The Predictive Content of High Frequency Consumer Confidence Data

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Abstract

This paper examines newly-available high frequency consumer confidence data, notably a daily survey conducted by Rasmussen. The information content of competing confidence measures is assessed. The Rasmussen survey is found to have some predictive power for future consumption growth, though a bit less than the lower-frequency Michigan survey. We also consider the determinants of consumer confidence, as measured by Rasmussen. We had little success in explaining the biggest daily moves in this confidence measure, but did find that changes in stock prices and the VIX both Granger-cause changes in Rasmussen confidence data. We also find that certain macroeconomic news announcements lead to significant and persistent shifts in this measure of consumer confidence.

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1   Introduction

Improved technology makes it possible to collect data at ever higher frequencies. This includes data on consumer sentiment and confidence. The Michigan Index of Consumer Sentiment (MCSI) was available on an annual basis at its inception in the 1940s, became a quarterly series in the 1950s, and has been available on a monthly basis since 1978. The Conference Board's Consumer Confidence Index (CBCI) has turned from a bi-monthly series at its inception in 1967 to a monthly series since 1977. But the methodology for conducting surveys has changed since, and dramatically so in the last decade. The Bloomberg Consumer Comfort index (BCCI), released weekly, reports on the respondents' rating about the condition of the economy and their personal finances. Data are even available on a daily basis—since 2004, the Rasmussen group has been conducting surveys daily to solicit information on confidence (RCCI), expectations, and sentiment towards the U.S. economy. The GALLUP group has also been gathering responses on employment, economic confidence, job creation, and consumer spending on a daily basis since 2008.

This paper explores what macroeconomists can learn from high frequency consumer confidence data. The instinctive answer to the question posed is that daily data provides timely information about the current state of the economy and should have predictive power about the future. But there are reasons to believe otherwise. To begin with, high frequency data can be noisy, and the lack of other daily macrodata makes it difficult to validate the signal. While participants in financial markets have a natural use of the daily data because trading takes place on an almost continuous basis, high frequency data may have little relevance to fundamentally long term decisions such as consumption and savings. Furthermore, the question of why macroeconomists should be interested in the confidence data in the first place is not entirely settled, in spite of the fact that their monthly releases are widely watched.

In this paper, we explore the information content of high-frequency consumer confidence data. We introduce the sources of consumer confidence data in more detail in section 2. In section 3, building on previous work with lower frequency data, we assess the predictive power of consumer confidence indicators for future consumption growth. This includes taking a mixed-frequency sampling perspective and studying if the weekly and daily data provide useful interim updates to the monthly MCSI and CBCI. In section 4, we turn things around and study the determinants of consumer confidence. We identify dates when the daily RCCI series exhibit large changes and look at the effects of macroeconomic news announcements on the Rasmussen data. Section 5 concludes.

2 Consumer Confidence Data

The MCSI and CBCI are the most widely followed indicators of consumer confidence. In brief, the Conference Board commissions the Nielsen group to survey 5,000 people by mail. Respondents are asked about current business conditions and expectations six months ahead, current employment and expectations six months ahead, as well as expectations about total family income six months ahead. It is now a monthly survey. The Michigan survey polls a rotating panel of 500 people by phone and ask questions directed towards their present and future financial conditions, spending intent, and business conditions. The Michigan survey is release twice a month: first a preliminary report, including about 60% of the survey respondents and then a final report about two weeks later. There are subcomponents in both the MCSI and CBCI data. There already exists a large literature documenting the differences between these two indices. Howrey (2001) finds that the monthly MCSI and CBCI—in conjunction with stock prices and interest rates—have statistically significant power for quarterly GDP growth, though by itself, the predictive power is marginal. Carroll, Fuhrer, and Wilcox (1994) reports that lags of MCSI have predictive power for future changes in consumption, but that the incremental predictive power given information in other available indicators is small. Ludvigson (2004) also finds that while the monthly confidence data do contain information about consumption growth, other economic indicators contain similar information. Bram and Ludvigson (1998) further find that the MCSI series has weaker forecasting power than the CBCI which has economically and statistically significant explanatory power for several spending categories even in the presence of other indicators. Bram and Ludvigson (1998) and Ludvigson (2004) examine the information content of subcomponents of MCSI and CBCI for forecasting consumption growth.

The Bloomberg weekly BCCI index was originally the ABC News Consumer Comfort Index which started in 1985 as a joint venture by ABC evening news and Money magazine to measure of consumer attitudes. In 2005, the Washington post replaced Money magazine as the co-sponsor and the index became known as the Washington Post-ABC Consumer Comfort Index. The index has been under the control of the Bloomberg corporation since 2011. The following three questions are posed to 250 respondents each week:[1]

    i Would you describe the state of the nation's economy these days as excellent, not so good, or poor?

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[1]Source: http://www.washingtonpost.com/wp-dyn/content/article/2005/04/26/AR2005042600569.html, https://en.wikipedia.org/wiki/Consumer_confidence, and http://www.langerresearch.com/the-cci/.

ii Would you describe the state of your own personal finances these days as excellent, good, not so good, or poor?

iii Considering the cost of things today and your own personal finances, would you say now is an excellent time, a good time, a not so good time, or a poor time to buy things you want and need?

For each question, the percent of households with a negative response is subtracted from the percent of households with a positive response. The index is a four-week moving average of 1,000 responses. The average of the three percentages is then taken.

The Rasmussen RCCI series is relatively new. The daily national survey tracks 1,500 consumers concerning their confidence, expectations, and sentiment toward the U.S. economy. In contrast to traditional operated-assisted technology, such as used by Gallup, the Rasmussen group's automated polling system uses a single, digitally-recorded, voice to conduct the interview[2]. Calls are placed every night to randomly-selected phone numbers that insure appropriate geographical and demographic representation. During weekdays, the calls are usually placed between 5pm to 9pm local time. On Saturdays, calls are made from 11am-6pm, and on Sundays, between 1pm and 9pm local time. The automated polling system naturally raises questions about the representativeness of the survey[3]—but it's usefulness in prediction is ultimately an empirical question that we shall assess in this paper. The respondents are asked:

i Generally speaking, how would you rate the U.S. economy these days?

ii Are economic conditions in the country getting better or worse?

iii How would you rate your own personal finances these days?

iv Are your personal finances getting better these days, or worse?

v Is the United States currently in a recession?

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[2]See http://www.rasmussenreports.com/public_content/about_us/methodology.

[3]See http://voices.washingtonpost.com/thefix/parsing-the-polls/parsing-the-polls-of-auto-dial.html for a discussion of potential limitations of surveys that do not involve a live questioner. The famous applied statistician Nate Silver has commented on biases that can be introduced to polling by the use of automated "robopolls" (http://fivethirtyeight.blogs.nytimes.com/2012/11/10/which-polls-fared-best-and-worst-in-the-2012-presidential-race). His focus was on political preference polls, but the same concerns may apply to measuring consumer confidence.

Three-day rolling averages of the daily data are used to compile nine indices using proprietary weights. There are two subindices—one for investors and one for consumers. The RCCI-Investors subindex refers to approximately half of the sample that have at least $5,000 in liquid financial assets.

Figure 1 plots the four consumer indices—MCSI, CBCI, BCCI and the consumer RCCI subindex. Of note is that all indices reached their peak in late 2006/early 2007 and then started to decline, well ahead of the most severe financial turmoil in 2008. But all four series were at rock-bottom before Lehman collapsed in 2008. Sustained consumer optimism did not return until late 2011. Between mid-2008 and mid-2011, the BCCI is unique in showing no obvious direction in consumer confidence while the other three series suggested mild recovery. The two lower-frequency indices (CBCI and MCSI) are highly correlated with the weekly BCCI and daily RCCI, but each series has independent variation. The matrix of contemporaneous correlations at the quarterly frequency is given in Table 1. The correlation between RCCI and BCCI is the highest (0.95), while the correlation between the BCCI and MCSI is the lowest (0.88).

3   Using Consumer Sentiment to Predict Consumption

We begin with an exercise in the spirit of Carroll, Fuhrer, and Wilcox (1994), Ludvigson (2004) and others. We do an in-sample forecasting regression at the monthly frequency of the form:

$$\log(\frac{C_{t+h}}{C_{t-1}}) = \mu + \beta' S_t + \varepsilon_t \tag{1}$$

where C_t denotes some real consumption measure (total, motor vehicles, goods except motor vehicles, services, or durables except motor vehicles) and S_t is a set of one or more consumer sentiment indicators—the most-recently observed RCCI-Consumer, RCCI-Investor, CBCI, MCSI or BCCI number as of a particular day in month t, and h is the horizon, in months. Here and throughout, we use the overall Michigan consumer sentiment and Conference Board consumer confidence indices, and not their components. We know the precise release dates for all of the survey data, and use these in constructing the most recently observed data. A horizon $h = 0$ corresponds to a nowcast—a forecast for the current month. Note that consumption data for month t are not released until the end of month $t + 1$.[4]

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[4]Consumption data are from the BEA. We do not use real-time data.

We can also consider a counterpart adding controls:

$$\log(\frac{C_{t+h}}{C_t}) = \mu + \Sigma_{j=0}^{11}\phi_j \log(\frac{C_{t-j}}{C_{t-j-1}}) + \Sigma_{j=0}^{11}\gamma_j \log(\frac{L_{t-j}}{L_{t-j-1}}) + \beta'S_t + \varepsilon_t \qquad (2)$$

where L_t is real labor income.[5] We ran regressions (1) and (2) over 2004:10-2015:12—the short sample being because of the short history of Rasmussen data.

Tables 2 and 3 show the t-statistics on β from estimating equations (1) and (2), respectively, with each consumer sentiment indicator separately. Results are shown as of the last day of the month, though are not very sensitive to which day of the month is used. Note that the approach of comparing the *most recent* data as of some fixed point in the month ensures that the staleness of the lower-frequency indicators is taken into account—for example, on the last day of the month the most recent Rasmussen data refer to that very day, whereas the most recent MCSI and CBCI data will have been released a week or so earlier. Broadly, we find that the MCSI index is the most consistently significantly predictor, but the Rasmussen indices do well too, while the CBCI and BCCI indices are a bit less significant predictors of consumption growth. Without controls, total consumption growth and services growth are highly significantly predictable, while the predictability of goods excluding motor vehicles and durables is on the borderline of statistical significance. Including lags of consumption growth and labor income growth as controls diminishes the significance of sentiment indicators as predictors of consumption growth (in lines with Carroll, Fuhrer, and Wilcox (1994)), but the RCCI, MCSI and CBCI indices remain highly significant predictors of growth in services consumption. Our findings contrast a bit with Bram and Ludvigson (1998) who compared the lower-frequency MCSI and CBCI indices as predictors of consumption growth on a much earlier sample, and found that the Conference Board measure had more predictive power.

3.1 Timeliness of High Frequency Indicators

The RCCI indices do well in these forecasting exercises, notwithstanding potential concerns about the representativeness of their survey samples. Part of their advantage could be due to their timeliness. As a way to exploit the timeliness of the Rasmussen indices, we next set up a model in which there is a latent value of all five sentiment indicators each day. Let the latent value of the RCCI-Consumer, RCCI–Investor, MCSI, CBCI and BCCI sentiment indicators on day t be denoted as X_t^{RC}, X_t^{RI}, X_t^{M}, X_t^{C}, X_t^{B} respectively. The five latent

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[5]Real labor income is defined as wages and salaries plus personal current transfer receipts less contributions for government social insurance (domestic), all deflated by the total PCE deflator

indicators moreover follow a VAR(1) at the daily frequency:

$$X_t = \mu + \Phi X_{t-1} + \varepsilon_t \qquad (3)$$

where $X_t = (X_t^{RC}, X_t^{RI}, X_t^M, X_t^C, X_t^B)'$ where the errors have an unrestricted variance-covariance matrix. Note that X_t^{RC} and X_t^{RI} are observed every day, but the other indicators are only observed monthly or weekly (on release dates). The Kalman filter used equation (3) as the transition equation, and a measurement equation in which the observed consumer sentiment indicators are equal to their latent values on their release dates. We included both preliminary and final MCSI data. The Kalman-filtered daily MCSI and CBCI data are shown in Figures 2 and 3, respectively.

We tested the significance of the Michigan and Conference Board indices in estimating equations (1) and (2) using the Kalman-filtered data as of the last day of the month. The results are shown in the two right-most columns of Tables 2 and 3. In some cases, using the Kalman-filtered MCSI or CBCI gives very slightly higher t-statistics than using the most recent (slightly stale) MCSI or CBCI data. But the improvements are tiny and inconsistent.

3.2 Multivariate Forecasting

We can also consider estimating equations (1) and (2) with all the sentiment indicators together. This constitutes a direct "horse race" among the different indicators. In Tables 4 and 5, we report the t-statistics on each element of β and the overall p-values from multivariate estimation of these equations.

Not surprisingly, given the short sample and highly correlated sentiment indicators, most of the individual coefficients are individually insignificant in these multivariate regressions. But MCSI is a significant predictor of some consumption growth indicators at some horizons, in both equations (1) and (2), over and above all other confidence measures and controls. Broadly speaking, MCSI is the winner of this horse-race, consistent with the findings in the univariate regressions. Nonetheless, the RCCI-Investor index is also borderline significant in a few cases, such as forecasting total consumption growth at the 1-month horizon. The BCCI index does quite poorly, and is indeed in some cases statistically significant but with the *wrong sign* in the multivariate regressions.

4 Determinants of sentiment

In the previous section, we documented that the Rasmussen indices have some predictive power for future consumption growth. In this section, we now instead consider determinants

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of the Rasmussen sentiment indices.

First, in Table 6 we catalog the five biggest daily increases and five biggest daily declines in the RCCI-Consumers and RCCI-Investors indices. The table lists events that we can find that were associated with those moves. For the consumers index, we find it hard to identify events that might have precipitated these moves in sentiment. For the investors index, there are a few cases where large changes are associated with financial turmoil and/or macroeconomic news announcements. Note that although we consider all days over the sample from October 2004 to December 2015, the vast majority of large daily changes (in either direction) occur in 2011-2015, and none of them occur during 2008. The changes in sentiment can be a little hard to interpret because of the three-day moving average filter that Rasmussen applies to its raw data. Sometimes large changes are mirrored by an offsetting change three days before or later.[6]

4.1 Sentiment and financial asset prices

A useful feature of the high-frequency Rasmussen data, is that it's relationship with daily asset price changes at high frequency can be assessed. To this end we consider bivariate VAR(5)s in daily changes in Rasmussen data (either consumer or investor) coupled with daily changes in an asset price: the WTI crude oil price, the S&P 500 or the VIX. Granger causality tests are reported in Table 7.

Changes in stock prices and the VIX both significantly Granger-cause changes in both Rasmussen indices. That's true for oil prices too, though it is on the borderline of statistical significance. We do not report the VAR coefficients, but as one might expect increases in oil prices and the VIX both lower future confidence while increases in stock prices raise future confidence. On the other hand, there is little evidence of Granger-causality going the other way: Changes in confidence do not Granger-cause changes in oil prices, stock prices or the VIX, except that changes in the RCCI-Investor index do have significant predict power for changes in the VIX.

4.2 The effects of macro news surprises on sentiment: Event Study Evidence

In this subsection, we run "event study" regressions to evaluate how macroeconomic news surprises affect consumer sentiment. We consider 9 types of macroeconomic news announce-

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[6]Not surprisingly given the MA(3) construction, the autocorrelation at lag 3 of daily changes in the Rasmussen consumers and investors index are -0.37 and -0.39, respectively.

ments: core CPI, durable goods orders, housing starts, existing home sales, new home sales, nonfarm payrolls, core PPI, retail sales and the unemployment rate. Each of these announcements comes out once a month. For each of these we have the announced value and the survey mean of analysts' expectations from Action Economics. We can hence measure the news surprise for an announcement of type j on day t, $x_{j,t}$. We scale each of the surprises to have unit standard deviation on announcement days. If there is no announcement of type j on day t, then we set $x_{j,t} = 0$. A large literature—including papers such as Ederington and Lee (1993), Andersen, Bollerslev, Diebold, and Vega (2003) and Faust, Rogers, Wang, and Wright (2007)—considers the effects of news surprises on asset prices. Here, we are instead considering the effects of news surprises on consumer sentiment.

Letting S_t be the Rasmussen index on day t, we consider regressions of the form:

$$S_{t+h} = a + \beta S_{t-1} + \Sigma_{j=1}^{J} \gamma_{j,h} x_{j,t} + \varepsilon_t \tag{4}$$

The coefficients $\{\gamma_{j,h}\}$ trace out the effect of a news surprise at time t on consumer sentiment h days later. They are effectively impulse responses of the sort considered by Jorda (2005). Figure 4 plots these estimated impulse responses at different horizons, along with 95 percent confidence intervals, formed using Newey-West standard errors[7]. Results are shown for the RCCI-Consumers index; the results for the investors index are not shown, so as to conserve space, but are very similar.

Because the different surprises are each scaled to have unit standard deviation, their magnitudes can be compared. Nonfarm payrolls surprises are the most important—a one standard deviation positive payrolls surprise is estimated to raise the Rasmussen index by 3 to 4 points, for at least 90 days. The effect is statistically significant. Positive retail sales surprises also have significantly positive, and persistent, effects on sentiment. Positive unemployment surprises have significantly negative, and persistent, effects on sentiment. Note that unemployment is the one news announcement we consider where high values are associated with a weakening economy. Positive values of the other surprises tend to lead to higher consumer sentiment, but the effects are not statistically significant at most horizons.

5   Conclusion

In this paper, we have examined high-frequency consumer sentiment indicators, with a special focus on the daily Rasmussen survey. On the one hand, one might worry about the automated

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[7]The lag truncation parameter is $1.5h$, rounded to the nearest integer.

sampling methodology underlying the survey, but on the other hand it is very timely. We assess different indicators in terms of their ability to forecast consumption growth using the *most recent* data on each indicator as of the end of each month, thereby taking publication lags into account. We find that all of the indicators have some ability to forecast consumption growth. The best performance cones from the Michigan survey, even though it is slightly stale. We also studied the determinants of consumer confidence, as measured by Rasmussen. We had little success in explaining the biggest daily moves in this confidence measure, but find did hat changes in stock prices and the VIX both Granger-cause changes in Rasmussen confidence data. We also find that certain macroeconomic news announcements lead to significant and persistent shifts in consumer confidence.

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Table 1: Correlation Matrix of Sentiment Indicators

	MCSI	CBCI	BCCI	RCCI
MCSI	1.00	0.89	0.88	0.93
CBCI	0.89	1.00	0.95	0.95
BCCI	0.88	0.95	1.00	0.94
RCCI	0.93	0.95	0.94	1.00

Notes: This table reports the correlations among end-of-quarter data from 2004:4 to 2015:4 in MCSI, CBCI, BCCI and RCCI-consumers indices.

Table 2: T-statistics on β in Equation (1)

	RCCI-C	RCCI-I	BCCI	MCSI	CBCI	MCSI (KF)	CBCI (KF)
Horizon h: 0 months							
Total	3.32	3.30	2.77	3.78	2.95	3.71	2.94
MV	0.09	0.21	-0.03	0.36	0.15	0.37	0.06
Goods ex MV	2.18	2.10	1.96	2.42	1.79	2.33	1.80
Services	4.96	4.97	4.21	5.44	4.85	5.61	5.02
Durables	1.74	1.74	1.52	2.04	1.73	1.98	1.72
Horizon h: 1 month							
Total	3.64	3.65	2.76	3.79	2.95	3.78	2.94
MV	0.13	0.18	-0.39	0.26	-0.32	0.29	-0.39
Goods ex MV	2.41	2.42	2.00	2.48	1.91	2.49	1.99
Services	5.41	5.41	4.42	6.00	5.28	6.01	5.28
Durables	1.91	1.98	1.64	2.24	1.82	2.24	1.83
Horizon h: 3 months							
Total	3.01	2.91	2.32	3.19	2.50	3.18	2.53
MV	-0.10	-0.24	-0.64	-0.18	-0.72	-0.16	-0.77
Goods ex MV	2.22	2.11	1.71	2.48	1.77	2.44	1.83
Services	4.42	4.32	3.46	5.19	4.08	5.28	4.15
Durables	1.72	1.71	1.34	2.10	1.53	2.05	1.54

Notes: This table reports the t-statistics associated with the sentiment indicators in equation (1) when each sentiment indicator is included one at a time. RCCI-C and RCCI-I refer to the consumers and investors Rasmussen indices, while BCCI, MCSI and CBCI are the Bloomberg, Michigan and Conference Board indices, respectively. The equations are estimated over 2004:10-2015:12. In the case $h = 0$ (a nowcast), White standard errors are used. In the cases $h = 1$ and $h = 3$, Newey-West standard errors with lag truncation parameters of 2 and 5 are used. For each sentiment indicator, the value in a given month is taken as the last number in that month. The two right-most columns, instead use the Kalman Filtered estimate of the MCSI and CBCI indicators, formed as described in subsection 3.1, as of the last day of the month.

Table 3: T-statistics on β in Equation (2)

	RCCI-C	RCCI-I	BCCI	MCSI	CBCI	MCSI (KF)	CBCI (KF)
Horizon h: 0 months							
Total	1.80	1.69	1.08	2.25	1.05	2.10	1.09
MV	0.73	0.70	0.35	1.56	0.73	1.50	0.73
Goods ex MV	1.95	1.87	1.14	1.78	0.70	1.63	0.62
Services	2.61	2.42	1.14	2.92	2.38	3.14	2.41
Durables	1.25	1.36	0.76	1.31	0.92	1.21	0.77
Horizon h: 1 month							
Total	1.84	1.88	1.11	1.96	0.96	1.90	0.93
MV	1.30	1.23	0.32	1.62	0.59	1.70	0.52
Goods ex MV	1.87	1.97	1.26	1.66	0.79	1.72	0.85
Services	3.32	3.11	1.58	3.68	3.24	3.61	2.98
Durables	1.46	1.73	1.20	1.75	1.25	1.76	1.19
Horizon h: 3 months							
Total	1.54	1.38	1.09	1.87	0.93	1.82	0.85
MV	0.68	0.48	0.01	0.73	0.00	0.78	-0.07
Goods ex MV	1.99	1.80	1.66	2.23	1.37	2.23	1.36
Services	3.22	2.99	1.79	3.85	3.25	4.02	3.13
Durables	1.57	1.62	1.44	2.04	1.48	2.01	1.41

Notes: This table reports the t-statistics associated with the sentiment indicators in equation (2) when each sentiment indicator is included one at a time. RCCI-C and RCCI-I refer to the consumers and investors Rasmussen indices, while BCCI, MCSI and CBCI are the Bloomberg, Michigan and Conference Board indices, respectively. The equations are estimated over 2004:10-2015:12. In the case $h = 0$ (a nowcast), White standard errors are used. In the cases $h = 1$ and $h = 3$, Newey-West standard errors with lag truncation parameters of 2 and 5 are used. For each sentiment indicator, the value in a given month is taken as the last number in that month. The two right-most columns, instead use the Kalman Filtered estimate of the MCSI and CBCI indicators, formed as described in subsection 3.1, as of the last day of the month.

Table 4: Multivariate Estimation of Equation (1)

	RCCI-C	RCCI-I	BCCI	MCSI	CBCI	
	t-statistics					p-val
Horizon h: 0 months						
Total	-0.69	1.39	-1.75	2.26	-0.07	0.00
MV	-1.08	1.10	-0.96	0.90	0.02	0.81
Goods ex MV	0.01	0.64	-0.12	1.24	-1.04	0.16
Services	-0.19	0.85	-2.53	1.62	1.71	0.00
Durables	-0.59	0.87	-1.20	1.48	0.32	0.36
Horizon h: 1 month						
Total	-0.86	2.10	-2.44	3.03	-0.68	0.00
MV	-0.84	1.34	-1.20	1.36	-1.22	0.60
Goods ex MV	-0.66	1.44	-0.39	2.31	-1.50	0.02
Services	-0.29	1.39	-3.85	2.42	2.14	0.00
Durables	-1.32	1.58	-1.46	2.95	-0.30	0.02
Horizon h: 3 months						
Total	0.06	1.45	-3.46	3.38	-0.37	0.00
MV	1.07	-0.28	-0.59	0.69	-1.57	0.35
Goods ex MV	-0.35	1.19	-1.60	2.92	-1.37	0.00
Services	-0.53	2.06	-5.32	3.91	2.53	0.00
Durables	-1.44	2.07	-2.47	3.49	-0.88	0.00

Notes: This table reports the t-statistics associated with the sentiment indicators in equation (1) when all five sentiment indicators are included jointly. The p-values from a Wald test of joint significance are also included. RCCI-C and RCCI-I refer to the consumers and investors Rasmussen indices, while BCCI, MCSI and CBCI are the Bloomberg, Michigan and Conference Board indices, respectively. The equations are estimated over 2004:10-2015:12. In the case $h = 0$ (a nowcast), White standard errors are used. In the cases $h = 1$ and $h = 3$, Newey-West standard errors with lag truncation parameters of 2 and 5 are used. For each sentiment indicator, the value in a given month is taken as the last number in that month.

Table 5: Multivariate Estimation of Equation (2)

	RCCI-C	RCCI-I	BCCI	MCSI	CBCI	
	t-statistics					p-val
Horizon h: 0 months						
Total	-0.64	1.32	-1.10	2.28	-0.83	0.13
MV	-0.53	0.78	-1.97	2.34	0.20	0.19
Goods ex MV	-0.32	1.24	-0.10	1.43	-1.59	0.08
Services	0.50	0.15	-2.63	1.42	1.19	0.00
Durables	-0.79	1.37	-0.86	1.28	-0.39	0.43
Horizon h: 1 month						
Total	-1.00	1.96	-1.20	2.78	-1.68	0.04
MV	-0.50	1.58	-2.54	2.98	-1.15	0.01
Goods ex MV	-1.06	2.49	0.03	2.15	-2.51	0.00
Services	0.38	0.40	-3.51	1.65	1.77	0.00
Durables	-1.75	2.20	-0.98	2.65	-0.82	0.05
Horizon h: 3 months						
Total	-0.07	0.72	-0.75	2.29	-1.44	0.07
MV	0.94	-0.04	-1.51	1.99	-1.43	0.16
Goods ex MV	-0.37	0.81	-0.11	2.81	-1.95	0.00
Services	0.06	0.95	-4.39	2.57	2.67	0.00
Durables	-1.57	1.66	-0.77	3.10	-0.76	0.02

Notes: This table reports the t-statistics associated with the sentiment indicators in equation (2) when all five sentiment indicators are included jointly. The p-values from a Wald test of joint significance are also included. RCCI-C and RCCI-I refer to the consumers and investors Rasmussen indices, while BCCI, MCSI and CBCI are the Bloomberg, Michigan and Conference Board indices, respectively. The equations are estimated over 2004:10-2015:12. In the case $h = 0$ (a nowcast), White standard errors are used. In the cases $h = 1$ and $h = 3$, Newey-West standard errors with lag truncation parameters of 2 and 5 are used. For each sentiment indicator, the value in a given month is taken as the last number in that month.

Table 6: Largest Absolute Daily Changes in Rasmussen indices

Biggest Rises					
Consumers			Investors		
Date	Change	Event	Date	Change	Event
9/11/2014	-13.3	-	5/22/2009	-15.2	-
7'/30/2006	-8.6	-	9/11/2014	-13.4	-
9/24/2012	-8.2	-	8/6/2010	-9.7	Employment report
1/24/2012	-7.7	-	7/18/2012	-8.9	-
6/7/2010	-7.6	-	1/27/2014	-8.7	Emerging market financial stress
Biggest Drops					
Consumers			Investors		
Date	Change	Event	Date	Change	Event
8/5/2012	6.7	-	6/20/2012	9.4	FOMC announcement
11/12/2012	6.8	-	7/23/2007	9.8	-
2/3/2013	6.9	-	9/15/2005	9.9	-
10/8/2012	7.3	-	7/13/2007	10.2	-
3/12/2015	9.1	-	10/8/2012	14.8	-

Notes: This table lists the days of the biggest increases and decreases in the Rasmussen consumers and investors indices between October 2004 and December 2015. The table also shows events that happened on those days. These entries are left blank in cases where we can find no particular event on that day.

Table 7: Granger Causality Tests

	Oil	Stocks	VIX
Granger causality **to** RCCI-C	0.052	0.000	0.000
Granger causality **to** RCCI-I	0.036	0.000	0.000
Granger causality **from** RCCI-C	0.452	0.250	0.080
Granger causality **from** RCCI-I	0.414	0.072	0.013

Notes: This table reports the p-values from Granger casuality tests in bivariate VAR(5)s in daily changes in Rasmussen consumer confidence measures and daily changes in oil prices (WTI), stock prices (S&P500), or the VIX. All VARs are estimated over the sample period from October 2004 to December 2015.

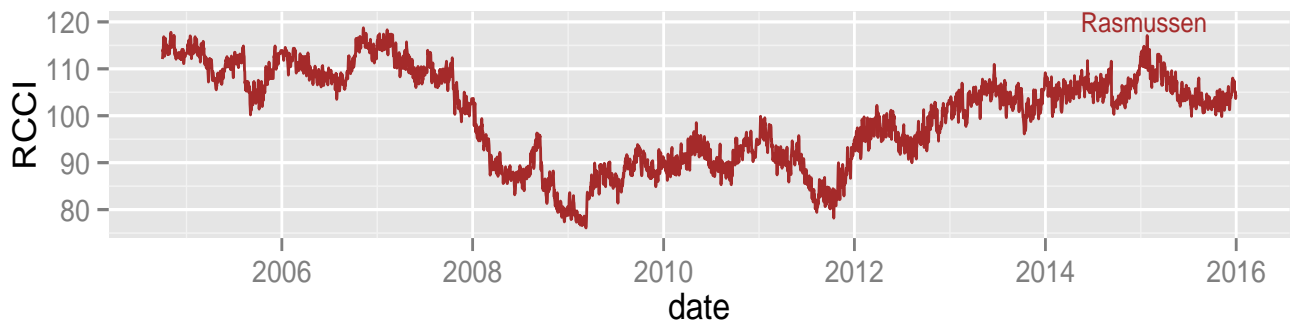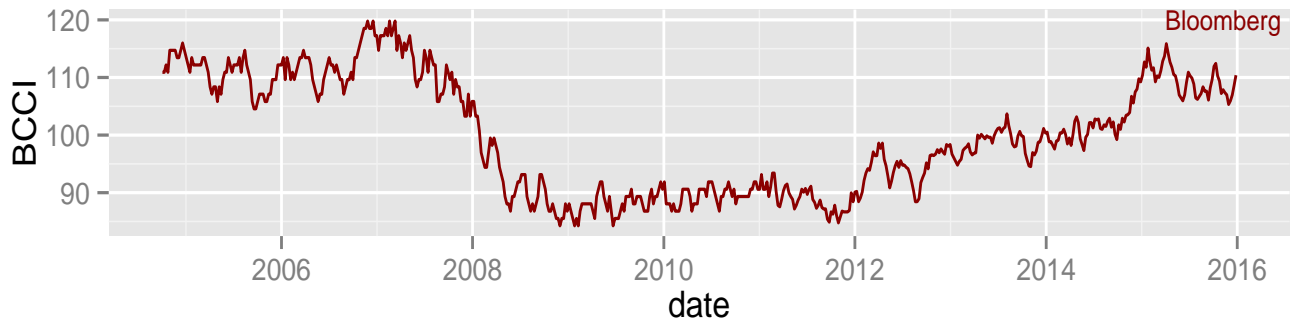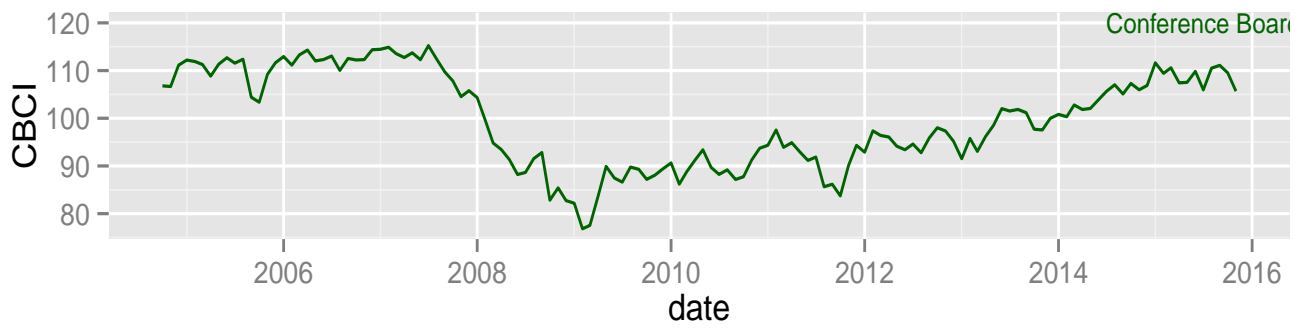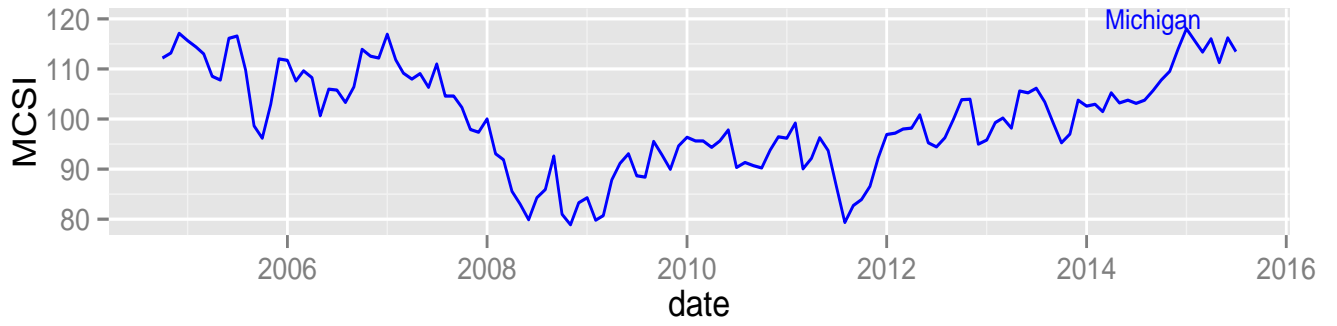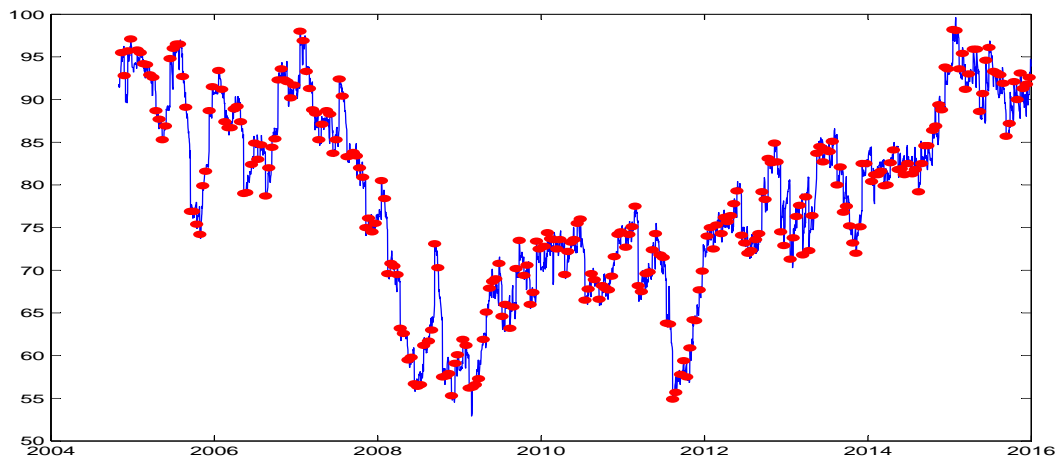Figure 1: Four Consumer Confidence Indices

Figure 2: Actual Michigan Consumer Confidence and Kalman Filtered values

Notes: This figure plots the actual monthly MCSI values (red dots) and Kalman filtered daily values (in blue), from the Kalman filter as described in subsection 3.1. Both preliminary and final MCSI values are shown.

Figure 3: Actual Conference Board Consumer Confidence and Kalman Filtered values
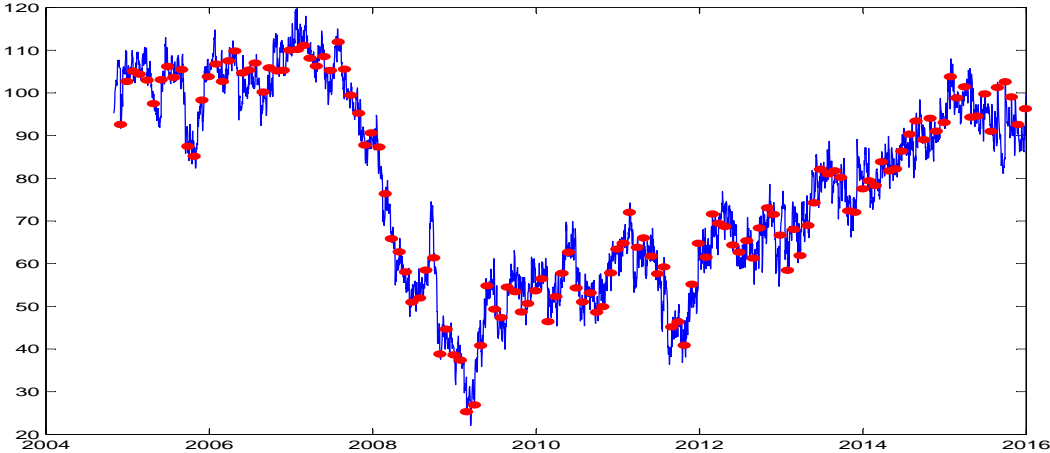
Notes: This figure plots the actual monthly CBCI values (red dots) and Kalman filtered daily values (in blue), from the Kalman filter as described in subsection 3.1.

Figure 4: Effects of Macroeconomic News Surprises on RCCI-Consumers Index
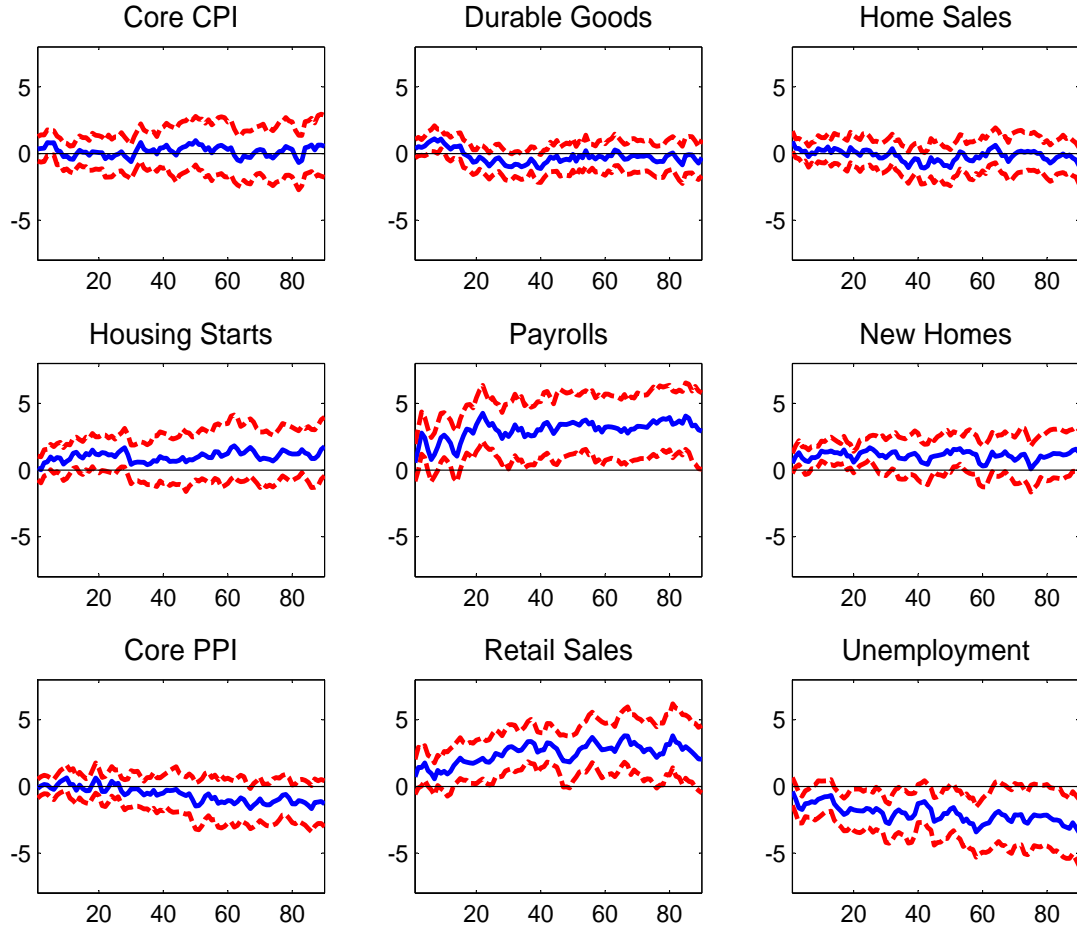
Notes: For each of the 9 announcement types, this figure plots the estimates of $\{\gamma_{j,h}\}$ and Newey-West confidence intervals (lag truncation parameter $1.5h$) against h, using the regression in equation (4). The sample period is 2004:10-2015:12. The impulse responses should be interpreted as the effect of a one standard deviation macroeconomic surprise on day t on the RCCI-Consumers index as of day $t + h$.