WORKING PAPER SERIES

Does Consumer Sentiment Predict Regional Consumption?

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JEL Codes: E27, E21, C53

Abstract

This paper tests the ability of consumer sentiment to predict retail spending at the state level. The results here suggest that, although there is a significant relationship between sentiment measures and retail sales growth in several states, consumer sentiment exhibits only modest predictive power for future changes of retail spending. Measures of consumer sentiment, however, contain additional explanatory power aside from the information available in other indicators. We also find that by restricting our attention to fluctuations in retail sales that occur at the business cycle frequency we can uncover a significant relationship between consumer sentiment and retail sales growth in many additional states. In light of these results, we conclude that the practical value of sentiment indices to forecast consumer spending at the state level is, at best, limited.

1. Introduction

Consumer sentiment is arguably the most cited indicator of current economic conditions, as it appears to be correlated with the strength of the economy. Following September 11, 2001, the two most common consumer sentiment indices—the University of Michigan's Index of Consumer

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Sentiment (ICS) and the Conference Board's Consumer Confidence Index (CCI)—fell an average of 20.9 percent through March 2003, reaching their lowest levels in nearly a decade. During the same period, real personal consumption expenditures grew by only 4.9 percent, compared to a 6.6 percent rate of growth over the two previous years when consumer sentiment was higher.

In fact, there is little argument in the academic literature that contemporaneous consumer sentiment and national consumption expenditure growth are related, as evidenced in Figure 1. Quarterly data since 1970 reveal an average correlation of 0.43 between personal consumption expenditures and both sentiment indices. What has been an important and controversial issue in the literature is the ability of consumer sentiment to forecast future consumption expenditures. Given that consumption expenditures have a direct correspondence with economic growth, the issue is, then, whether consumer sentiment can predict economic growth. If consumer sentiment does predict economic growth, a further question is whether consumer sentiment captures the perceptions of individuals directly or whether it encompasses the forecasting information contained in other variables. The answer to this question is of interest, given the timeliness with which the sentiment indices are released, often ahead of other indicators.[2]

[Figure 1 about here]

Carroll, Fuhrer, and Wilcox (1994) find that lagged values of ICS significantly explain nearly 14 percent of growth in real personal consumption expenditures. However, after including other forecasting variables in their models, the incremental impact of lagged sentiment falls to 3 percent. Bram and Ludvigson (1998) extend the models of Carroll, Fuhrer, and Wilcox (1994) by considering additional forecasting variables and the CCI in addition to the ICS. They find that the ICS is no longer a significant predictor of consumption expenditures when interest rate and equity price changes are included in the models. The CCI, however, did significantly improve the explanatory power of their forecasting models. This suggests that the CCI and the ICS do not provide the same forecasting information.

These mixed results are echoed in the ability of each sentiment index to forecast production and employment. Batchelor and Dua (1998) show that the CCI is useful in predicting the 1991 recession, but their results cannot be generalized to other years. Matsusaka and Sbordone (1995) find that the ICS significantly improves their forecasting model for GNP after considering other factors such as money growth, interest rates, and government spending. Howrey (2001) obtains a similar result for forecasts of GDP. Leeper (1992) finds that while the ICS alone is a significant predictor of industrial production, the inclusion of additional variables eliminates any predictive power of the ICS.

In contrast with most of the earlier studies, which have explored whether consumer sentiment predicts *national* measures of consumption expenditures, in this paper we examine (1) how well consumer sentiment indices predict retail sales growth at the *state* level and (2) whether consumer sentiment measures contain any incremental predictive power about future changes in consumer spending relative to other indicators of retail sales growth.[3] But why attempt to predict state-level measures at all when suitable aggregate measures are readily available?

A recent paper by Owyang, Piger, and Wall (2004) found that state-level business cycles are not necessarily synchronous with national cycles. Thus, it is of interest to determine whether and to what extent consumer sentiment reflects idiosyncratic regional activity versus aggregate conditions. Further, uncovering a significant relationship between consumer sentiment and retail spending across states may allow policymakers to extract timely information about regional economic conditions from consumer sentiment measures. Therefore, we examine whether the relationship between sentiment and retail spending at the state level is reflected in the national data, and whether the statistical significance, if any, is driven by a few isolated states.

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[2] The sentiment indices are some of the earliest economic indicators available at the quarterly frequency.
[3] Allenby, Jen, and Leone (1996) find that consumer sentiment forecasts retail fashion sales. The authors used sales data from five specialty divisions of a Fortune 500 retailer.

2. Methodology and Data

2.1 Model

The regression model we use to judge the predictive ability of consumer sentiment on state retail sales growth is:

$$R_t = \alpha + \sum_{i=1}^{K} \beta_i S_{t-i} + \gamma' Z_{t-1} + \varepsilon_t ,$$

where R_t is the log-difference in seasonally adjusted real state retail sales in year t, α is a constant term, and S_{t-i}, $i = 1,2 ... K$ denote lagged values of consumer sentiment, with corresponding coefficients β_i. Z is a vector of additional explanatory variables used to control for other factors affecting retail sales growth and to determine whether consumer sentiment is capturing omitted economic conditions; γ is the corresponding vector of coefficients. This model is used in Carroll, Fuhrer, and Wilcox (1994) and Bram and Ludvigson (1998).

We run this regression for each of 43 states, the District of Columbia, and the aggregate separately. We first judge the forecasting power of consumer sentiment by testing the null hypothesis that $\beta_i=0$, $\forall\, i = 1,2 ... K$, in a specification that does not include the vector Z. If the null hypothesis is rejected in this model, we analyze the incremental improvement in forecasting power from consumer sentiment relative to using only the variables in Z as predictors. For this, we compute the increase in the model's adjusted R^2 from including lagged consumer sentiment in addition to Z and we test again for the joint significance of the consumer sentiment lags.

2.2 Data

We use quarterly data over the period 1971:2 to 2002:1 for the analysis. The choice of sample length and frequency is based on data availability and to ensure adequate variations in the business cycle. The analysis uses the two most common measures of consumer sentiment—the ICS and the CCI. Each index is calculated using respondents' answers to five questions dealing with current economics conditions and future economic expectations. The ICS began as an annual

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survey in the 1940s and was converted to a quarterly survey in 1952, and to a monthly survey in 1978. The CCI began in 1967 as a bimonthly survey and was converted to a monthly survey in 1977. While both indices are highly correlated, the series do differ in terms of the survey questions asked, sample size, and construction.[4] The ICS report also provides sentiment indices by geographic regions. There are four regions: North East, North Central, South, and West.

We choose retail sales as the measure of state-level consumption because quarterly personal consumption expenditure data are not available at the state level. Although data on national retail sales are available from the U.S. Census, retail sales at the state level are not directly available. Thus, to compute actual retail sales, we obtained quarterly state retail sales tax collections over the period 1973:2 to 2002:1 for each of the 43 states and the District of Columbia.[5] Retail sales were computed by dividing state sales tax collections by the state sales tax rate in the corresponding quarter.[6] A national series was computed by summing over the individual states and the District of Columbia.   The nominal series were deflated by the national CPI and seasonally adjusted using the Census X-12 adjustment method. The resulting measure of real national retail sales has a correlation of 97.5 percent with a measure of real national retail sales constructed with U.S. Census survey data on aggregate nominal retail sales. The correlation between the two series expressed in log-differences is 18.6 percent.

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[4] See Bram and Ludvigson (1998) and Piger (2003) for a discussion of the two consumer sentiment indices. Information on the calculation of the CCI is found at www.consumerresearchcenter.org/consumer_confidence/methodology.htm and information on the construction of the ICS is found at www.sca.isr.umich.edu/main.php. While the ICS and CCI are each based on five questions, both the Conference Board and the University of Michigan also compute an index of current conditions that is based on two of the five questions and an index of expectations based on the remaining three questions.   Thus, the expectations component is 60 percent of the ICS and CCI and the current conditions components is 40 percent of each index.

[5] Delaware, Montana, Oregon, New Hampshire, and Alaska do not have state sales taxes. Utah and Nevada were not included due to incomplete reporting of sales tax collections. Quarterly state sales tax collections are from the U.S. Census Bureau's *State Government Tax Collections*, various years.

[6] State sales tax rates over the sample period were obtained from the U.S. Census Bureau's *State Government Tax Collections*, various years; Advisory Commission on Intergovernmental Relations *Significant Features of Fiscal Federalism: Budget Processes and Tax Systems*, vol. 1, September 1995; The Council of State Governments' *The Book of the States*, 1996; and The Tax Foundation *Facts and Figures on Government Finances*, various years.

[7] A comparison of retail sales and personal consumption expenditures is found in Rodgers and Temple (1996). The correlation between the growth rates of national retail sales and personal consumption is 0.35 over the sample period.

Retail sales are a subset of personal consumption expenditures. Retail sales include only goods and services that are subject to state sales tax. Personal consumption expenditures include other forms of consumption of goods and services that are not usually subject to state sales tax. On average, state sales taxes apply to roughly 60 percent of personal consumption expenditures, with certain variation across states. The sales tax exemptions on food, prescription drugs, clothing, utilities, and certain services also create differences across states.[7]

Following the specification of Carroll, Fuhrer, and Wilcox (1994) and Bram and Ludvigson (1998), we include as explanatory variables in the vector **Z** lagged values of real state-level personal income growth as well as lagged retail sales growth to account for any autocorrelation. Quarterly dummy variables are also included to capture any remaining seasonal differences in retail sales growth.[8]

3. Estimation and Results

3.1 Estimation

The model is estimated by OLS for each of the 43 states and the District of Columbia separately using the national ICS and CCI, as well as the regional ICS, matching each state to one of the four ICS regions. We do not conduct a panel estimation, as we are interested in the predictive power of the consumer sentiment measures for each individual state. We estimate a national retail sales growth model to compare with the results of past studies that used a national measure of spending such as personal consumption expenditures. Following Carroll, Fuhrer, and Wilcox (1994), all the models are estimated with four lags of the consumer sentiment indexes and four lags of the control variables. Additionally, the tests for joint statistical significance are based on the Newey-West heteroskedasticity and autocorrelation consistent estimate of the covariance

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[8] Other variables such as employment and wages, as well as additional lags of personal income and retail sales growth, were also considered. The inclusion of these variables made no difference in the explanatory power of the final models.

matrix of the regression parameters using a window of four lags. Lag selection tests reported in previous studies indicate that 4 lags seem to be adequate for quarterly data.

3.2 Consumer Sentiment and Retail Sales Growth

The impact of consumer sentiment on retail sales growth is shown in Table 1. This table presents the adjusted R^2 from the regressions with the national and regional ICS, as well as the Wald statistic for the joint significance test on the lags of the consumer sentiment measure, which is distributed asymptotically as a χ^2 with K degrees of freedom. K represents the number of lags of the sentiment variable, and therefore the number of linear restrictions in the test; in our case $K = 4$. The table presents the significance tests without including the vector of control variables Z in columns 1, 2, and columns 5 and 6. We also conduct the joint significance tests conditioning on the vector Z. In this case, the incremental adjusted R^2 represents the difference in explained variation in a specification that includes lags of the sentiment index and the control variables and a specification that includes only the control variables.

The results with the national and regional ICS are very similar, although not the same states present significant relationships in both cases. The consumer sentiment index predicts retail sales growth in about 39 percent of the states in the sample when no additional variables are included. The percentage of explained variation in retail sales growth, measured by the adjusted R^2, in the states with a significant relationship varies from 0 to about 17 percent, with an average of 2.8 percent using the national ICS and an average of 4.6 percent using the regional ICS.[9] The geographic pattern of the significance results when using the national ICS can be observed in Figure 2, where we have also outlined the ICS regions.

When additional control variables are included, the consumer sentiment/retail sales growth relationship is significant in 19 out of the 44 sample states, when using the national ICS, and in 22 states, when using the regional ICS. The incremental variation explained by the lagged consumer

sentiment in the states with a significant relationship varies from 0 to about 12 percent, using the national ICS, with an average of 4.6 percent; the incremental explained variation varies from 0 to about 10 percent, with an average of 3.7 percent, when using the regional ICS.

[Table 1 about here]

[Figure 2 about here]

The results with the national CCI are summarized in Table 2. With no additional control variables, the consumer sentiment/retail sales relationship is significant in about 27 percent of the sample states, and the adjusted R^2 varies from 0 to about 15 percent, with an average of 3.5 percent among the states with a significant relationship. When additional control variables are included, the relationship is significant in about 43 percent of the sample states. The incremental adjusted R^2 varies from 0 to about 12 percent, with an average of 4.3 percent among the states with a significant relationship.

[Table 2 about here]

We learn from these tables that consumer sentiment lags predict retail sales growth in as much as 39 percent of the states analyzed, when used as the only regressors, and in as much as half of the sample states, when adding other control variables. The percentage of explained retail sales growth variation, however, rarely exceeds 5 percent among the sample states.   In contrast, about 14 percent of the variation in consumer expenditure growth is explained by consumer sentiment lags in the results reported by Carroll et al. Nevertheless, the incremental variation, with respect to including additional controls, often exceeds 2 percent, which is in line with the 3 percent of incremental variation of consumer spending growth explained by consumer sentiment reported by Carroll et al. These results indicate that, although the relationship between consumer sentiment and state retail sales growth appears to be significant in many states, consumer sentiment has limited predictive power for future changes of retail spending, as measured by the percentage of explained

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[9] Negative values of the adjusted R^2 were set to 0 to compute the averages.

variation in the regression. Measures of consumer sentiment, however, contain additional explanatory power aside from the information available from other indicators.

Regarding the national retail sales model, we find that the consumer sentiment/retail sales growth relationship is significant in both the national ICS and the national CCI. The CCI, when used without additional control variables, explains about 4 percent of the retail sales growth variation, while the ICS explains only about 2 percent. The predictive power of the CCI over the ICS is consistent with Bram and Ludvigson (1998). The incremental increase in adjusted R^2, when including additional control variables, is 1.9 percent with the ICS and 4.7 percent with the CCI.

4. Discussion

The empirical results suggest that consumer sentiment measures are relatively poor predictors of state-level retail sales growth. At the national level, we find that consumer sentiment appears to perform as well as in the average state with a significant relationship between consumer sentiment and retail sales growth. This raises two questions: (1) are the national results driven by a few states with a highly significant relationship between sentiment and retail sales growth, and (2) does the use of aggregated data mitigate large variations in state-level retail sales growth?

4.1 Are the national results driven by a few states?

To answer the first question, we conducted the following exercise. We ranked the individual state regressions in decreasing order of adjusted R^2, then iteratively subtracted the level of that state's retail sales from the national aggregate, re-computing the growth rate of national retail sales. At each step, we ran the national regression using the new dependent variable and tested again for the joint significance of the consumer sentiment measures. If the national results are driven by the top significant states, then one would expect the significance of the sentiment

coefficients in the national regression to drop quickly once retail sales from the significant states are subtracted out. Table 3 presents a summary of this exercise, listing, for each case of the state regressions, the number of states that have to be removed before the national regression loses significance. Each row in the table indicates a regression at the state level from which we ordered the states in terms of the adjusted R^2 coefficient.

[Table 3 about here]

Table 3 provides evidence that the impact of sentiment on national retail sales does not appear to be the result of a strong relationship between sentiment and retail sales growth in only a few states. Using the national or regional ICS as the sentiment measure in the state regressions, we find that we have to remove 20 and 19 states, respectively, to render the national regression insignificant (with the ICS as the dependent variable and no additional explanatory variables). However, when including additional explanatory variables in the national and state regressions, we have to remove only 6 states before the national regression loses significance. This indicates that the predictive power of this sentiment measure when additional explanatory variables are included in the national regression is somewhat less robust. In contrast, we find that the predictive power of CCI is robust in the national regression also when including additional explanatory variables. In the specification with no additional variables we have to remove 14 states before the national regression loses significance. The CCI measure in the specification with additional variables remains significant even when we iteratively subtract every state in the sample.

4.2 Does the use of national-level data mitigate large variations in state-level data?

With regards to the second question, it is possible that idiosyncratic state-level variation in retail sales is sufficiently large to confound prediction of disaggregated retail sales but washes out in aggregation. The sum of squared residuals for the national and state-level regressions can provide insight into this scenario. It turns out that for each of the state-level specifications, with the exception of Alabama, the sum of squared residuals for a state-level regression is equal or larger

than the sum of squared residuals for the corresponding national regression. Large variations in

retail sales growth at the state level appear to be mitigated by aggregating states to the national

level, thus providing a more predictable data series.

If these idiosyncratic state-level fluctuations in retail sales are indeed responsible for

confounding the state regressions, restricting our attention to the variations in retail sales that occur

at a business cycle frequency might increase the indices' explanatory power. We accomplish this

by employing the Baxter-King *bandpass* filter (henceforth, BK filter) to the retail sales and

consumer sentiment data.[11] The algorithm has the effect of filtering out fluctuations that occur

outside a pre-specified periodic band. Since we are interested in business cycle fluctuations, we

parameterize the filter using Baxter and King's suggestion of filtering out fluctuations with

periodicity lower than eighteen months and greater than eight years. An example of the resulting

bandpassed series and the original retail sales data for Texas is plotted in Figure 3. Specifically,

note that the BK filter eliminates the high frequency noise in the retail sales series.

[Figure 3 about here]

[Tables 4 and 5 about here]

Using the BK-filtered data, we perform the same regressions from section 3. Results are

illustrated in Tables 4 and 5. We find that, sans high frequency noise, the explanatory power of

consumer sentiment increases considerably. In fact, the number of states in which lags of national

ICS enter significantly in the joint test, once the high frequency fluctuations are filtered out, jumps

from 17 to 30, and the average adjusted R^2 equals 15.5 percent among these states. The number of

states in which lags of regional ICS enter significantly jumps from 13 to 30, with an average

adjusted R^2 of 14.5 percent. The number of states in which lagged CCI enters significantly

increases from 12 to 30, with an average adjusted R^2 of 16.6 percent. The national estimates are

significant in both the ICS and CCI cases. The adjusted R^2 equals 33.4 percent using the ICS and

44.9 percent using the CCI. The average increment in explained variation when using additional

control variables, however, does not exceed 0.1 percent in any of the specifications, suggesting that no additional information is provided by the consumer sentiment indices that is not contained in the control variables.

This increase in explanatory power across states suggests that high-frequency fluctuations do confound the assessment of consumer sentiment's merit in evaluating regional economic conditions. While these results validate in part the theory of employing consumer sentiment indices to predict economic conditions, the practical value of the indices as forecasting instruments is limited. Although the results imply that the business cycle component of the indices (that is, fluctuations that occur with business cycle periodicity) are useful in forecasting the business cycle component of retail sales, forecasting actual retail sales from actual consumer sentiment, however, is problematic because filtering the data requires dropping observations at the end of sample as well, not just at the beginning. Thus, the indices may provide some indication about the *overall* state of the regional economy but little information about next month's data releases.

5. Summary

In this paper we examine how well consumer sentiment predicts state-level retail sales growth. The empirical results suggest that consumer sentiment measures are relatively weak predictors of state-level retail sales growth. We find that, on average, consumer sentiment forecasts retail sales growth for at least 27 percent of the 44 states we analyzed. In those states having a significant sentiment/spending relationship the incremental explanatory power of including lagged sentiment to the forecasting models averages about 4 percent.

We find that consumer sentiment predicts national-level retail sales growth. This, however, raises the question of what may explain the difference in results between state and national forecasting models. This study shows that aggregation at the national level mitigates random state-level variations in retail sales growth. However, while data aggregation reduces state-level

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[11] See Baxter and King (1999) for details about this filter.

variations in retail sales growth, our analysis also revealed that the significant sentiment and spending relationship using national retail sales is not driven by a strong sentiment/spending relationship in only a few states. Focusing the investigation on fluctuations at the business cycle frequency reveals a significant sentiment/spending relationship in a greater number of states. The findings here reveal that, while consumer sentiment may help assess the general state of the national economy, it may not be an important factor in forecasting regional economic growth.

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Table 1

State	National ICS				Regional ICS			
	Without Z		With Z		Without Z		With Z	
	$\overline{R}^2$	Wald	Incremental	$\overline{R}^2$ Wald	$\overline{R}^2$	Wald	Incremental	$\overline{R}^2$ Wald
US	0.0194	*** 16.3703	0.0190	** 9.9559				
AL	0.0442	*** 27.1993	0.0815	*** 27.7168	0.0345	*** 23.5608	0.0623	*** 23.2495
AR	-0.0330	3.9717	0.0497	** 13.1049	-0.0349	2.6993	0.0348	** 10.1214
AZ	-0.0124	3.5221	0.0154	3.2555	-0.0211	3.4728	0.0036	3.1669
CA	-0.0223	1.7748	-0.0049	4.7685	-0.0274	1.9554	0.0024	5.6199
CO	0.1697	*** 24.1463	0.1176	*** 18.1498	0.1226	*** 16.8004	0.0684	** 10.7723
CT	-0.0161	2.0039	-0.0053	5.6662	-0.0212	1.2923	-0.0102	2.851
DC	-0.0081	* 8.2721	0.0174	*** 16.3165	-0.0112	6.977	0.0024	** 12.5779
FL	-0.0012	2.7424	-0.0109	7.5171	-0.0021	2.5166	-0.0139	* 8.4344
GA	0.0095	*** 19.7664	0.0183	*** 14.6034	0.0205	*** 17.3759	0.0201	*** 14.1595
HI	-0.0337	3.9011	-0.0024	5.2851	-0.0256	6.3148	0.0023	* 8.5978
IA	-0.0402	5.5709	-0.0096	4.1646	-0.0391	3.632	-0.0110	4.2824
ID	0.0423	** 12.7544	0.0506	* 8.0419	0.0448	* 9.1047	0.0595	6.9867
IL	-0.0368	4.1341	-0.0161	3.6903	-0.0439	2.9488	-0.0267	1.6327
IN	-0.0503	2.6864	-0.0123	4.3965	-0.0393	4.3864	0.0005	5.2363
KS	-0.0504	1.0586	-0.0235	1.6308	-0.0420	1.6929	-0.0088	4.1489
KY	-0.0008	** 10.4088	0.0387	*** 17.6416	-0.0116	7.2481	0.0326	*** 15.7179
LA	-0.0443	1.7738	-0.0031	3.889	-0.0452	1.5643	-0.0056	3.7553
MA	-0.0438	0.9663	-0.0174	2.1183	-0.0141	2.8906	-0.0127	3.2662
MD	-0.0251	1.6831	0.0084	6.9994	-0.0108	1.7462	0.0194	7.1703
ME	0.0426	** 11.5192	0.0841	** 11.4593	0.0154	7.1007	0.0682	** 10.3919
MI	-0.0247	5.7867	0.0279	* 8.9368	-0.0292	4.8937	0.0258	7.359
MN	0.0140	3.5756	0.0045	3.7805	0.0197	2.957	0.0040	3.0212
MO	0.0073	7.3192	0.0014	4.9464	0.0340	*** 18.3779	0.0336	*** 13.3948
MS	-0.0350	5.9557	0.0006	*** 13.7579	-0.0320	4.948	0.0094	** 11.5056
NC	0.0922	*** 14.3595	0.1148	*** 14.7460	0.0858	* 8.9512	0.1004	* 7.8614
ND	-0.0201	2.8979	-0.0061	3.1262	-0.0272	2.7048	-0.0104	2.9829
NE	0.0538	6.1571	0.0213	5.0933	0.1497	*** 34.3810	0.0886	*** 23.0285
NJ	-0.0492	0.4235	-0.0177	3.1765	-0.0478	0.5994	-0.0160	4.001
NM	-0.0087	* 9.1504	-0.0167	3.234	0.0052	** 10.5201	0.0030	** 9.7119
NY	-0.0024	* 9.2457	0.0219	** 10.9356	0.0038	** 10.4192	0.0350	*** 14.0319
OH	-0.0046	5.4121	0.0484	** 11.4363	-0.0127	5.9861	0.0350	** 11.2356
OK	-0.0132	1.0523	-0.0187	1.2005	-0.0066	2.6948	-0.0102	1.6628
PA	0.0100	*** 20.8126	0.0720	*** 20.7860	0.0120	*** 15.7343	0.0899	*** 14.5139
RI	-0.0306	* 8.5597	0.0073	** 9.6595	-0.0372	7.2832	0.0083	* 8.6687
SC	-0.0368	0.9584	-0.0094	3.9242	-0.0369	0.606	-0.0076	5.2506
SD	0.0399	3.8455	0.0244	4.0524	0.0716	6.7661	0.0319	3.8502
TN	0.0963	*** 22.7503	0.0884	*** 27.7922	0.0444	*** 16.0358	0.0560	*** 17.5668
TX	-0.0059	* 9.0368	0.0111	5.7727	0.0013	** 10.4029	0.0166	6.3835
VA	-0.0134	3.074	-0.0113	6.1991	0.0095	3.4795	-0.0180	4.1992
VT	0.0010	5.6392	0.0148	*** 13.6221	0.0030	4.7773	0.0168	** 12.6896
WA	-0.0390	2.3579	-0.0075	3.7253	-0.0223	3.3019	0.0047	5.1338
WI	0.0085	** 12.0078	0.0045	** 10.0209	0.0387	* 8.9474	0.0155	** 12.0821
WV	0.0111	* 8.7151	0.0249	*** 13.2782	0.0380	6.2564	0.0405	** 10.3601
WY	0.0136	* 7.9847	0.0107	5.5896	-0.0091	5.9534	0.0002	4.9953
No. of Sig. States	17		19		13		22	
Share of Sig. States	0.3864		0.4318		0.2955		0.5	
No. of Obs.	124		124		124		124	

Notes:

1) The baseline regression equation is $R_t = \alpha + \sum_{i=1}^{K} \beta_i S_{t-i} + \gamma' Z_{t-1} + \varepsilon_t$, where Z_t includes 4 lags of real retail sales and 4 lags of real personal income growth.

2) The Wald statistic is from the joint significance test on the lags of the consumer sentiment measure, which is distributed asymptotically as a χ^2 with $K=4$ degrees of freedom.

3) The incremental $\overline{R}^2$ is the difference in explained variation in a specification that includes lags of the sentiment index and the control variables and a specification that includes only the control variables.

4) All regressions include quarterly dummy variables.

Table 2

State	National CCI				
	Without Z			With Z	
	$\overline{R}^2$	Wald	Incremental	$\overline{R}^2$	Wald
US	0.0395	*** 16.2407	0.0470		** 9.5723
AL	0.0267	*** 29.5784	0.0423		*** 18.1061
AR	-0.0299	3.1322	0.0445		*** 15.3454
AZ	0.0163	** 10.6010	0.0583		* 9.0056
CA	-0.0185	5.0044	-0.0020		4.942
CO	0.1512	*** 25.8783	0.0941		*** 20.9290
CT	-0.0308	0.2611	-0.0179		1.5915
DC	-0.0195	5.4149	0.0109		* 8.6949
FL	-0.0079	3.2429	-0.0016		6.5437
GA	0.0008	*** 23.6877	0.0407		*** 23.0608
HI	-0.0195	5.813	0.0242		* 8.2153
IA	-0.0534	0.6954	-0.0125		2.2808
ID	0.0206	*** 15.3374	0.0466		** 11.9457
IL	-0.0308	2.7776	0.0040		6.4904
IN	-0.0551	1.0435	-0.0200		3.0961
KS	-0.0327	5.9747	-0.0031		6.063
KY	-0.0176	6.4156	0.0297		*** 13.5088
LA	-0.0311	4.5513	-0.0097		3.6195
MA	-0.0452	5.3728	0.0071		*** 15.4617
MD	-0.0256	0.9191	-0.0015		1.7196
ME	0.0406	*** 16.0393	0.0792		** 12.2705
MI	-0.0165	5.7469	0.0291		** 9.9917
MN	0.0087	3.3834	-0.0030		2.7751
MO	0.0016	** 9.8358	0.0050		6.2007
MS	-0.0390	7.235	0.0008		** 13.1303
NC	0.0963	** 10.7041	0.1182		*** 16.2520
ND	-0.0196	3.4301	-0.0046		4.0016
NE	0.0185	5.1149	0.0067		4.3593
NJ	-0.0348	1.7404	-0.0159		3.0367
NM	-0.0161	4.2911	-0.0236		1.202
NY	-0.0285	2.0339	-0.0143		2.689
OH	-0.0141	1.5769	0.0514		* 8.6690
OK	-0.0214	0.5755	-0.0238		0.8261
PA	0.0064	*** 19.0759	0.0697		*** 13.6032
RI	-0.0101	5.3615	-0.0188		3.2067
SC	-0.0378	0.6484	-0.0093		3.4403
SD	0.0032	3.0572	0.0309		4.8005
TN	-0.0022	5.3644	0.0260		*** 16.2701
TX	0.0040	** 10.2062	0.0015		6.4641
VA	-0.0213	1.1928	-0.0092		3.8202
VT	0.0007	* 8.2720	0.0200		*** 16.4255
WA	-0.0456	0.5312	-0.0097		3.1324
WI	-0.0133	4.2399	0.0049		4.6503
WV	0.0507	*** 14.1404	0.0233		* 9.1675
WY	-0.0007	5.4429	0.0078		4.4185
No. of Sig. States		12			19
Share of Sig. States		0.2727			0.4318
No. of Obs.		124			124

Notes:

1) The baseline regression equation is $R_t = \alpha + \sum_{i=1}^{K} \beta_i S_{t-i} + \gamma' Z_{t-1} + \varepsilon_t$, where Z includes 4 lags of real retail sales and 4 lags of real personal income growth.

2) The Wald statistic is from the joint significance test on the lags of the consumer sentiment measure, which is distributed asymptotically as a χ^2 with $K=4$ degrees of freedom.

3) The incremental $\overline{R}^2$ is the difference in explained variation in a specification that includes lags of the sentiment index and the control variables and a specification that includes only the control variables.

4) All regressions include quarterly dummy variables.

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Table 3: National Model: Iterative Subtraction of Top Significant States

States Regression	Subtracted States*
Nat. ICS	20
Nat. ICS with **Z**	6
Reg. ICS	19
Reg. ICS with **Z**	6
Nat. CCI	14
Nat. CCI with **Z**	43

* Number of states that have to be removed from the calculation of national retail sales before lags of consumer sentiment lose significance in the national regression.

Table 4

State	National ICS				Regional ICS			
	Without Z		With Z		Without Z		With Z	
	$\overline{R}^2$	Wald	Incremental $\overline{R}^2$	Wald	$\overline{R}^2$	Wald	Incremental $\overline{R}^2$	Wald
US	0.3337	*** 45.2977	0.0006	** 13.0699				
AL	0.4461	*** 67.7667	0.0020	*** 30.0992	0.4479	*** 62.8791	0.0018	*** 30.7239
AR	0.2375	*** 37.9923	0.0003	4.5625	0.1596	*** 24.6486	0.0010	* 8.1242
AZ	0.0171	4.9411	0.0005	6.7998	0.0136	6.6199	0.0001	5.35
CA	0.1503	7.0782	0.0016	*** 13.5792	0.1571	** 11.9313	0.0024	** 12.1052
CO	0.3463	*** 26.7764	0.0004	** 10.9229	0.2763	*** 25.3171	0.0001	* 8.7513
CT	0.1705	** 9.6350	0.0013	*** 16.2784	0.0737	6.6263	0.0016	*** 16.6780
DC	0.0098	*** 14.2995	0.0014	** 11.4549	-0.0229	** 10.1608	0.0014	** 12.0484
FL	-0.0316	3.6356	0.0059	*** 13.9820	0.0433	2.8036	0.0054	** 10.5561
GA	0.1717	*** 17.3047	0.0000	* 8.5662	0.1321	*** 14.0626	-0.0003	6.4041
HI	0.0018	4.5091	-0.0003	6.2346	-0.0060	5.0868	-0.0003	* 8.4027
IA	0.1378	** 11.4569	-0.0007	2.0571	0.1582	*** 14.8744	-0.0007	2.5608
ID	0.1543	* 8.5366	-0.0001	1.9097	0.1070	* 8.0150	-0.0002	1.7068
IL	0.1326	*** 16.8109	0.0000	6.389	0.1734	*** 21.3654	0.0002	*** 13.3735
IN	0.0922	*** 17.0641	0.0018	*** 26.6683	0.1911	*** 20.8963	0.0018	*** 27.0175
KS	0.0035	*** 16.0447	-0.0006	2.1206	0.0258	*** 21.0589	-0.0007	2.1018
KY	0.0038	** 11.3802	-0.0007	5.0612	0.0191	*** 13.5870	-0.0009	3.5954
LA	0.0318	** 11.9219	-0.0004	5.2552	0.0570	*** 17.8756	-0.0004	5.8511
MA	0.1506	*** 14.1654	0.0010	7.2287	0.1792	*** 21.6907	0.0001	4.3149
MD	-0.0151	4.8609	-0.0023	3.9027	-0.0007	3.5998	-0.0024	3.7002
ME	0.2946	*** 33.6198	0.0023	*** 20.5371	0.2490	*** 26.9085	0.0025	*** 23.3702
MI	0.1019	* 8.2941	-0.0006	4.5142	0.1179	** 12.2485	0.0001	7.228
MN	0.0039	6.7072	-0.0011	3.8667	0.0593	** 12.2624	-0.0011	4.0118
MO	0.1763	** 12.4560	0.0002	3.2518	0.2020	*** 16.4107	0.0003	4.3417
MS	0.0443	** 12.7706	0.0017	* 8.5699	0.1088	*** 16.4688	0.0021	** 10.5523
NC	0.2089	*** 14.2964	0.0038	*** 28.6966	0.1205	** 9.9927	0.0034	*** 31.5400
ND	0.0253	4.584	-0.0006	6.3773	-0.0142	3.138	-0.0006	6.2748
NE	0.0579	6.3143	0.0005	** 9.9377	0.0818	* 8.6343	0.0007	** 11.9757
NJ	-0.0144	2.7231	-0.0010	1.4506	-0.0443	1.0448	-0.0011	0.803
NM	0.0663	** 12.0026	0.0003	* 8.2425	0.0365	** 11.1883	-0.0001	6.6917
NY	0.1601	*** 18.7195	0.0057	*** 13.6368	0.1859	*** 19.2699	0.0080	*** 19.1539
OH	0.2901	*** 21.4710	0.0010	7.0026	0.3099	*** 22.8270	0.0005	6.6274
OK	0.0019	** 9.5713	-0.0005	3.7905	0.0001	* 8.1625	-0.0007	1.8234
PA	0.3371	*** 42.8525	0.0022	*** 13.7554	0.3399	*** 46.7987	0.0028	*** 15.4966
RI	0.1539	** 11.9046	0.0008	** 9.7213	0.1439	** 12.3703	0.0006	** 11.2415
SC	0.0250	5.5716	0.0005	** 10.4328	0.0180	5.219	-0.0005	5.4714
SD	0.0466	** 10.0845	0.0004	* 8.8026	0.0208	* 8.1881	-0.0001	5.4646
TN	0.3684	*** 43.2376	0.0007	** 11.4612	0.3287	*** 31.8020	0.0007	*** 15.8775
TX	0.0363	*** 19.5994	-0.0006	0.3641	0.0639	*** 26.0904	-0.0006	0.4355
VA	0.2915	*** 52.5277	0.0013	*** 13.5755	0.2034	*** 44.2381	0.0007	** 9.9447
VT	0.0189	6.121	0.0023	*** 17.4817	0.0147	6.0123	0.0018	*** 16.2494
WA	0.0693	7.6779	-0.0002	6.0483	0.0115	3.7351	-0.0004	6.3913
WI	-0.0002	* 9.3039	0.0004	* 8.3219	0.0189	** 13.2683	0.0005	* 8.6497
WV	-0.0168	3.1777	0.0011	*** 19.1226	-0.0355	1.7039	0.0006	*** 13.8610
WY	-0.0591	1.3146	-0.0003	** 11.7378	-0.057	1.1186	-0.0004	** 9.6988
No. of Sig. States	30		24		32		23	
Share of Sig. States	0.6818		0.5455		0.7273		0.5227	
No. of Obs.	100		100		100		100	

Notes:

1) The baseline regression equation is $R_t = \alpha + \sum_{i=1}^{K} \beta_i S_{t-i} + \gamma' Z_{t-1} + \varepsilon_t$, where Z includes 4 lags of real retail sales and 4 lags of real personal income growth.

2) The Wald statistic is from the joint significance test on the lags of the consumer sentiment measure, which is distributed asymptotically as a χ^2 with $K = 4$ degrees of freedom.

3) The incremental $\overline{R}^2$ is the difference in explained variation in a specification that includes lags of the sentiment index and the control variables and a specification that includes only the control variables.

4) All regressions include quarterly dummy variables.

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Table 5

State	Without Z $\overline{R}^2$	Wald	Incremental	With Z $\overline{R}^2$	Wald
	National CCI				
US	0.4494	*** 59.5632	0.0010	***	22.4383
AL	0.4259	*** 50.5937	0.0015	***	31.4574
AR	0.2768	*** 56.4146	0.0010	***	16.2626
AZ	0.0971	6.6743	0.0006	*	8.3992
CA	0.0663	4.9006	0.0000		4.9454
CO	0.4393	*** 38.4504	0.0003	*	8.1545
CT	0.1918	** 10.2275	0.0009		5.1699
DC	0.0328	** 11.1118	0.0011	***	14.3203
FL	-0.0143	7.0437	0.0007		6.2027
GA	0.2282	*** 30.2795	0.0002		7.0174
HI	0.0222	4.3974	0.0006	**	12.4077
IA	0.2683	*** 24.8176	0.0002		5.3151
ID	0.1683	6.4689	0.0011	*	7.9442
IL	0.1123	*** 14.8746	0.0024	***	19.5365
IN	0.0129	*** 15.9946	0.0021	***	26.2565
KS	0.0242	** 11.5989	0.0006	**	11.9320
KY	0.0916	*** 19.9457	0.0015	***	14.6352
LA	0.1149	*** 23.9777	0.0006	*	8.5058
MA	0.0836	** 11.6382	-0.0009		3.575
MD	0.0977	*** 30.0958	-0.0018		4.2129
ME	0.1902	*** 30.8777	0.0016	***	16.6692
MI	0.1140	*** 15.2409	0.0001	*	8.8736
MN	0.0182	* 9.3121	0.0041	***	21.9944
MO	0.1997	*** 14.4171	0.0010	**	10.9872
MS	0.0138	** 10.9348	0.0006	**	11.3909
NC	0.2576	*** 16.9984	0.0028	***	19.3355
ND	0.0397	* 8.8050	-0.0010		3.4515
NE	0.2475	*** 26.0480	-0.0003		6.0452
NJ	0.0163	2.2212	-0.0007		1.8269
NM	-0.0044	4.6305	-0.0003		4.8008
NY	0.0437	7.236	0.0036	**	11.3987
OH	0.2643	** 12.5101	0.0004		6.4235
OK	0.0289	5.9615	-0.0008		0.8754
PA	0.3002	*** 36.7049	0.0036	***	20.3744
RI	0.1727	*** 16.6432	0.0018	**	11.5002
SC	0.0090	6.0099	-0.0005		3.6021
SD	0.1232	** 10.4177	0.0016	***	14.1806
TN	0.1888	*** 15.2097	0.0007	**	9.6399
TX	0.2563	*** 18.4421	0.0000		4.5892
VA	0.0992	*** 25.4387	0.0006	**	9.9386
VT	-0.0106	6.1181	0.0014	**	10.9100
WA	0.1034	** 10.9625	-0.0009		3.2508
WI	-0.0151	3.733	-0.0007		4.349
WV	0.0193	5.3236	0.0005	*	8.8752
WY	-0.0523	2.6545	0.0004	***	16.4838
No. of Sig. States	30				27
Share of Sig. States	0.6818				0.6136
No. of Obs.	100				100

Notes:

1) The baseline regression equation is $R_t = \alpha + \sum_{i=1}^{K} \beta_i S_{t-i} + \gamma' Z_{t-1} + \varepsilon_t$, where Z includes 4 lags of real retail sales and 4 lags of real personal income growth.

2) The Wald statistic is from the joint significance test on the lags of the consumer sentiment measure, which is distributed asymptotically as a χ^2 with $K=4$ degrees of freedom.

3) The incremental $\overline{R}^2$ is the difference in explained variation in a specification that includes lags of the sentiment index and the control variables and a specification that includes only the control variables.

4) All regressions include quarterly dummy variables.

Figure 1: Consumer Sentiment and Personal Consumption Expenditures
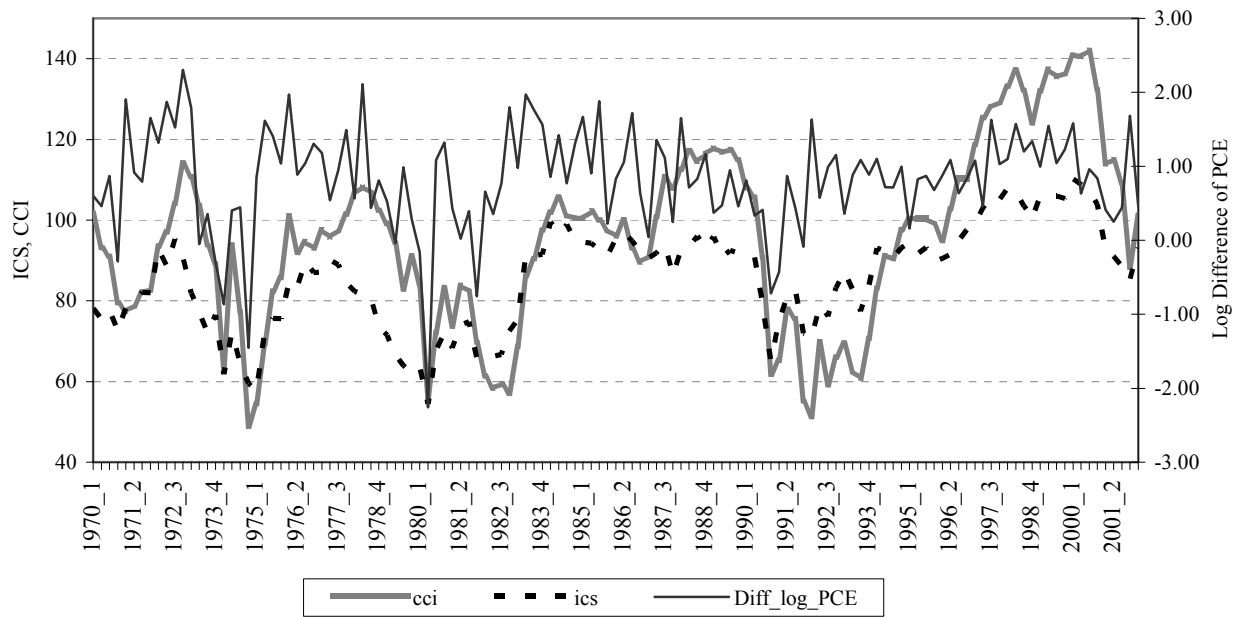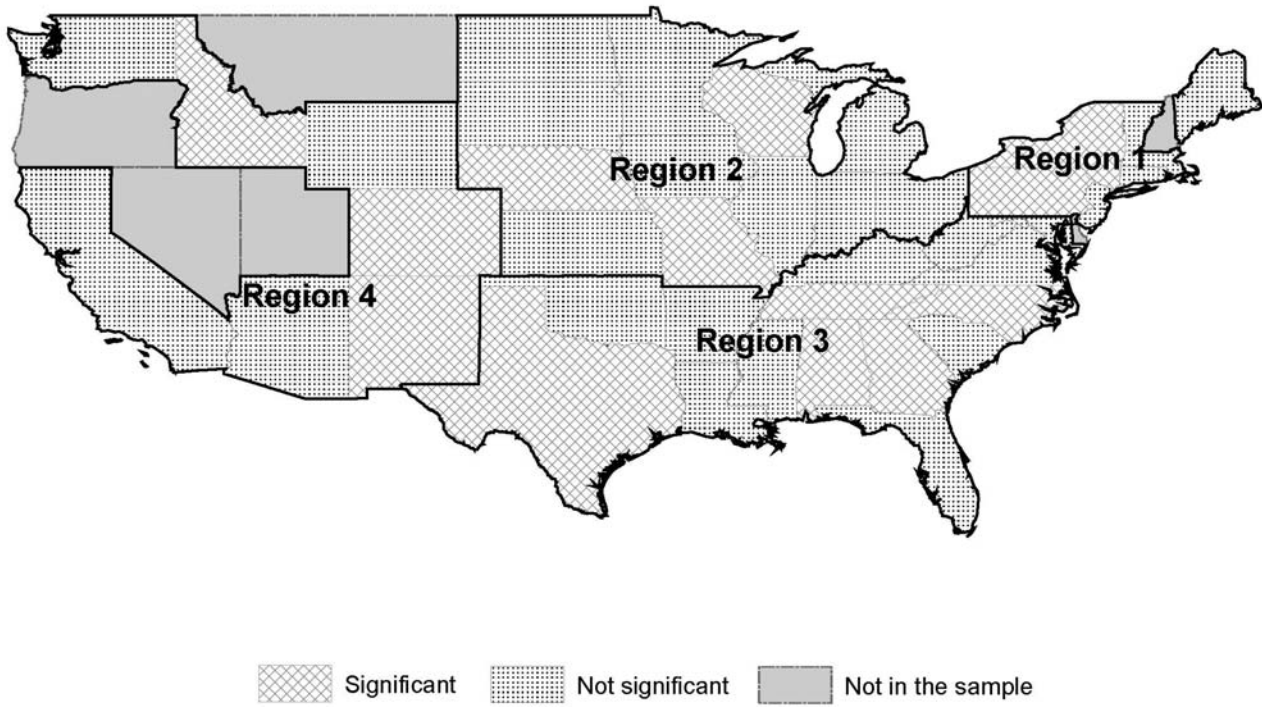
Figure 2: Significance Levels by Region

Figure 3: Comparison of BK Filtered and Unfiltered Sales Data for Texas