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And Action: TV Sentiment and the US Consumer*

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Abstract

With a novel dataset, 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 is taken to compare its explanatory power with TV sentiment in classical consumer behavior models. We find that TV sentiment can be used at least as good a proxy for consumer sentiment as the Index of Consumer Sentiment, while TV sentiment can best explain private consumption behavior with personal income and savings.

Keywords: TV sentiment, consumer sentiment, private consumption

JEL classifications: D12, E21

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I. Introduction

In the past decades, the United States of America have shifted towards an information technology society. Recently, Nielsen (2010) reported that the average American watches over five hours of television per day. A few years earlier, Pew (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 has an impact on private households?

This paper 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 behavior, including studies from Carroll et al (1994) who consider that sentiment and other variables can influence private consumption behavior. Carroll (2003) notes that news coverage and volume of economic topics is relevant to the consumer. Doms and Morin (2004) show that household spending is influenced by sentiment that is shaped through the tone and volume of news reporting. Further, Souleles (2004) finds that consumer sentiment helps to forecast consumer behavior, whereas Sommer (2007) notes that there is a sensitivity of both sentiment and income to the consumption behavior of private households. Ang et al (2007) find that consumer sentiment surveys perform best in forecasting models, and Westerhoff (2008) attempts 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 deal with the impact of news in TV and radio broadcasts on voter and investor behavior.

Inspired by the above mentioned studies and the lack of, at least to the best of our knowledge, literature that sets TV sentiment into context with private consumption behavior. Thus, we attempt to relate TV sentiment and private consumption behavior by drawing on a novel dataset with positive and negative sentiment from TV news broadcasts in the US 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 behavioral 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 her behavior, as she watches news about the economy. Postulating that positive (negative) sentiment in TV news shows increases (decreases) private consumption in the US, we test this hypothesis with a novel dataset.

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

II. Modelling

The dataset 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 pre-defined 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.

[table 1 about here]

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 behavior 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) shows that interest rates and inflation have a potential impact on private consumption growth.⁶

¹See MediaTenor. *Human Analysis vs. Software*. Available at http://www.mediatenor.com/mca_brain_vs_software.php, last accessed 1 March 2011.

²For a more detailed description of MediaTenor's methodology, go to http://www.mediatenor.com/mca_methodology.php, last accessed 1 March 2011.

³See Federal Reserve Bank of St. Louis. *Archival Federal Reserve Economic Data*. Available at <http://alfred.stlouisfed.org/>, last accessed 15 September 2010.

⁴See <http://www.sca.isr.umich.edu/>, last accessed 15 January 2011.

⁵See U.S. Bureau of Economic Analysis. *Personal Income and Outlays*. Available at <http://www.bea.gov/national/index.htm#personal>, last accessed 24 June 2010.

⁶ Short-term 3-month USD LIBOR interest rates and consumer price index data were

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) point out, we take logarithmized first differences of all macroeconomics variables in the dataset. For the two sentiment variables, the ICS and TV sentiment, we take level data. Sommer (2007) makes a clear case why.

Figs. 1 and 2 show charts of private consumption growth against the ICS and TV sentiment, respectively. Compared to 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 2 shows simple cross correlations of all (non-lagged) variables of the dataset. 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.

[table 2 about here]

According to previous findings in the literature, we construct a regression model that is based on simple autoregressive and moving averages. Sommer (2007) applies an ARMA(1,2) structure to modeling private consumption growth.

obtained from Thomson Reuters Datastream.

This is based on findings by Working (1960) who finds 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) justify in their study on habit formation. They further claim 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:

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

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-squared 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 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.

[table 3 about here]

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 behavior 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-squared 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 (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 are 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 behavior models. However, there are differences between the two variables with a slight advantage for TV sentiment. The best model to explain private consumer behavior appears to be (3), which comprises TV sentiment as well as personal income and savings as independent variables.

IV. Conclusion

The University of Michigan Index of Consumer Sentiment has served as a good proxy for consumer sentiment for many years. This paper 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

her behavior. With the aid of a novel dataset, we test TV sentiment in various models of private consumption behavior against the University of Michigan Index of Consumer Sentiment. Our results suggest a positive correlation between TV sentiment and private consumption growth. The best regression results for explaining private consumption in the US 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 Index of Consumer Sentiment. Given that this paper seeks new ways of explaining consumer behavior 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 dataset used here should be of interest in succeeding studies.

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Figure 1: Time-Series Chart of Private Consumption Growth and the University of Michigan Index of Consumer Sentiment

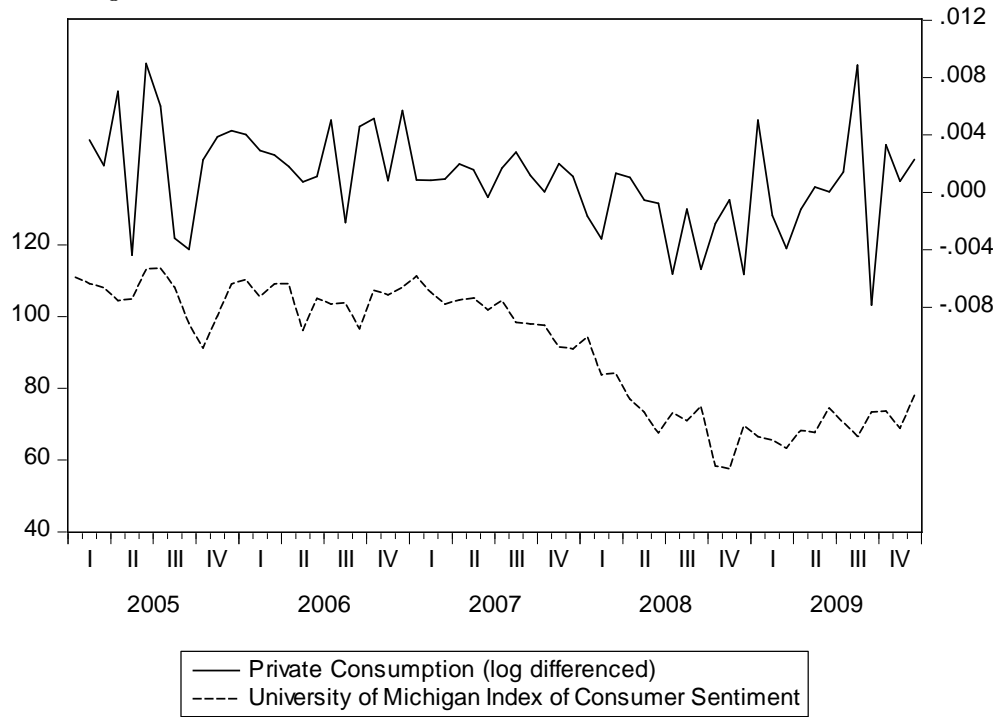


Figure 2: Time-Series Chart of Private Consumption Growth and TV Sentiment

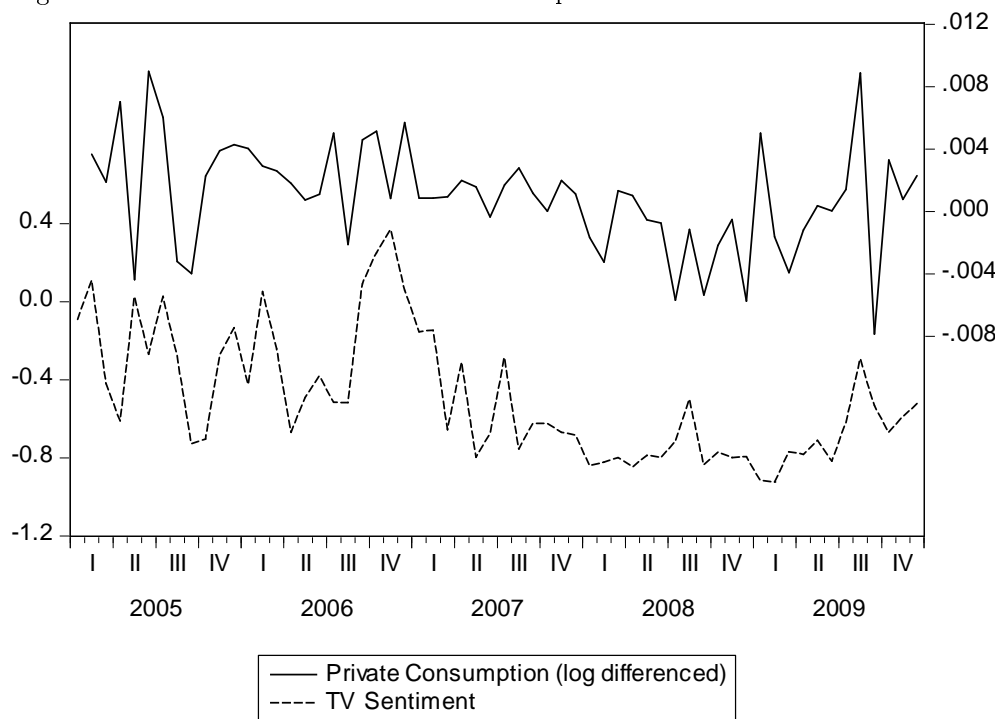


Table 1

TV Sentiment Sources

| | Number of TV news broadcasts examined for sentiment 2005 - 2009 |
|-------------------------------|---|
| <i>ABC World News Tonight</i> | 2'408 |
| <i>CBS Evening News</i> | 1'981 |
| <i>FOX News</i> | 3'306 |
| <i>NBC Nightly News</i> | 2'734 |
| Total | 10'429 |

Source: MediaTenor

Table 2

Cross Correlations of Private Consumption, TV and Consumer Sentiment and other macroeconomic variables (p-values in parentheses below coefficients)

| | Private Consumption (log difference) | University of Michigan Index of Consumer Sentiment (level) | TV Sentiment (level) | Personal Income (log difference) | Consumer Price Index (log difference) | Personal Savings (log difference) | Short-term interest rates (3-month USD LIBOR) (log difference) |
|--|--------------------------------------|--|----------------------|----------------------------------|---------------------------------------|-----------------------------------|--|
| Private Consumption (log difference) | 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 difference) | 0.19324 0.1425 | 0.18944 0.1507 | 0.08729 0.5109 | 1.00000 ----- | | | |
| Consumer Price Index (log difference) | 0.16450 0.2131 | 0.10478 0.4297 | 0.25602 0.0503 | 0.18086 0.1704 | 1.00000 ----- | | |
| Personal Savings (log difference) | -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 difference) | 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 ----- |

Table 3

Private Consumption, Consumer and TV Sentiment and other macroeconomic variables (*monthly data*)
 Regression Coefficient Estimates of ARMA(1,2) models'
 (standard errors in parentheses beneath coefficients)

| <i>Dependent Variable</i> | Private Consumption (log differenced) | | | | | |
|---|---------------------------------------|----------------------------|----------------------------|----------------------------|-----------------------------|----------------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| <i>Coefficient Estimates of Independent Variables</i> | | | | | | |
| 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*** (0.0000363) | -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-squared | 0.646444 | 0.640496 | 0.489731 | 0.622724 | 0.301484 | 0.350038 |
| Adjusted R-squared | 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 Percent Error | 0.160433 | 0.157881 | 0.185639 | 0.163848 | 0.216838 | 0.227543 |
| Theil Inequality Coefficient" | 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 |

*,**,*** denote statistical significance at the 10%-, 5%-, and 1%-level, respectively

' All models calculated with heteroskedasticity consistent coefficient covariance and standard errors according to White (1980).

" The Theil Inequality Coefficient is calculated as in Theil (1958).