

September 11, 2007

Forecasting Components of Consumption With Components of Consumer Sentiment

James A. Wilcox^{*}

Haas School of Business
University of California, Berkeley
Berkeley, CA 94720-1900

jwilcox@haas.berkeley.edu

^{*} I am grateful for helpful comments from Robert Crow, Richard Curtin, Luis Dopico, and participants at the 2007 Annual Meeting of the National Association for Business Economics. Any remaining errors are solely my responsibility.

Forecasting Components of Consumption With Components of Consumer Sentiment

James A. Wilcox
Haas School of Business
University of California, Berkeley
Berkeley, CA 94720-1900

jwilcox@haas.berkeley.edu
510.642.2455

Abstract

We present new evidence that existing, but long-ignored, measures of consumer sentiment can reduce errors in forecasting total consumption expenditures and its components. The component questions of the aggregate Index of Consumer Sentiment improve forecasts, not only of consumer expenditures on durables but also on nondurables and services. Empirical studies have historically focused on whether consumer sentiment improves 1-quarter-ahead forecasts of consumer expenditures. In fact, we document that measures of consumer sentiment are especially predictive at the longer, 4-quarter-ahead horizon. In addition, they typically contribute at least as much to 1-quarter-ahead and 4-quarter-ahead forecasts of consumption as do income and wealth variables. Out-of-sample forecasts for the 2000-2005 period further substantiate that measures of consumer sentiment can reduce consumption forecasting errors appreciably.

I. INTRODUCTION

Accuracy of forecasts of almost all macroeconomic variables, whether real or financial, typically depends importantly on how accurately households' consumption expenditures are forecasted. Decades of research have documented that income, wealth, and interest rate movements help account for changes in consumption. Decades ago, to complement these macroeconomic variables, the University of Michigan's Survey Research Center began asking, and still asks, households a series of questions about their views about their own and the national economy's recent, current, and expected future economic and financial conditions. These surveys intended to provide measures of consumers' willingness to spend. In that regard, consumer sentiment might serve as a useful complement to measures, such as income, wealth, and interest rates, that might signal consumers' ability to pay for consumption expenditures. The best-known of the Michigan measures is its Index of Consumer Sentiment (ICS). The index is an aggregation of answers to five questions.¹

Measures of consumer attitudes such as the ICS might improve consumption forecasts for any number of reasons. One reason may be that measures like the ICS provide an instantly available measure (that is not subject to data revisions) of households' evaluations of the current and upcoming conditions for themselves and the economy more broadly. Households' answers may reflect their evaluations of the current and upcoming impacts of recent shocks that have left their imprint on macroeconomic variables. In addition, their answers might incorporate the effects on households' evaluations of the effects of changed expectations and uncertainties about future conditions. For example, simultaneous increases in the likelihood of and uncertainty about future tax due to the

¹A listing of the survey questions and a description of the methodology used to calculate the ICS are given in Appendix A. The Conference Board also surveys households to measure consumer attitudes. It refers to its measure as consumer confidence, rather than consumer sentiment, and focuses on a horizon of six months, whereas the Michigan index is based on questions that relate to the past year, the upcoming year, and the upcoming five years.

changed prospects of certain presidential candidates might well reduce the numbers of households who answer that this is a good time to buy major household goods. Such a repercussion on households' evaluations often would not be captured by any of the macroeconomic variables that are typically embedded in consumption forecasting models.

Measures like the ICS may incorporate the extent to which households estimate the impacts of rare or even unique shocks—such as the first oil price shock and embargo in the mid 1970s, whose effects could not be directly or reliably estimated statistically from past data. Further, such measures might reflect households' evaluations of the impacts of changes in the structure of the economy. Thus, for example, appointment of a new Fed Chair who was widely anticipated to follow a distinctly different monetary policy rule might affect how the economy, and thus households and their attitudes, react to various shocks to the economy. Households' changed expectations may well show up in their answers to surveys long before the changed structure of the economy can be distilled from macroeconomic data. Thus, surveys of households may rapidly provide data about households' evaluations of the impacts of events in circumstances where analysts often find it difficult to estimate impacts.

We focus on the improvements in forecasting consumption that measures of consumer sentiment might offer, especially once other macroeconomic variables are taken into account. In Section II, we briefly survey prior studies of the marginal contributions of consumer sentiment to forecasting consumption. Section III shows the correlations between the aggregated ICS and its five component questions. Section IV presents results from a baseline consumption forecasting specification that excludes any measures of consumer sentiment. Section V then presents new evidence that consumer sentiment does improve forecasts of consumer spending. In particular, we present evidence along several dimensions:

1. We show that the individual component questions that comprise the ICS often much more significantly improve consumption forecasts than does the aggregated ICS that is constructed from those questions.
2. We show that the individual component questions, and the aggregated ICS itself, provide much more reliable improvements in 4-quarter-ahead forecasts than they do for 1-quarter-ahead forecasts.
3. We show that forecasts, not just of durables—or vehicles in particular, but also of nondurables and services are improved by including individual component questions about consumer sentiment.

Sections VI and VII present evidence along two additional dimensions.

4. We show that individual component questions tend to be at least as statistically reliable in improving forecasts of consumption and its components as are the usual income, wealth, and interest and inflation rate factors that form the baseline forecasting models of consumption growth. We present evidence, in turn, about which macroeconomic variables significantly improve consumption forecasts, once we also include various measures of consumer sentiment.
5. We show how much out-of-sample forecasting errors of consumption growth, at both 1-quarter and 4-quarter horizons, for the 2000-2005 period are reduced by including various components of consumer sentiment.

Section VIII summarizes our findings and suggests promising areas for further research.

II. **PRIOR STUDIES**

Figure 1 plots quarterly averages of the ICS from 1960 through 2006. Not surprisingly, sharp declines in the ICS typically were accompanied by noticeable deteriorations in income, wealth, and other macroeconomic variables. Figure 2 plots the 1-quarter and 4-quarter-ahead growth rates of

total consumption over the past ten years.² Of course, the 1-quarter-ahead growth rates are much more volatile than those calculated year-over-year.

There has long been a robust simple correlation between consumer sentiment and consumer spending. The econometric evidence, however, is mixed on whether, once other measured macroeconomic factors are allowed for, consumer sentiment affects consumer expenditure. A number of studies argue that consumer sentiment is significant in "old-fashioned-structural" equations for consumption expenditures. Juster and Wachtel (1972a, b), for example, long ago showed that "anticipatory variables" (including the ICS) usually add to the explanatory power of automobile and consumer durables demand equations. They also report that consumer sentiment is of considerable importance in forecasting automobile expenditures. Kelly (1990) reports that in the DRI model consumer sentiment directly affects consumer spending, imports, business inventories, and industrial production. Changes in consumer sentiment have particularly noticeable effects on housing starts and the growth of auto sales.

In addition, Carroll, Fuhrer, and Wilcox (1994) find lagged ICS significant in "new-fashioned-structural" equations for consumption growth. They show consumer sentiment helps predict future changes in consumption, regardless of whether other variables, such as income growth, are included. They favor the interpretation that the ICS improves forecasting because it serves as a proxy for expected future income.

In other studies, however, consumer sentiment proved redundant in the presence of variables like income, interest rates, assets, and liabilities. Hymans (1970) pointed out that in the majority of econometric models, consumer-sentiment-type variables played "little if any part".³ Hymans's

² As explained more below, we use (and plot in figure 2) total consumption, expressed as annualized growth rates of real, per capita total personal consumption expenditures. Throughout, the 1-quarter-ahead and 4-quarter-ahead growth rates refer to percentage point changes from 1-quarter prior to the current quarter and from 1-quarter prior to three-quarters into the future. We use the same procedure for each of the components of consumption.

³ Nevertheless, he found that changes in consumer sentiment improved the forecasting accuracy of

Michigan RSQE model did allow for consumer sentiment effects, but they were generally regarded as being economically unimportant once other variables are included. Mishkin (1978) found that changes in consumer sentiment affected spending on consumer durables generally and on automobiles in particular. The presence of financial asset and liability variables, however, typically reduced consumer sentiment effects to insignificance. Neither the Federal Reserve Board, WEFA, Meyer, nor the OECD models historically included consumer sentiment variables in their equations for consumer expenditures.

More recent studies generally conclude that some measures of consumer sentiment or confidence improve consumption forecasts reliably, but that the improvements are small (Bram and Ludvigson (1998), Howrey (2001), Garner (2002), and Ludvigson (2004). Curtin (2006) stresses that ICS is more likely to improve forecasts of household spending over a somewhat longer, 6-12 month horizon than to improve forecasts of current or 1-quarter-ahead outcomes. He also suggests that answers to any number of questions in the household survey are likely to be useful—some of which are incorporated in the ICS and some of which are not. Lovell (2001) suggested that the future-oriented questions might well be expected to be more useful for forecasting than the questions that pertain to current or recently-past conditions. In general, the more recent results also tend to support the expectations component, as opposed to the current conditions component, as being the source of the additional forecasting power. Garner (2002), on the other hand, concluded that the answers to questions about current, rather than expected, conditions improved consumption forecasts more.

Thus, the econometric evidence has been inconclusive about the marginal impact of consumer sentiment: About as many studies claim that consumer sentiment is useful as judge it to be

a stock adjustment model of automobile spending.

superfluous in forecasting consumer spending. The more recent of these studies, however, conclude that the ICS improves consumption forecasts by small, but statistically reliable, amounts.

III. DISAGGREGATING CONSUMPTION AND THE ICS

A number of the studies that are noted above documented that the ICS most powerfully and reliably affects, and thus helps forecast, consumption of durables, and vehicles in particular. Almost no evidence has heretofore documented that stronger consumer sentiment, given other macroeconomic determinants of consumer expenditures such as income, wealth, and interest rates, leads to increased spending on nondurables or services. In addition to re-examining the effects of consumer sentiment on the various components of consumption, below we show how correlated are the answers to the current and expectations sub-indexes of the ICS and answers to the five individual component questions used to construct the ICS. (Details on the five survey questions and how the ICS is constructed are presented in Appendix A.)

Table 1 displays the simple correlations between (indexes of the answers to) the ICS, each of its five component questions (ICSQ1-5), the current (ICSCURR, comprised of questions 1 and 5) and the expectations (ICSEXP, comprised of questions 2, 3, and 4) sub-indexes respectively.⁴ Table 1 shows, in the column entitled ICS, that each of the component questions that is used to construct the ICS is quite highly correlated with the aggregate index, with correlations hovering around 0.90.⁵ The least correlated (with the ICS) answers come from question 5, which inquires about whether now is a good time to buy durables. The same column shows that the sub-indexes are quite highly correlated (0.85 or more) with the ICS.

⁴ ICSEXP is one of the ten series that comprise the index of leading indicators.

⁵ Since the ICS itself is a simple average of the answers to these five questions, we are not surprised that the correlations would be quite high, though we would not necessarily have expected them to be so close to 1.00.

Table 1 also hints that the individual questions might improve forecasts because the simple correlations between the answers to the individual questions average only about 0.7. Below we pursue whether some questions improve forecasting more than others do or more than the aggregate index, ICS, does, and whether some questions are more informative about the future of some components of consumption expenditures than they are about others.

IV. A BASELINE MODEL FOR FORECASTING CONSUMPTION

In the analysis that follows, we used data for (annualized growth rates of seasonally-adjusted, real, per-capita) consumption and its components, income, and household wealth. We used data from the first quarter of 1960 (1960:1), when the index of consumer sentiment first became available regularly and quarterly, through the third quarter of 2006 (2006:3), the last quarter for which we have data for all variables. For (total) consumption (denoted PC in tables), we used personal consumption expenditures. We also used data for expenditures on each of the components of consumption: durables (D), vehicles (V), non-vehicle durables (NV), nondurables (ND), and services (S). As income and wealth measures that are likely to be relevant to households' expenditures, we used disposable personal income (Income), the non-home-equity (NHNW), and the home-equity (HOME) components of total household net worth (NW). For interest and inflation rates, we used the 1-year nominal interest Treasury bill yield and the percentage point change in the year-over-year, seasonally-adjusted, quarterly-average, total CPI.

Tables 2.1 and 2.4 present results for a baseline model that is fairly similar to those used by Carroll, Fuhrer, and Wilcox (1994), Bram and Ludvigson (1998), Garner (2002), and others. The baseline model, shown as equation 1 below, regresses the annualized, 1-quarter-ahead (i.e., from period $t-1$ to t) growth rates of consumption (or its components), C_j , on a matrix of macroeconomic variables, $X_{t-i, k}$, that includes lags of the dependent variable (denoted "Own lags" in tables) and lags of income, of the non-home-equity and of the home-equity components of household wealth, and of

interest and inflation rates.⁶ Each regression included an intercept term. Each regression included the first four lags of each right-hand-side variable. K is the number of right-hand side, macroeconomic variables, including the lagged dependent variable.

$$(1) \quad C_j = \alpha_j + \sum_{i=1}^4 \sum_{k=1}^K X_{t-i,k} + \varepsilon_{j,t}$$

We used the baseline model, separately for 1-quarter-ahead and for 4-quarter-ahead forecasts, to assess whether the (lags of) macroeconomic variables (income, wealth, and interest and inflation rates) individually improved consumption forecasts by statistically significant amounts.⁷ Tables 2.1 and 2.4 display the F-statistics of the joint significance of (the four lags of) each macroeconomic variable's effects on consumption and each of its components.⁸

The results of the F-tests conform broadly to those of prior studies. Several features are particularly noteworthy, however. First, income effects are quite weak, especially at a 4-quarter forecasting horizon. Households' net worth in stock, bond, bank deposit, and other financial assets tend to help forecast for the shorter, 1-quarter-ahead horizon, but not for the longer, 4-quarter-ahead horizon. By contrast, households' home equity improved short-term forecasting little, but much more reliably improved longer-term forecasts. The nominal interest rate was especially helpful for longer-horizon forecasts, but also helped shorter-horizon forecasts, apparently through its effects on durables.⁹ Inflation had a mixed record in helping forecast consumption, having strong effects on durables, but weak effects elsewhere.

⁶ McCarthy and Steindel (2006) point out that housing might have effects on consumption spending that might differ from other sources of wealth.

⁷ The critical values for 1%, 5%, and 10% joint significance of four lags of a macro factor are 3.44, 2.43, and 1.98, respectively.

⁸ We numbered tables 2.1 and 2.4 in reference to the 1- and 4-quarter-ahead forecasts. Since we did not generate 2- and 3-quarter-ahead forecasts, there are no tables headed 2.2 and 2.3. Similarly, we generated tables numbered 3.1, 3.4, 4.1, 4.4, 5.1, and 5.4, but not tables 3.2, 3.3, 4.2, 4.3, 5.2, and 5.3.

⁹ Wilcox (1989) documents the dominance of nominal, rather than real, interest rates in explaining consumption before the 1990s.

V. DOES CONSUMER SENTIMENT IMPROVE CONSUMPTION FORECASTS?

We now turn to whether measures of consumer sentiment reliably improve consumption forecasts. As measures of consumer sentiment, we use the ICS itself, answers to each of the ICS individual, component questions, and the sub-indexes constructed from those answers. We examine to which component questions in the survey of households do answers affect which components of consumption¹⁰ Tables 3.1 and 3.4 display the F-statistics for tests of whether (the first four lags of) a measure of consumer sentiment affects individual components of consumption by statistically significant amounts. First, note that, in the left panel of table 3.1, the F-statistic for the effect on total consumption of the ICS is not quite significant, even at the 10% level ($1.93 < 1.98$).¹¹ The corresponding entry in the right panel of table 3.1 shows that the index of consumer sentiment raised the adjusted R^2 by little, from the baseline value of 0.29 by 0.02 (to 0.31).¹²

These results fit the prior literature's conclusions that the ICS only modestly improves consumption forecasts in the presence of macroeconomic variables that are commonly included in econometrically-estimated consumption functions. In contrast to prior literature, however, we found significant effects on nondurables, but no effects on the vehicle component of durables expenditures. Given these results for the index, we turn now to the results based on (answers to the) individual questions that comprise the index.

Despite the high simple correlations of the component questions with the aggregate measure of consumer sentiment (ICS), we find that the answers to the individual questions often provide useful information for forecasting the components of aggregate consumption. For example, table 3.1 shows that questions 1 and 2 both significantly improve forecasting expenditures on nondurables.

¹⁰ Richard Curtin (2003), the long-time Director of the Survey of Consumers at the University of Michigan, pointed to the usefulness of using information in the answers to individual questions.

¹¹ The expectations-oriented sub-index, ICSEXP, which has sometimes also been examined in prior studies, performs quite similarly to the overall aggregate index, the ICS.

¹² Because almost always larger F-statistics corresponded to larger increases in adjusted R^2 , we discuss the adjusted R^2 's relatively little.

Indeed, question 1 had slightly more statistical significance (as measured by F-statistics, $2.01 > 1.93$) in forecasting total consumption than did the aggregate index, the ICS. Whereas questions 1 and 2 helped forecast nondurables, by contrast, and fortunately for a forecaster, question 3 helps forecast both services and expenditures on vehicles (at the 10% level), and thereby total consumption, PC (at the stronger 5% level). Question 4 did not significantly improve forecasting of any of the components of consumption. Services are also forecasted by the answers to question 5.

The bottom row of the left panel of table 3 presents the F-statistics for the test of whether (jointly) all four lags of all five questions significantly forecast consumption.¹³ The F-statistic indicates that, taken together, the component questions do significantly improve forecasts of total consumption (with calculated F-statistic of 1.68 slightly exceeding the critical value of 1.64). Intriguingly, the source of the improvement stems from the improved ability to forecast nondurables and services, two components where consumer sentiment has historically been thought to add little: The F-statistics of 1.92 and 2.25 indicate that jointly all five questions (ICSALL5) significantly improve forecasts of nondurables and services. Larger F-statistics in the left panel of table 3.1 also typically correspond, naturally, to larger improvements in adjusted R^2 's.

In many cases of corporate planning and budgeting, in employment decisions, and so on, forecasters are likely to get more value from improvements in longer-horizon, as opposed to 1-quarter-ahead, forecasts. In that regard, it has been somewhat surprising that empirical studies have typically restricted their tests to whether the ICS improved forecasts over relatively short, 1-quarter-ahead horizons.

Table 3.4 displays the F-statistics obtained when we substitute 4-quarter (for 1-quarter) - ahead growth rates of consumption.¹⁴ The most obvious change in moving to the longer forecast horizon is that that F-statistics are very typically larger. Consistent with Curtin's evaluation (2006),

¹³ The critical value for the F-statistic for this test at the 5% significance level is 1.64.

¹⁴ See Curtin (2006).

the ICS and its components contribute more to forecasts of the generally smoother, but longer-horizon, 4-quarter growth rates of consumption and its components.¹⁵ At this longer forecasting horizon, the aggregate ICS significantly ($F = 3.43$) forecasts aggregate consumption, due apparently to its ability to forecast expenditures on vehicles, in addition to nondurables. One reason for the very large increase in the F-statistic for vehicles ($F = 4.62$) in the top row of the left panel of table 3.4 compared with that for the short-horizon ($F = 1.56$) is probably that the fairly smooth ICS results from its questions being oriented not toward forecasting the very volatile 1-quarter growth rates of vehicle expenditures, but instead were geared toward longer-horizon forecasts, even of relatively volatile series.¹⁶

The left panel of table 3.4 also shows that the F-statistics for individual questions very often exceed those for the ICS. Thus, these 4-quarter-ahead forecasts are generally helped by almost any configuration of the questions posed in the household survey. But, some useful distinctions remain. Despite the ICS's improving forecasts neither of non-vehicle durables nor of services, questions 1 and 2 both improve the former and questions 3 and 5 improve the latter. Indeed, question 5 is a stellar performer: It significantly improves forecasts of total consumption and each of its components. The results based on jointly using all five questions do nearly as well, significantly improving forecasts of each component of consumption, except non-vehicle durables.

These results contrast with prior studies' findings that measures of consumer sentiment helped forecast vehicles most strongly, but helped little in forecasting nondurables and services. While vehicles might once have been the paramount example of discretionary purchases, secular increases in per-capita, real income and wealth likely have raised the fractions of expenditures on

¹⁵ Shortening the 47-year sample slightly to conduct 4-quarter rather than 1-quarter-ahead forecasts changes the critical F values by trivial amounts.

¹⁶ Questions 2 and 3 ask about conditions a year ahead from the time of the survey and Question 4 asks about conditions over the upcoming 5 years.

nondurables (e.g., dining out) and on services (e.g., travel) that are in effect discretionary and that, like vehicles, are importantly connected to changes in consumer sentiment.

VI. BUT, THEN, DO MACRO VARIABLES STILL FORECAST CONSUMPTION?

It has been common to test whether consumer sentiment matters in the presence of other macroeconomic determinants of consumption expenditures. Tables 3.1 and 3.4 did just that. Less common has been testing whether the macroeconomic variables still matter in the presence of consumer sentiment. Here we do those tests. The results are likely most relevant to forecasters who are operating in “real time.” If measures of consumer sentiment and other macroeconomic variables predict growth in consumption (and its components) with similar accuracy, forecasters might justifiably prefer to base their forecasts on the inputs that become available sooner (i.e., on consumer sentiment).

For 1-quarter- and 4-quarter-ahead horizons, tables 4.1 and 4.4 display F-statistics of tests for the statistical significance of (the four lags of) of each macroeconomic variable, given a measure of consumer sentiment and the remaining macroeconomic variables. To compute the F-statistics for table 4.1, we used (the answers to) Question 1 for nondurables, Question 5 for services, and Question 3 for the other consumption variables. To compute the F-statistics for table 4.4, we used Question 5 for each of the six consumption categories. For ease of comparison, at the bottom of tables 4.1 and 4.4, we reproduce again the F-statistics obtained by adding each of those questions to the baseline model.

Fewer than half of the F-statistics in table 4.1 point to significant effects on consumption of income, wealth, or interest or inflation rates. Compared with the F-statistics in table 2.1, the F-statistics in table 4.1, obtained by adding a measure of consumer sentiment to the baseline model, were lower for non-home-equity and higher for home-equity wealth. The previously-strong interest rate effects are little affected by adding an ICS question, as were the previously-weak income and inflation rate effects.

Table 4.4 repeats the exercise for 4-quarter-ahead forecasts. The changes are somewhat different from those noted above for table 2.4. Like table 2.4, nominal interest rate effects remained consistently strong, while the income, non-home-equity wealth, and inflation rate effects remained neither very strong nor consistent. In contrast to the 1-quarter-ahead forecast specification, however, home-equity wealth effects were weakened by the inclusion of the ICS question.

What tables 4.1 and 4.4 newly reveal is that these ICS questions, as measured by their F-statistics (and the changes in the adjusted R^2 's, which are not shown here), add more to 4-quarter-ahead forecasts of each of the six consumption categories, except for non-vehicle durables, than they do to 1-quarter-ahead forecasts. In addition, the ICS questions tend to add more to the 1-quarter-ahead forecasts than any of the macroeconomic variables considered, except for the nominal interest rate.

Here is where these results suggest quite a difference with conventional wisdom. Based on a considerable number of econometric studies over the past few decades, conventional wisdom regards consumer sentiment as making statistically detectable, but often economically modest or mixed improvements in consumption forecasts. The results in tables 4.1 and 4.4, which are based on answers to only one of the five questions in the household survey rather than prior studies' focusing on the aggregate ICS, show that a measure of consumer sentiment is one of the most powerful aids to consumption forecasts at the one-quarter horizon. Those results also show that the measure of consumer sentiment is the single largest contributor to forecasting each of the six consumption categories over the 4-quarter horizon (except for non-vehicle durables).

VII. OUT-OF-SAMPLE FORECASTS

To further explore the forecasting contributions of these measures of consumer sentiment, we estimated the specifications used for tables 4.1 and 4.4 over rolling samples and then calculated out-of-sample forecasts for the ensuing four quarters. We used the same, 1-quarter-ahead specification that we used for table 4.1 to generate forecasts for the 24 quarters of the years 2000-

2005 as follows: We used that specification to estimate a vector autoregression (VAR) through the end of 1999 and then generated forecasts for the four quarters of 2000. The first quarter forecast relied only on actual, lagged values of the macroeconomic variables and the ICS question. The dynamic forecasts for ensuing quarters of 2000 were based on actual and forecasted values. We then repeated this procedure, estimating through the end of 2000 and forecasting the four quarters of 2001, and so on.

Table 5.4 is based on a similar procedure, but one that was modified to fit the 4-quarter-ahead forecasting specification. We obtained six (one for each year, 2000-2005) 4-quarter-ahead forecasts as follows: Because calculating a 4-quarter-ahead forecast did not require using prior quarters' forecasts, to begin we estimated a single equation for each consumption category with data for consumption 4-quarter-ahead through 1999 (and with data for all right-hand-side variables through 1998). Then we used those estimates to forecast 4-quarter-ahead growth through the fourth quarter of 2000. For each later year's forecast, we added one year of data to the estimation period. This procedure produced six 4-quarter-ahead forecasts of each consumption category.

From left to right, table 5.1 displays the mean of the 1-quarter-ahead growth rate of each of the six consumption categories, the mean (or average) forecast error when no ICS question is included (in the column titled "None"), when one is included (in the column titled "ICS"), the difference between the two (in the column titled "Difference"), the root-mean-squared-errors (RMSE) when no ICS question is included (in the column titled "None"), when one is included (in the column titled "ICS"), and the percentage difference between the two (in the column titled "% Difference").

The top row of results in Table 5.1 shows that including an ICS question reduced the mean forecast error for 1-quarter-ahead forecasts of total consumption from 0.84 to 0.27 percentage points, or more than $\frac{1}{2}$ of 1 percentage point. Similarly, the RMSE was reduced from 2.16 (about the average size of consumption growth itself) to 1.65 percentage points, or a 24 percent reduction. The

next rows show that most of the improvement in 1-quarter-ahead forecasts was concentrated in vehicle expenditures and in services, whether measured by the reduction in mean errors or in RMSEs. Despite the large F-statistic, forecasts of nondurables were not improved by adding an ICS question during this most recent period.¹⁷

Table 5.4 displays the same forecast error measures for the six 4-quarter-ahead horizons for each consumption category. Again, forecast errors generally were reduced by including the ICS question, which for the 4-quarter-ahead horizon was based on question 5 for each consumption category. Again, forecasting improvements were concentrated in vehicle expenditures (based on the mean error) and in services (based on the root mean square error). Forecast errors of 4-quarter-ahead growth of non-vehicle durable and nondurable consumption were little affected by including an ICS question (based respectively on the root mean square error and the mean error).

Overall, tables 5.1 and 5.4 show that including an ICS question clearly reduced consumption forecasting errors at both the 1-quarter-ahead and the 4-quarter-ahead horizons. Conveniently for forecasting practice, forecasting improvements tended to be concentrated in categories where the F-statistics for the ICS questions were the largest. If that pattern tends to hold, then forecasters would have some indications from in-sample results about where and how much their forecasts were likely to improve.

VIII. CONCLUSION

Perhaps not surprisingly, econometric evidence has long suggested that consumer sentiment improves forecasts of consumption somewhat. More surprising is that so little attention has been directed to the individual component questions that comprise the aggregate index. Our results

¹⁷ Forecast improvements for the 2000-2005 period may not be representative since that period included a recession, 9/11, atypical fiscal and monetary policies, atypical housing sales and finance conditions, a war, and other potentially important and interesting but atypical events. Nonetheless, it is the most recent period and therefore of considerable interest.

suggest that the separate questions in the household survey of consumer attitudes have differing abilities to improve forecasts of various components of consumption.

We present new evidence that these long-available, but long-ignored, measures of consumer sentiment can reduce errors in forecasting total consumption and its components. The component questions of the aggregate Index of Consumer Sentiment improve forecasts, not only of expenditures on durables but also of nondurables and services. Measures of consumer sentiment seem particularly useful at the longer, 4-quarter-ahead horizon. In addition, they typically contribute at least as much to 1-quarter-ahead and 4-quarter ahead forecasts as do income and wealth variables. Out-of-sample forecasts for the 2000-2005 period further substantiate that measures of consumer sentiment can reduce consumption forecasting errors appreciably. If these patterns persist in further investigations, they suggest that attention might fruitfully be directed at deriving the most useful combinations of the answers to the individual component questions of the Index of Consumer Sentiment.

REFERENCES

Bram, Jason and Sydney C. Ludvigson. 1998. "Does Consumer Confidence Forecast Household Expenditure? A Sentiment Index Horse Race." Federal Reserve Bank of New York, Economic Policy Review, June, 4:2, pp.59-78.

Carroll, Christopher D., Fuhrer, Jeffrey C., and Wilcox, David W., "Does Consumer Sentiment Affect Household Spending? If So, Why?," American Economic Review, December 1994, pp. 1397-1408.

Curtin, Richard, "What Recession? What Recovery? The Arrival of the 21st Century Consumer," Business Economics, 38: 2, April 2003, pp. 25-32.

Curtin, Richard, "Surveys of Consumers: Theory, Methods, and Interpretation," NABE 3rd Annual Professional Development Seminar, May 23, 2006, pp.1-7.

Garner, C. Alan, "Consumer Confidence After September 11," Federal Reserve Bank of Kansas City Economic Review, Second Quarter 2002, pp. 1-21.

Howrey, E. Philip, "The Predictive Power of the Index of Consumer Sentiment," Brookings Papers on Economic Activity, 2001:1, pp. 175-207.

Hymans, Saul H. "Consumer Durable Spending: Explanation and Prediction," Brookings Papers on Economic Activity, 1970:2, pp. 173-199.

Juster, F. Thomas and Wachtel, Paul "Inflation and the Consumer," Brookings Papers on Economic Activity, 1972:1, pp. 71-114. (a)

Juster, F. Thomas and Wachtel, Paul "Anticipatory and Objective Models of Durable Goods Demand," American Economic Review, September 1972, pp. 564-579. (b)

Kelly, David, "The Plunge in Confidence Will Hit Spending, But How Hard?," DRI/McGraw Hill U.S. Review, September 1990.

Lovell, Michael C., "Comment on Howrey," Brookings Papers on Economic Activity, 2001:1, pp. 208-213.

Ludvigson, Sydney C, "Consumer Confidence and Consumer Spending," Journal of Economic Perspectives, v. 18:2, Spring 2004, pp. 29-50. (2004).

McCarthy, Jonathan and Charles Steindel, "Housing Activity and Consumer Spending," Business Economics, v.42:2, April 2007, pp. 6-21.

Mishkin, Frederic S., "Consumer Sentiment and Spending on Durable Goods," Brookings Papers on Economic Activity, 1978:1, pp. 217-231.

University of Michigan, Survey Research Center, Institute for Social Research, "Survey of Consumers, Historical Data."

Wilcox, James A. "Liquidity Constraints on Consumption: The Real Effects of 'Real' Lending Policies," Federal Reserve Bank of San Francisco Quarterly Review, Fall 1989, pp. 39-52.

APPENDIX A

CONSTRUCTION OF THE INDEX OF CONSUMER SENTIMENT (ICS)

Quarterly since 1960 and monthly since 1978, the Survey Research Center at the University of Michigan has surveyed consumers. (The timing of surveys was irregular between 1946 and 1959. Some of the questions in the survey were not asked regularly until 1969.) Currently responses from about 500 consumers are collected by telephone throughout the month.

The questions ask about personal finances and economy-wide conditions; they ask about the past, the present, and the future. Responses from 5 questions are used to construct the Index of Consumer Sentiment (ICS). [The answers to each of the questions are bracketed following the questions.] Here are the five questions whose answers are used to calculate the ICS:

- 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 off or worse off financially than you were a year ago?" [better off, same, worse off, or don't know/not available]
- 2."Now looking ahead--do you think that 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?" [better off, same, worse off, or don't know/not available]
- 3."Now turning to business conditions in the country as a whole--do you think that during the next 12 months we'll have good times financially, or bad times or what?" [good times, uncertain, bad times, don't know/not available]
- 4."Looking ahead, which would you say is more likely--that in the country as a whole we'll have continuous good times during the next 5 years or so, or that we will have periods of widespread unemployment or depression, or what?" [good times, uncertain, bad times, don't know/not available]
- 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?" [good time, uncertain, bad time]

For each question, a "relative" is calculated as 100 plus the difference between the percentage of respondents answering "good" (or "better") and the percentage answering "bad" (or "worse"). A simple average of the relatives for questions 1 through 5 is used as the "Index of Consumer Sentiment." A simple average of the relatives for questions 1 and 5 is used as the "Current Index." A simple average of the relatives for questions 2, 3, and 4 is used as the "Expected Index." (The indexes are rebased to equal 100 in February 1966.)

The "Expected Index" is one of the 12 series used in the index of leading economic indicators.

Figure 1

The Index of Consumer Sentiment (ICS)

(1966 = 100, NSA, Quarterly averages of monthly data, 1960:1 - 2006:3)



Source: University of Michigan, Survey Research Center.

Figure 2

Consumption

**(1-quarter (GRCPC) and 4-quarter (GRC4PC) -ahead
growth rates in real, per capita personal consumption expenditures,
percent, SAAR, 1997:1 – 2006:3)**

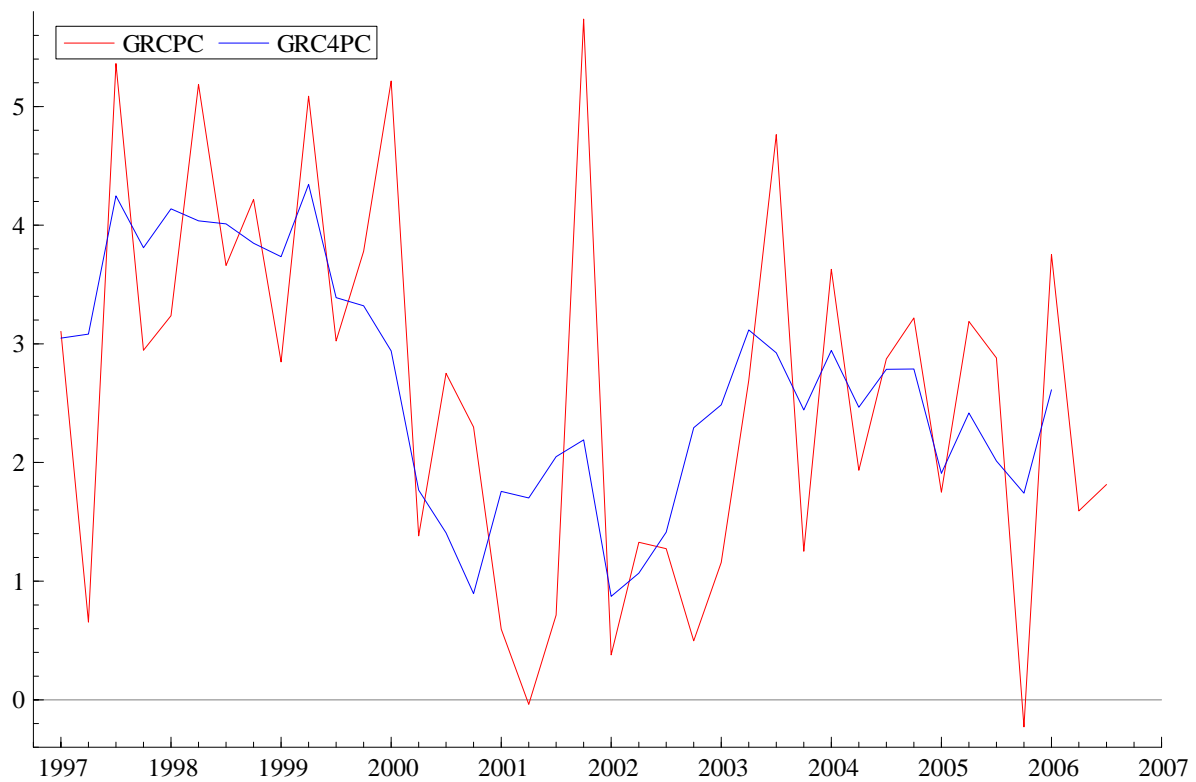


TABLE 1								
The Index of Consumer Sentiment, Component Questions, and Sub-Indexes: Correlations								
1961:1 - 2006:3								
	<u>ICS</u>	<u>ICSQ1</u>	<u>ICSQ2</u>	<u>ICSQ3</u>	<u>ICSQ4</u>	<u>ICSQ5</u>	<u>ICSCURR</u>	<u>ICSEXP</u>
ICS	1							
ICSQ1	0.91	1						
ICSQ2	0.88	0.80	1					
ICSQ3	0.91	0.77	0.78	1				
ICSQ4	0.93	0.79	0.85	0.92	1			
ICSQ5	0.79	0.77	0.61	0.51	0.56	1		
ICSCURR	0.86	0.88	0.69	0.61	0.65	0.98	1	
ICSEXP	0.96	0.81	0.88	0.97	0.97	0.59	0.68	1

TABLE 2.1						
Forecasting Growth in Components of Consumption Without ICS:						
F-statistics						
(1-quarter-ahead growth rates, SAAR, 1961:1 - 2006:3)						
	<u>PC</u>	<u>D</u>	<u>V</u>	<u>NV</u>	<u>ND</u>	<u>S</u>
Own lags	1.85	4.39	7.16	5.63	0.85	2.98
Income	1.92	2.10	1.80	0.24	0.95	0.76
NHNW	2.48	2.37	2.39	2.62	2.89	2.57
HOME	1.44	1.64	2.23	1.91	0.97	0.92
Interest Rate	4.48	3.49	2.81	1.53	1.42	4.04
Inflation Rate	1.56	1.43	3.15	0.79	1.79	0.59

F's above the 5% level of significance are bolded.

TABLE 2.4						
Forecasting Growth in Components of Consumption Without ICS						
F-statistics						
(4-quarter-ahead growth rates, SAAR, 1961:1 - 2006:1)						
	<u>PC</u>	<u>D</u>	<u>V</u>	<u>NV</u>	<u>ND</u>	<u>S</u>
Own lags	1.22	1.47	1.96	3.40	0.68	4.57
Income	0.46	0.76	1.18	0.45	0.19	0.74
NHNW	1.08	0.40	0.24	1.48	2.46	1.83
HOME	2.42	3.92	5.99	4.21	0.81	1.65
Interest Rate	3.38	5.81	4.70	3.91	3.53	2.32
Inflation Rate	2.40	4.76	5.78	0.39	2.27	0.42

F's above the 5% level of significance are bolded.

TABLE 3.1														
Effects on Forecasts of Consumption Growth (and its Components) of adding ICS Measures to a Baseline Model														
(Baseline Model includes lags of dependent variable, income, non-home wealth, home equity, the nominal interest rate, and the inflation rate)														
F-Statistics and Change in Adjusted R ²														
(1-quarter-ahead growth rates, SAAR, 1961:1 - 2006:3)														
F-Statistics							Change in Adjusted R ²							
							w/o ICS	0.29	0.22	0.23	0.13	0.17	0.19	
	<u>PC</u>	<u>D</u>	<u>V</u>	<u>NV</u>	<u>ND</u>	<u>S</u>		<u>PC</u>	<u>D</u>	<u>V</u>	<u>NV</u>	<u>ND</u>	<u>S</u>	AVERAGE
ICS	1.93	2.11	1.56	0.52	2.69	0.60	ICS	0.02	0.02	0.01	-0.01	0.03	-0.01	0.01
ICS1	2.01	0.82	0.68	1.18	4.80	0.40	ICS1	0.02	0.00	-0.01	0.00	0.07	-0.01	0.01
ICS2	1.02	0.67	0.39	0.85	3.12	0.23	ICS2	0.00	-0.01	-0.01	0.00	0.04	-0.02	0.02
ICS3	2.58	2.05	2.38	0.35	1.78	2.42	ICS3	0.03	0.02	0.01	-0.01	0.02	0.03	0.01
ICS4	1.83	2.04	1.15	0.54	1.44	0.77	ICS4	0.01	0.02	0.00	-0.01	0.01	0.00	0.01
ICS5	1.11	1.53	1.12	1.22	1.22	3.31	ICS5	0.00	0.01	0.00	0.00	0.00	0.04	0.01
ICSCURR	1.44	1.63	1.16	0.94	2.56	1.69	ICSCURR	0.01	0.01	0.00	0.00	0.03	0.01	0.01
ICSEXP	1.97	1.88	1.66	0.22	1.76	1.10	ICSEXP	0.02	0.02	0.01	-0.02	0.02	0.00	0.01
ICSALL5	1.68	1.09	0.85	0.69	1.92	2.25	ICSALL5	0.06	0.01	-0.02	-0.04	0.09	0.11	0.04
F's above the 5% level of significance are bolded.							AVERAGE	0.02	0.01	0.00	-0.01	0.03	0.02	0.01

TABLE 3.4														
Effects on Forecasts of Consumption Growth (and its Components) of adding ICS Measures to a Baseline Model														
(Baseline Model includes lags of dependent variable, income, non-home wealth, home equity, the nominal interest rate, and the inflation rate)														
F-Statistics and Change in Adjusted R ²														
(4-quarter-ahead growth rates, SAAR, 1961:1 - 2006:1)														
F-Statistics							Change in Adjusted R ²							
							w/o ICS	0.31	0.39	0.36	0.24	0.22	0.22	
	<u>PC</u>	<u>D</u>	<u>V</u>	<u>NV</u>	<u>ND</u>	<u>S</u>		<u>PC</u>	<u>D</u>	<u>V</u>	<u>NV</u>	<u>ND</u>	<u>S</u>	AVERAGE
ICS	3.43	5.42	4.62	1.82	5.18	0.89	ICS	0.04	0.06	0.02	0.02	0.08	0.00	0.04
ICS1	3.95	4.10	4.44	3.44	5.01	1.83	ICS1	0.05	0.04	0.04	0.04	0.07	0.02	0.05
ICS2	1.17	2.83	3.82	3.08	1.87	0.28	ICS2	0.00	0.03	0.04	0.04	0.02	-0.01	0.02
ICS3	6.15	3.81	5.54	0.28	4.45	6.07	ICS3	0.08	0.04	-0.01	-0.01	0.06	0.09	0.05
ICS4	3.39	2.99	2.60	0.71	4.21	1.22	ICS4	0.04	0.03	-0.01	-0.01	0.06	0.00	0.03
ICS5	5.62	6.26	7.15	3.61	3.28	8.41	ICS5	0.07	0.07	0.05	0.05	0.04	0.12	0.07
ICSCURR	5.83	7.17	7.42	3.29	4.21	6.56	ICSCURR	0.08	0.08	0.04	0.04	0.06	0.10	0.07
ICSEXP	4.04	3.77	4.27	0.46	3.98	2.18	ICSEXP	0.05	0.04	0.01	-0.01	0.06	0.02	0.03
ICSALL5	3.27	2.29	3.43	1.38	2.01	5.98	ICSALL5	0.15	0.08	0.03	0.03	0.09	0.30	0.14
F's above the 5% level of significance are bolded.							AVERAGE	0.06	0.07	0.03	0.02	0.06	0.07	0.06

TABLE 4.1						
Effects on Forecasts of Consumption Growth (and its Components) of Adding Macroeconomic Variables: F-statistics						
(1-quarter-ahead growth rates, SAAR, 1961:1-2006:3)						
	<u>PC</u>	<u>D</u>	<u>V</u>	<u>NV</u>	<u>ND</u>	<u>S</u>
Own lags	1.49	5.56	8.56	5.41	0.50	2.10
Income	1.23	1.61	0.85	0.18	1.05	0.46
NHNW	1.41	0.78	0.84	1.73	3.33	2.18
HOME	1.82	2.40	2.37	1.66	1.21	0.75
Interest rate	5.45	3.80	3.36	1.67	2.54	3.38
Inflation rate	1.72	0.88	2.01	0.40	2.98	1.25
ICS question	2.58	2.05	2.38	0.35	4.80	3.31

TABLE 4.4						
Effects on Forecasts of Consumption Growth (and its Components) of Adding Macroeconomic Variables: F-statistics						
(4-quarter-ahead growth rates, SAAR, 1961:1-2006:1)						
	<u>PC</u>	<u>D</u>	<u>V</u>	<u>NV</u>	<u>ND</u>	<u>S</u>
Own lags	0.82	1.88	3.49	3.92	0.56	3.16
Income	0.19	0.25	0.30	0.35	0.09	0.17
NHNW	1.05	0.69	0.58	1.04	0.99	2.62
HOME	1.62	3.54	4.56	2.48	1.01	0.08
Interest rate	2.92	5.59	4.36	4.84	2.88	2.84
Inflation rate	2.44	4.10	3.56	1.15	1.24	3.71
ICS question	5.62	6.26	7.15	3.61	3.28	8.41

TABLE 5.1								
Out-of-Sample Forecasts for Growth of Consumption (and its Components)								
Based on Dynamic Forecasts for Next Four Quarters, Annually, 2000:1 - 2005:4								
Based on 1-Quarter-Ahead Model, Re-estimated Annually								
<u>Actual</u>		<u>Mean Error</u>			<u>Root Mean Squared Error</u>			
<u>Forecast of</u>	<u>Mean</u>	<u>None</u>	<u>ICS</u>	<u>Difference</u>	<u>None</u>	<u>ICS</u>	<u>% Difference</u>	
PC	2.14	-0.84	-0.27	-0.57	2.16	1.65	-24	
D	4.47	-1.70	-1.40	-0.30	12.57	11.54	-8	
V	0.73	-5.53	-4.23	-1.30	25.43	22.52	-11	
NV	2.89	1.42	1.17	0.25	5.89	5.91	0	
ND	2.13	-0.06	-0.07	0.01	2.55	2.69	5	
S	1.67	-0.74	-0.62	-0.12	1.39	1.22	-12	

TABLE 5.4							
Out-of-Sample Forecasts for Growth of Consumption (and its Components)							
Based on Six Forecasts of 4-Quarter Ahead Growth Rates, 2000:4 - 2005:4							
Based on 4-Quarter-Ahead Model, Re-estimated Annually							
<u>Actual</u>		<u>Mean Error</u>			<u>Root Mean Squared Error</u>		
<u>Forecast of</u>	<u>Mean</u>	<u>None</u>	<u>ICS</u>	<u>Difference</u>	<u>None</u>	<u>ICS</u>	<u>% Difference</u>
PC	2.12	-0.80	-0.67	-0.13	1.98	1.94	-2
D	4.54	-0.90	-0.32	-0.58	9.15	9.51	4
V	-1.64	-5.64	-4.96	-0.68	20.21	20.79	3
NV	2.87	1.34	1.04	-0.30	6.34	6.33	0
ND	1.87	-0.13	-0.25	0.12	1.71	1.66	-3
S	1.74	-0.83	-0.71	-0.13	2.04	1.82	-11