables Equation

(1963.1–990.4)

$$\Delta LGCD = \underset{(-8.53)}{-4.29} + \underset{(.0669)}{.0396}\,\Delta LCNS_{-1} + \underset{(.0656)}{.0370}\,\Delta LCNS_{-2} + \underset{(1.36)}{.791}\,\Delta LCNS_{-3} + \underset{(.0797)}{.458}\,\Delta LCNS_{-4} - \underset{(-8.47)}{.591}\,LGCD + \underset{(8.59)}{.989}\,LGYD$$

$$- \underset{(-5.92)}{.00716}\,ICP + \underset{(4.14)}{.00153}\,ICS$$

$\bar{R}^2 = .444$ S.E. = .0260 D.W. = 2.48

$$\Delta LGCD = \underset{(-7.92)}{-5.95} + \underset{(.578)}{.0338}\,\Delta LCNS_{-1} - \underset{(-.354)}{.202}\,\Delta LCNS_{-2} + \underset{(1.78)}{1.04}\,\Delta LCNS_{-3} - \underset{(-.113)}{.0671}\,\Delta LCNS_{-4} - \underset{(1.61)}{.00427}\,\Delta ICP_{-1} - \underset{(-1.76)}{.00446}\,\Delta ICP_{-2}$$

$$\underset{(.0409)}{.0000993}\Delta ICP_{-3} - \underset{(-1.67)}{.0039}\,\Delta ICP_{-4} - \underset{(-3.61)}{.00232}\,\Delta CIND_{-1} - \underset{(-1.16)}{.000729}\,\Delta CIND_{-2} - \underset{(-.794)}{.000467}\,\Delta CIND_{-3} + \underset{(1.07)}{.000572}\,\Delta CIND_{-4}$$

$$- \underset{(-8.00)}{.867}\,LGCD + \underset{(8.00)}{1.37}\,LGYD - \underset{(-4.36)}{.00744}\,ICP + \underset{(5.32)}{.00317}\,CIND$$

$\bar{R}^2 = .502$ S.E. = .0246 D.W. = 2.12

Implicit Cointegrating Vectors Normalized on LGCD

LGCD = constant + 1.67 LGYD − .0121 ICP + .00259 ICS
LGCD = constant + 1.58 LGYD − .00858 ICP + .00365 CIND

Appendix B

In constructing an expanded error correction model of consumer sentiment, the stationarity of the menu of possible independent variables is examined first. Table B1 presents the results of such tests on the levels and first differences of the variables discussed in the text.

The first difference of DEBT is not stationary. Therefore, it cannot be cointegrated with consumer sentiment, which is stationary in first differences. Nor can short-run changes in sentiment truly be explained by changes in DEBT because the former is stationary and the latter is not. Since it does not make any sense to use FIN without DEBT, both FIN and DEBT are therefore dropped. In contrast, YDT, DLSP, DLPOIL, and DU are stationary in levels and so cannot be cointegrated with consumer sentiment either. However, since the first differences in these variables are stationary, they may be related to first differences in sentiment in the short run. This leaves inflation (DLCPI), oil prices (LPOIL), unemployment (U), and interest rates (ICP from results in Table A1) as possible candidates for cointegration with consumer sentiment.

Turning to Tables B2 and B3, all four variables appear to be significantly cointegrated with either measure of sentiment, although the inflation rate is the most closely related (eqs. 1 to 4). Next, in combining each of the other variables with inflation, unemployment improves the fit of the cointegration relationship the most (eqs. 5 to 7). The further addition of the price of oil to the relationship does not materially improve the fit and generates a "wrong" sign for the coefficient on oil prices (eq. 8). Alternatively, adding the interest rate to the relationship worsens the fit somewhat (eq. 9). This leaves inflation and the unemployment rate as the only variables that are cointegrated with the measures of consumer sentiment. Therefore, the errors from equation 6 are used to form the error correction terms in the expanded error correction models of consumer sentiment, shown in Table 4 in the text.

Table B1

Augmented Dickey-Fuller Tests for Stationarity

(1963.Q1–1990.Q4)

A. Tests on Levels of Variables

	FIN	DEBT	YDT	DLCPI	DLSP	LPOIL	DLPOL	U	DU
Constant	284.38	−74.1	0.792	0.002	0.0107	0.0155	0.0057	0.0153	0.0013
	(0.56)	(1.63)	(0.74)	(2.25)	(1.70)	(0.92)	(0.72)	(0.56)	(0.05)
Trend	—	2.483	—	—	—	—	—	—	—
		(2.39)							
Coefficient on	0.003	−0.0137	−0.463	−0.139	−0.805	−0.0328	−0.962	−0.0412	−0.501
lagged level	(1.36)	(2.06)	(3.88)[a]	(2.42)	(4.87)[a]	(1.40)	(5.68)[a]	(2.30)	(4.94)[a]

B. Tests on Differences of Variables

	FIN	DEBT	YDT	DLCPI	DLSP	LPOIL	DLPOL	U	DU
Constant	472.6	27.3	−0.509	0.00015	−0.0017	0.0057	0.0034	0.0833	0.0052
	(2.44)	(1.92)	(0.46)	(0.35)	(0.26)	(0.71)	(0.40)	(0.12)	(0.18)
Coefficient on	−0.945	−0.148	−1.56	−1.36	−2.31	−0.962	−2.37	−0.498	−1.55
lagged level	(4.47)[a]	(2.52)	(5.72)[a]	(5.32)[a]	(7.84)[a]	(5.66)[a]	(8.50)[a]	(4.90)[a]	(6.81)[a]

Notes:

Each regression contains three lags of the dependent variable.

Significance Levels:
[a]Significant at the 1% level

Table B2

Dickey-Fuller Cointegration Tests on ICS

(1963.Q1–1990.Q4)

	Constant	DLCPI	LPOIL	U	ICP	S.E.	$\bar{R}^2$	Dickey-Fuller Test
1.	99.7 (67.6)	−11.0 (−11.7)	—	—	—	8.07	.551	−4.91[a]
2.	75.6 (35.3)	—	−14.8 (−5.00)	—	—	10.91	.179	−2.33
3.	85.8 (77.0)	—	—	−2.43 (3.47)	—	11.48	.091	−2.14
4.	102.9 (40.9)	—	—	—	−2.18 (−7.67)	9.76	.344	−3.13[b]
5.	94.2 (39.6)	−10.0 (−10.2)	−6.48 (−2.85)	—	—	7.81	.578	−4.90[a]
6.	100.2 (75.1)	−10.9 (−12.8)	—	−2.27 (−5.11)	—	7.27	.635	−5.33[a]
7.	103.6 (51.1)	−9.1 (−7.78)	—	—	−.790 (−2.71)	7.84	.576	−4.87[a]
8.	106.2 (31.1)	−11.9 (−12.0)	6.72 (1.88)	−3.41 (−4.56)	—	7.19	.643	−5.64[a]
9.	101.4 (52.1)	−10.3 (−9.20)	—	−2.10 (−4.27)	−.246 (−.825)	7.28	.635	−5.26[a]

Levels of Significance
[a]Significant at 1%
[b]Significant at 5%

Table B3

Dickey-Fuller Cointegration Tests on CIND

(1963.Q1–1990.Q4)

	Constant	DLCPI	LPOIL	U	ICP	S.E.	$\bar{R}^2$	Dickey-Fuller Test
1.	102.8 (61.1)	−7.15 (−6.64)	—	—	—	9.19	.281	−3.80[a]
2.	87.2 (42.9)	—	−9.60 (−3.42)	—	—	10.35	.089	−2.67[c]
3.	93.7 (91.5)	—	—	−1.70 (−2.64)	—	10.56	.051	−2.58[c]
4.	105.2 (41.6)	—	—	—	−1.46 (−5.10)	9.79	.186	−3.15[b]
5.	99.2 (35.6)	−6.50 (−5.67)	−4.21 (−1.59)	—	—	9.13	.291	−3.74[b]
6.	103.2 (63.3)	−7.06 (−6.79)	—	−1.60 (−2.95)	—	8.88	.329	−3.80[b]
7.	105.7 (44.9)	−5.71 (−4.21)	—	—	−.582 (−1.72)	9.11	.294	−3.76[b]
8.	108.3 (25.7)	−7.91 (−6.48)	5.76 (1.30)	−2.58 (−2.79)	—	8.85	.333	−3.92[b]
9.	104.2 (43.7)	−6.57 (−4.79)	—	−1.45 (−2.43)	−.205 (−.561)	8.91	.325	−3.78[b]

Levels of Significance
[a]Significant at 1%
[b]Significant at 5%
[c]Significant at 10%

References

Adams, F.G., and E.W. Green. 1965. "Explaining and Predicting Aggregate Consumer Attitudes." *International Economic Review* (September).

_____ and L.R. Klein. 1972. "Anticipatory Variables in Macro-Econometric Models." In *Human Behavior in Economic Affairs: Essays in Honor of George Katona*, eds. Strumpel, Morgan, and Zahn. Amsterdam: Elsevier Scientific Publishing Co.

Ando, Albert, and Franco Modigliani. 1963. "The Life-Cycle Hypothesis and Saving: Aggregate Implications and Tests." *American Economic Review* (March).

Ball, Laurence and Stephen C. Cecchetti. 1990. "Inflation and Uncertainty at Long and Short Horizons." *Brookings Papers on Economic Activity* I.

Banerjee, Anindya, Juan J. Dolado, David F. Hendry, and Gregor W. Smith. 1986. "Exploring Equilibrium Relationships in Econometrics Through Static Models: Some Monte Carlo Evidence." *Oxford Bulletin of Economics and Statistics* (August).

Blanchard, Olivier Jean and Stanley Fischer. 1989. *Lectures on Macroeconomics*. Cambridge, Mass.: The MIT Press.

Campbell, John Y. 1987. "Does Saving Anticipate Declining Labor Income? An Alternative Test of the Permanent Income Hypothesis." *Econometrica* (November).

_____, and Pierre Perron. 1991. "Pitfalls and Opportunities: What Macroeconomists Should Know about Unit Roots." Technical Working Paper No. 100, National Bureau of Economic Research (April).

Cochrane, John H. 1990. "Univariate vs. Multivariate Forecasts of GNP Growth and Stock Returns: Evidence and Implications for the Persistence of Shocks, Detrending Methods, and Tests of the Permanent Income Hypothesis." Working Paper No. 3427, National Bureau of Economic Research (September).

Dreze, Jacques H., and Franco Modigliani. 1972. "Consumption Decisions Under Uncertainty." *Journal of Economic Theory* (December).

Dunkelberg, William C. 1972. "The Impact of Consumer Attitudes on Behavior: A Cross Section Study." In *Human Behavior in Economic Affairs: Essays in Honor of George Katona*, eds. Strumpel, Morgan, and Zahn. Amsterdam: Elsevier Scientific Publishing Co.

Eckstein, Otto. 1983. *The DRI Model of the U.S. Economy*. New York: McGraw-Hill.

Engle, Robert F., and C.W.J. Granger. 1987. "Co-Integration and Error Correction: Representation, Estimation and Testing." *Econometrica* (March).

Engle, Robert F., and Byung-Sam Yoo. 1987. "Forecasting and Testing in Cointegrated Systems." In *Topics In Applied Regression and Time Series Analysis*, Supplement to *Journal of Econometrics*.

Fisher, Stanley. 1981. "Towards an Understanding of the Costs of Inflation: II." *Carnegie-Rochester Conference Series on Public Policy* 15.

Flavin, Marjorie A. 1981. "The Adjustment of Consumption to Changing Expectations about Future Income." *Journal of Political Economy* (October).

Friedman, Milton. 1957. *A Theory of the Consumption Function*. Princeton: Princeton University Press.

Fuller, Wayne A. 1976. *Introduction to Statistical Time Series*. John Wiley & Sons.

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).

Granger, C.W.J. 1986. "Developments in the Study of Cointegrated Economic Variables." *Oxford Bulletin of Economics and Statistics* (August).

_____, and P. Newbold. 1974. "Spurious Regressions in Econometrics." *Journal of Econometrics* 2.

Hall, Robert. 1978. "Stochastic Implications of the Life-Cycle-Permanent Income Hypothesis: Theory and Evidence." *Journal of Political Economy* (December).

Hall, S.G. 1986. "An Application of the Granger and Engle Two-Step Estimation Procedure to United Kingdom Aggregate Wage Data." *Oxford Bulletin of Economics and Statistics* (August).

Hendry, David. 1980. "Econometrics—Alchemy or Science?" *Econometrica* (November).

_____. 1986. "Econometric Modeling with Cointegrated Variables: An Overview." *Oxford Bulletin of Economics and Statistics* (August).

Hymans, Saul H. 1970. "Consumer Durable Spending: Explanation and Prediction." *Brookings Papers on Economic Activity* 2.

Jenkinson, J.J. 1986. "Testing Neo-Classical Theories of Labor Demand: An Application of Cointegration Techniques." *Oxford Bulletin of Economics and Statistics* (August).

Juster, F. Thomas, and Paul Wachtel. 1972a. "Anticipatory and Objective Models of Durable Goods Demand." *American Economic Review* (September).

_____, and _____. 1972b. "Uncertainty, Expectations, and Durable Goods Demand Models." In *Human Behavior in Economic Affairs: Essays in Honor of George Katona*, eds. Strumpel, Morgan, and Zahn. Amsterdam: Elsevier Scientific Publishing Co.

Katona, George. 1975. *Psychological Economics*. Amsterdam: Elsevier Scientific Publishing Co., Inc.

Leland, Hayne E. 1968. "Saving and Uncertainty: The Precautionary Demand for Saving." *Quarterly Journal of Economics* (August).

Lovell, Michael C. 1975. "Why Was the Consumer Feeling So Bad?" *Brookings Papers on Economic Activity* 2.

Mishkin, Frederic S. 1976. "Illiquidity, Consumer Durable Expenditure, and Monetary Policy." *American Economic Review*, (September).

_____. 1977. "What Depressed the Consumer? The Household Balance Sheet and the 1973-75 Recession." *Brookings Papers on Economic Activity* 1.

_____. 1978. "Consumer Sentiment and Spending on Durable Goods." *Brookings Papers on Economic Activity* 1.

Modigliani, Franco. 1971. "Monetary Policy and Consumption: Linkages via Interest Rates and Wealth Effects in the FMP Model." In

Consumer Spending and Monetary Policy: The Linkages, Conference Series No. 5. Federal Reserve Bank of Boston.

_____, and R.E. Brumberg. 1954. "Utility Analysis and the Consumption Function: An Interpretation of Gross-Section Data." In *Post-Keynesian Economics*, ed K.K. Kurihara. New Brunswick, N.J.: Rutgers University Press.

Nelson, Charles R. 1987. "A Reappraisal of Recent Tests of the Permanent Income Hypothesis." *Journal of Political Economy* (June).

Sandmo, Agnar. 1970. "The Effect of Uncertainty on Saving Decisions." *Review of Economic Studies* (July).

Shapiro, Harold T. 1972. "The Index of Consumer Sentiment and Economic Forecasting: A Reappraisal." In *Human Behavior in Economic Affairs: Essays in Honor of George Katona*, Stumpel, Morgan, and Zahn, eds. Amsterdam: Elsevier Scientific Publishing Co.

Steindel, Charles. 1981. "The Determinants of Private Saving." In *Public Policy and Capital Formation*. Washington, D.C.: Board of Governors of the Federal Reserve System.

Stock, James H. and Mark W. Watson. 1988. "Variable Trends in Economic Time Series." *The Journal of Economic Perspectives* (Summer).

Strumpel, Burkhard, James N. Morgan, and Ernest Zahn. 1972. *Human Behavior in Economic Affairs: Essays in Honor of George Katona*. Amsterdam: Elsevier Scientific Publishing Co., Inc.

Taylor, John B. 1981. "On the Relation between the Variability of Inflation and the Average Inflation Rate." *Carnegie-Rochester Conference Series on Public Policy* 15.

Throop, Adrian W. 1991a. "Consumer Confidence and the Outlook for Consumer Spending." *Weekly Letter*, Federal Reserve Bank of San Francisco (July) 19.

_____. 1991b. "The Gulf War and the U.S. Economy." *Weekly Letter*, Federal Reserve Bank of San Francisco *Weekly Letter*, (September) 13.

Trehan, Bharat. 1991. "Using Consumption to Forecast Income." Federal Reserve Bank of San Francisco *Weekly Letter*, (June 7).

Wilcox, James A. 1989. "Liquidity Constraints on Consumption: The Real Effects of Real Lending Policies." Federal Reserve Bank of San Francisco *Economic Review*, (Fall).

Zeldes, Stephen P. 1989. "Optimal Consumption with Stochastic Incomes: Deviations from Certainty Equivalence." *Quarterly Journal of Economics* (May).