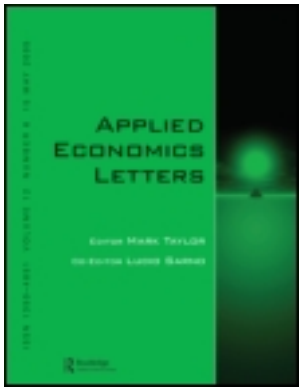

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And action: TV sentiment and the US consumer

Matthias W. Uhl [a]
[a] KOF Swiss Economic Institute, Swiss Federal Institute of Technology (ETH) Zurich, 8092, Zurich, Switzerland
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And action: TV sentiment and the US consumer

Matthias W. Uhl

KOF Swiss Economic Institute, Swiss Federal Institute of Technology (ETH) Zurich, 8092 Zurich, Switzerland
E-mail: uhl@kof.ethz.ch

With a novel data set, we test whether sentiment in TV news can be used as a proxy for consumer sentiment in order to explain changes in private consumption growth in the United States. The University of Michigan Index of Consumer Sentiment (ICS) is taken to compare its explanatory power with TV sentiment in classical consumer behaviour models. We find that TV sentiment can be used at least as good a proxy for consumer sentiment as the ICS, while TV sentiment can best explain private consumption behaviour with personal income and savings.

Keywords: TV sentiment; consumer sentiment; private consumption

JEL Classification: D12; E21

I. Introduction

In the past decades, the United States have shifted towards an information technology society. Recently, Nielsen (2010) reported that the average American watches over 5 hours of television per day. A few years earlier, Pew Report (2004) and Harris Interactive (2007) found that television is the source of information and news gathering for most Americans. Given these results about the quantity of news being watched on TV, can we draw inferences about a qualitative influence of news? Does the way of reporting TV news have an impact on private households?

This article is motivated by studies from two camps. The first camp deals with the literature on the explanatory and predictive power of consumer sentiment on private consumption behaviour, including studies from Carroll *et al*. (1994) who considered that sentiment and other variables can influence private consumption behaviour. Carroll (2003) noted that news coverage and volume of economic topics are relevant to the consumer. Doms and Morin (2004) showed that household spending is influenced by sentiment that is shaped through the tone and volume of news reporting. Further, Souleles (2004) found that consumer sentiment helps to forecast consumer behaviour, whereas Sommer (2007) noted that there is a sensitivity of both sentiment and income to the consumption behaviour of private households. Ang *et al*. (2007) found that consumer sentiment surveys perform best in forecasting models, and Westerhoff (2008) attempted to show that consumer sentiment may have an influence on economic activity. The second camp is much smaller and newer and comprises studies by Strömberg (2004), DellaVigna and Kaplan (2007) and Meschke and Kim (2011), who all dealt with the impact of news in TV and radio broadcasts on voter and investor behaviour.

This article is inspired by the above-mentioned literature and the lack of, at least to the best of our knowledge, literature that sets TV sentiment into context with private consumption behaviour. Thus, we attempt to relate TV sentiment and private consumption behaviour by drawing on a novel data set with positive and negative sentiments from TV news broadcasts in the United States by comparing its explanatory power with an established and well-known index for consumer sentiment: the University of Michigan Index of Consumer Sentiment (ICS). In our analysis, we want to consider more closely the behavioural part of the consumption equation, while accounting for

'hard facts', such as income, savings, inflation and interest rates. Thus, we test the hypothesis that watching TV influences the ordinary consumer and his/her behaviour, as he/she watches news about the economy. Postulating that positive (negative) sentiment in TV news shows increases (decreases) private consumption in the United States, we test this hypothesis with a novel data set.

This article continues as follows: Section II lays out the model, Section III provides the empirical results, while Section IV concludes.

II. Modelling

The data set consists of monthly TV sentiment data from MediaTenor, a professional news sentiment provider. The sentiment data were compiled exclusively from US TV news broadcasts on the US economy. Contrary to other approaches and studies, the sentiment was coded by humans, not by a machine or a predefined automatic algorithm.[1] Tagged topics range broadly and contain possible links to the development and the state of the economy.[2] Table 1 shows the number of tagged statements in news shows. In total, statements in over 10 000 TV news broadcasts were coded for sentiment from January 2005 to December 2009.

Monthly private consumption data were obtained from the ALFRED database.[3] The ICS data were downloaded from the University of Michigan and Thomson Reuters public access website.[4] Other macroeconomic variables are included according to previous studies that examined consumer behaviour models with different explanatory variables. According to Carroll *et al*. (1994), among others, personal income and savings data are considered. The personal income data were downloaded from the Bureau of Economic Analysis.[5] Personal savings data were obtained from the ALFRED database. Breeden (1986) showed that interest rates and inflation have a potential impact on private consumption growth.[6]

According to Augmented Dickey–Fuller (ADF) tests as in Dickey and Fuller (1979), we find that all variables have unit roots on the level, except TV sentiment. To avoid spurious regression results, as Granger and Newbold (1974) pointed out, we take logarithmized first differences of all macroeconomics variables in the data set. For the two sentiment variables, the ICS and TV sentiment, we take level data. Sommer (2007) made a clear case why.

Figures 1 and 2 show charts of private consumption growth against the ICS and TV sentiment, respectively. Compared with the growth rates of private consumption, the ICS looks less volatile and smoother. The TV sentiment shows a more volatile pattern than the ICS, and thus a more similar one to private consumption growth. Both variables seem to track private consumption fairly well.

Table 1. TV sentiment sources

	Number of TV news broadcasts examined for sentiment, 2005–2009
ABC World News Tonight	2 408
CBS Evening News	1 981
FOX News	3 306
NBC Nightly News	2 734
Total	10 429

Source: Media Tenor.

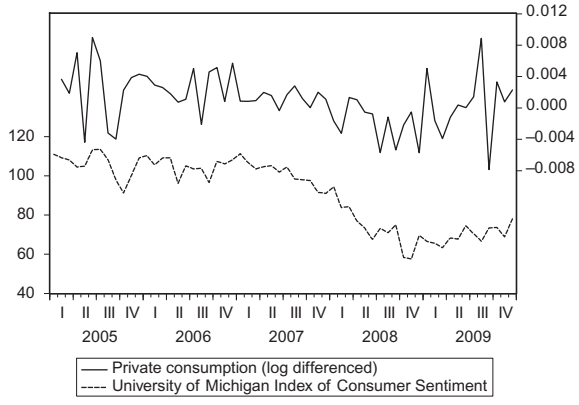

Fig. 1. Time-series chart of private consumption growth and the University of Michigan Index of Consumer Sentiment

[1] See MediaTenor. *Human Analysis vs. Software*. Available at http://www.mediatenor.com/mca_brain_vs_software.php (accessed 1 March 2011).
[2] For a more detailed description of MediaTenor's methodology, go to http://www.mediatenor.com/mca_methodology.php (accessed 1 March 2011).
[3] See Federal Reserve Bank of St. Louis. *ArchivaL Federal Reserve Economic Data*. Available at http://alfred.stlouisfed.org/ (accessed 15 September 2010).
[4] See http://www.sca.isr.umich.edu/ (accessed 15 January 2010).
[5] See US Bureau of Economic Analysis. *Personal Income and Outlays*. Available at http://www.bea.gov/national/index.htm#personal (accessed 24 June 2010).
[6] Short-term 3-month USD LIBOR interest rates and consumer price index data were obtained from Thomson Reuters Datastream.

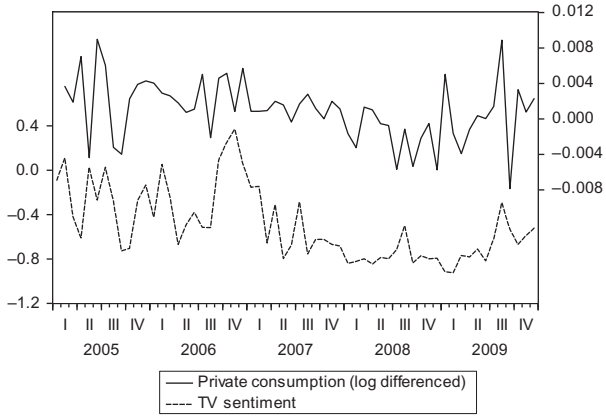

Fig. 2. Time-series chart of private consumption growth and TV sentiment

Table 2 shows simple cross correlations of all (non-lagged) variables of the data set. We focus on the first column, which shows the correlations of all variables with private consumption growth. Both sentiment variables have a high correlation with private consumption growth (ca 0.4), with TV sentiment having the slightly higher correlation. Both correlation coefficients are highly statistically significant and have a positive coefficient sign, as expected. This means that higher (more positive) sentiment scores indicate higher private consumption growth. Most of the other macroeconomic variables are not even closely as correlated with private consumption growth as the sentiment variables, except personal savings growth (–0.33). Personal savings are negatively correlated with private consumption growth, which seems intuitive. The correlation between the sentiment variables is quite high (0.63) and positive, which speaks for an examination of whether TV sentiment can replace the ICS. We need to look at this issue more closely by examining empirically the question whether consumer or TV sentiment is the better variable to explain private consumption growth.

According to previous findings in the literature, we construct a regression model that is based on simple Autoregressive (AR) and Moving Averages (MAs). Sommer (2007) applied an Autoregressive Moving Average (ARMA) (1,2) structure to modelling private consumption growth.

This is based on findings by Working (1960) who found the necessity of an MA(1)-process because preference choices generate time aggregation. The MA(2)-process is needed since time aggregation generates an MA(2)-process in consumption growth, as Carroll *et al.* (2010) justified in their study on habit formation. They further claimed that the AR(1)-process is important because of the stickiness in consumption growth. We thus formulate the regression estimation in accordance with the previously laid out findings:

$$\Delta \log c_t = k + \alpha_1 \Delta \log c_{t-1} + \beta S_t + \gamma \Delta \log Z_t + \sum_{i=1}^{2} \theta_i \varepsilon_{t-i} + \varepsilon_t \quad (1)$$

Table 2. Cross correlations of private consumption, TV and consumer sentiment and other macroeconomic variables

	Private consumption (log differenced)	University of Michigan Index of Consumer Sentiment (level)	TV sentiment (level)	Personal income (log differenced)	Consumer price index (log differenced)	Personal savings (log differenced)	Short-term interest rates (3-month USD LIBOR) (log differenced)
Private consumption (log differenced)	1.00000 (–)						
University of Michigan Index of Consumer Sentiment (level)	0.39909 (0.0017)	1.00000 (–)					
TV sentiment (level)	0.40732 (0.0014)	0.63076 (0.0000)	1.00000 (–)				
Personal income (log differenced)	0.19324 (0.1425)	0.18944 (0.1507)	0.08729 (0.5109)	1.00000 (–)			
Consumer price index (log differenced)	0.16450 (0.2131)	0.10478 (0.4297)	0.25602 (0.0503)	0.18086 (0.1704)	1.00000 (–)		
Personal savings (log differenced)	–0.33807 (0.0088)	–0.08594 (0.5175)	0.00375 (0.9775)	0.68262 (0.0000)	0.07155 (0.5902)	1.00000 (–)	
Short-term interest rates (3-month USD LIBOR) (log differenced)	0.13388 (0.3121)	0.44411 (0.0004)	0.31792 (0.0141)	0.18797 (0.154)	0.16644 (0.2077)	0.05618 (0.6726)	1.00000 (–)

Note: *p*-Values are in parentheses below coefficients.

where $\Delta \log c_t$ refers to logged private consumption growth, k is the constant, S_t to either TV or consumer sentiment (i.e. the ICS) and $\Delta \log Z_t$ to logged growth rates of other macroeconomic variables as in Carroll *et al*. (1994), such as personal income and savings, consumer prices and interest rates, while ε_t marks the error term.

III. Empirical Results

Table 3 shows the regression results. In regressions 1 and 2, we include all variables of Z_t, and the ICS and TV sentiment variables, respectively. Both sentiment variables are highly statistically significant, with relatively similar and high adjusted R^2 and low Schwarz criteria values. Other statistics, such as the Root Mean Squared Error (RMSE) and the Theil Inequality Coefficient, show that the models are similar in their predictive quality. Both sentiment variables have a positive coefficient sign, meaning that higher sentiment results in higher private consumption growth. This finding is in line with our expectation and the initial results from the cross correlations in Table 2. The other variables that are highly statistically significant are personal income and savings. Given the coefficient signs, higher personal income causes consumers to consume more, while a lower savings rate results in higher

Table 3. Private consumption, consumer and TV sentiment and other macroeconomic variables – regression coefficient estimates of ARMA(1,2) models (monthly data)

	Private consumption (log differenced)					
Dependent variable	(1)	(2)	(3)	(4)	(5)	(6)
Coefficient estimates of independent variables						
University of Michigan Index of Consumer Sentiment (level)	0.0000809*** (0.0000132)		0.0000449** (0.0000202)		0.0000833*** (0.0000193)	
TV sentiment (level)		0.004028*** (0.000674)		0.003986*** (0.000532)		0.005397*** (0.000836)
Personal income (log differenced)	0.139634** (0.054995)	0.313188*** (0.035594)	0.286051*** (0.055129)	0.297355*** (0.038088)		
Consumer price index (log differenced)	1.113944*** (0.106045)	0.317609 (0.195444)				
Personal savings (log differenced)	–0.006781*** (0.002489)	–0.012543*** (0.001594)	–0.012060*** (0.002301)	–0.012371*** (0.001566)		
Short-term interest rates (3-month USD LIBOR) (log differenced)	–0.005699*** (0.001984)	–0.002186 (0.001898)				
Constant	–0.009154*** (0.001168)	0.001469*** (0.000511)	–0.003857** (0.001901)	0.002140*** (00.000363)	–0.006615*** (0.001888)	0.003674*** (0.000482)
AR(1)	–0.700156*** (0.131416)	0.599280*** (0.159148)	0.547068 (0.826139)	0.693366*** (0.139918)	–0.721676*** (0.137386)	–0.684488*** (0.119352)
MA(1)	–0.011653 (0.035227)	–0.932600*** (0.170421)	–0.612343 (0.852549)	–0.923132*** (0.190346)	0.585880*** (0.194595)	0.552635*** (0.177431)
MA(2)	–0.947213*** (0.033662)	–0.067134 (0.187556)	–0.061958 (0.223899)	–0.051154 (0.186325)	–0.366148* (0.183899)	–0.406079** (0.173577)
R^2	0.646444	0.640496	0.489731	0.622724	0.301484	0.350038
Adjusted R^2	0.588721	0.581801	0.4297	0.578339	0.248766	0.300984
N (after adjustments)	58	58	58	58	58	58
Schwarz criterion	–8.898431	–8.881746	–8.671550	–8.973511	–8.497544	–8.569588
Root Mean Squared Error (RMSE)	18.76354	18.94258	22.55819	19.3939	26.42074	25.49718
Mean absolute error	14.60032	14.38817	16.91465	14.92899	19.73575	20.73254
Mean absolute per cent error	0.160433	0.157881	0.185639	0.163848	0.216838	0.227543
Theil Inequality Coefficient[a]	0.001027	0.001037	0.001235	0.001061	0.001446	0.001395
Bias proportion	0.004794	0.00376	0.000027	0.003075	0.000001	0.000009
Variance proportion	0.002465	0.000144	0.038268	0.0002	0.028239	0.015872
Covariance proportion	0.992741	0.996096	0.961704	0.996724	0.97176	0.984119

Notes: All models calculated with heteroscedasticity consistent coefficient covariance and SEs according to White (1980). SEs are in parentheses beneath coefficients. AR, Autoregressive; MA, Moving Average; ARMA, Autoregressive Moving Average.
[a]The Theil Inequality Coefficient is calculated as in Theil (1958).
*, ** and ***Significant at 10%, 5% and 1% levels, respectively.

consumption. Higher consumer prices result in an increase in private consumption, hailing from the expectation of consumers of even higher prices in the future, so that they prefer to consume now rather than later. Interest rates have a negative coefficient sign since an increase in interest rates drives consumers to save more because they get rewarded with higher interest.

In regression 2, both the consumer price index and interest rates coefficients are not statistically significant, so that we exclude these two variables in regressions 3 and 4. We then have a pure consumption behaviour regression that only accounts for sentiment and wealth effects with the two variables personal income and savings, similar to Carroll *et al.*'s (1994) model. In both regressions, all coefficients of the independent variables are statistically significant. However, the difference between the two sentiment variables becomes apparent now. The adjusted R^2 values are markedly higher for regression 4, while the Schwarz criterion value is markedly lower. Also, the RMSE and the Theil Inequality Coefficient are much lower in regression 4 than in regression 3. This makes a strong case for TV sentiment as opposed to the ICS. To make the case clearer, we exclude personal income and savings and include only the sentiment variables in regressions 5 and 6. As previously noted, TV sentiment has the slightly better statistics than the ICS, although both sentiment variables are highly statistically significant. The covariance proportion in those regressions with TV sentiment is much closer to one than those that entail the ICS as sentiment variable, as the covariance proportion measures the remaining unsystematic forecasting errors.

We find that both TV and consumer sentiment are highly statistically significant in private consumption behaviour models. However, there are differences between the two variables with a slight advantage for TV sentiment. The best model to explain private consumer behaviour appears to be regression 3, which comprises TV sentiment as well as personal income and savings as independent variables.

IV. Conclusion

The University of Michigan ICS has served as a good proxy for consumer sentiment for many years. This article attempts to identify a new way of measuring channels of influence on private households, such as sentiment from TV news broadcasts. We test the hypothesis that the sentiment in TV news about the economy influences the ordinary consumer and ultimately his/her behaviour. With the aid of a novel data set, we test TV sentiment in various models of private consumption behaviour against the University of Michigan ICS. Our results suggest a positive correlation between TV sentiment and private consumption growth. The best regression results for explaining private consumption in the United States are obtained with a combination of TV sentiment as well as personal savings and income. TV sentiment thus appears to be at least as good a proxy for consumer sentiment as the University of Michigan ICS. Given that this article seeks new ways of explaining consumer behaviour because of recent developments in technology and the media, further research should look at media sentiment in general more closely. Out-of-sample forecasts and a closer examination of the TV sentiment data set used here should be of interest in succeeding studies.

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