IDENTIFYING THE INTERDEPENDENCE BETWEEN CONSUMER CONFIDENCE AND MACROECONOMIC DEVELOPMENTS IN CROATIA

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ABSTRACT

This article represents an empirical attempt to discern the interrelationship between consumer confidence and macroeconomic trends in Croatia. Previous studies that employ both subjective and objective variables show that consumer confidence, consumption and gross domestic product in other countries are interdependent to a great extent. Apart from the mentioned variables, our study additionally includes savings, as another important determinant in the households' economic decision making. The results indicate that consumer confidence Granger-causes all selected macroeconomic variables and vice versa. Not surprisingly, there are also many significant interrelations between the macroeconomic variables. These findings confirm the predictive ability of consumer confidence in Croatia and suggest that combining subjective and objective indicators has an important role in understanding households' economic behaviour.

KEY WORDS

CLASSIFICATION

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INTRODUCTION

A substantial amount of research has been devoted to investigating the interrelationship between economic sentiment and macroeconomic trends. Generally speaking, indicators of consumer confidence, which present economic agents' "state of mind" when assessing overall economic conditions, are believed to be closely associated with macroeconomic developments. This article examines the way consumer confidence and selected macroeconomic variables are connected in Croatia. In other words, by including the psychological component in the econometric model, the aim is to combine the subjective (survey derived) variable and the standard set of macroeconomic variables. Hence this work could add to the literature in behavioural economics, which is an insufficiently explored field in Croatia.

Similar studies have been done for other countries and mostly proved that indicators of consumer confidence serve as rather good predictors of macroeconomic activity. The latter could be considered as a truly important result. In a theoretical sense, it enables us an improved understanding of the way these variables are interrelated, as well as a better comprehension of households' economic behaviour. On the other hand, there is also a practical contribution of this finding related to economic policy making and doing business. Namely, policy makers and managers could advance the quality of their analyses and decision making process by taking into account the variable which directly reflects the level of consumers' confidence in a given moment.

Thus this work contributes to the existing literature in several aspects. First, it will be analysed whether confidence of Croatian consumers and consequently their economic behaviour generate macroeconomic trends and *vice versa*. Such research has not yet been done for Croatia. In that manner, our main research goal is to find out if it is suitable to predict future macroeconomic trends using consumer confidence indicator (CCI). We hypothesise that, in line with the results of studies done for other countries, CCI is a useful leading indicator in Croatia as well. Apart from that, our model additionally includes the variable savings which is also a very important determinant in household financial decision making. That is especially true for the case of Croatia due to several experienced hyperinflation episodes, which permanently made Croatian consumers very sensitive to (expected) changes in macroeconomic conditions and therefore very careful in making financial choices.

The structure of this article is organised as follows. Section 2 provides an overview of previous research, Section 3 describes the data and methodology used, while Section 4 presents and discusses the empirical results. The final section brings concluding remarks.

OVERVIEW OF PREVIOUS RESEARCH

There are a number of empirical studies, done mostly for developed countries, which examine the relationship between consumer confidence, their economic behaviour and macroeconomic trends. The theory behind most research questions is rather simple. If consumer confidence is high enough, it should drive them to spend more and save less, leading to higher aggregate consumption, which is often the largest gross domestic product (GDP) component. While the relationship between macroeconomic variables (consumption, savings and GDP) is theoretically grounded, the link between consumer confidence and macroeconomic activity is an empirical question. Although the results of different analyses are distinct, many of them confirm the thesis that consumer confidence successfully predicts consumption and/or gross domestic product. The contribution of CCI in explaining consumption is even increasing when households experience some major changes or when there is evidence of certain economic shocks. Among others, [1-3] describe household decision making as depending on whether the economy is currently in the boom or bust phase of the business cycle.

The widely held view is that households make economic decisions in accordance with their current level of optimism regarding their financial situation and general economic outlook. The way consumers feel is often measured via consumer surveys. In line with that, when investigating household behaviour, it is generally essential to know if they are trustworthy when answering survey questions about their financial situation. If not, indicators stemming from household survey results might not be reliable. Authors [4] include the subjective variable in their study using survey information and show that the results are in accordance with the life-cycle-permanent-income (LC-PI) model, which represents a prevailing conceptual framework for learning representative consumer's financial behaviour. They confirm the premise that households are honest when reporting on their financial position.

There are many ways various authors addressed the question if consumer confidence indices were truly the leading indicators. When speaking about household decisions and habits, one strand of the literature emphasised the importance of precautionary saving motive, see e.g. [5-11]. They all examined whether the role of consumer confidence in explaining future total private consumption could be related to either the precautionary saving motive or the permanent income hypothesis. Nonetheless, authors [12] argue that the mentioned predictive ability of consumer confidence cannot be explained by either precautionary savings motive or permanent income hypothesis. They show that holding all other variables constant, the lagged values of consumer confidence indices have explanatory power in the future growth of total private consumption.

Authors who examined the role of consumer confidence in predicting economic activity, among others, are [12-22]. To be specific, these authors investigated the impact of consumer confidence on consumption expenditures. For example, [5] suggest the use of precautionary motives for explaining the tendency of savings that increase during recessions. In their study, [23] show that indicators of consumer confidence are procyclical and generally play a significant role in predicting downturns.

On the other hand, [17, 24, 25] propose that while considering other relevant determinants of consumption, the impact of confidence on consumption is weak. According to [20], one of the components that makes confidence significant in forecasting consumption growth could be the asymmetry in the way household process information from diverse sources. The latter is partially mirrored by the sentiment diffusion indices.

In his study [26] implies that people's opinions about future economic circumstances are helpful in predicting future consumer spending. Similarly, [27] examine if the expectation formation of boundedly rational agents could exceed purely rational expectations. The authors stated that consumer confidence is a very important factor in determining household decisions about consumption. Interestingly, in his paper [28] addresses the situation when the people's assessment of their financial situation actually contradicts their expenditure decisions.

Further on, [29] found that consumer confidence index Granger-causes future consumption with an average time lag of 4 to 5 months. They suggest that consumer confidence is a useful predictor of consumption not only in the short-term, but also in long time horizons. Generally speaking, this conclusion might be very beneficial to policymakers at the macro level, as well as to managers at the micro level (for example production and retail managers).

In the case of Poland [30] investigates which confidence indicators are significant for predicting future aggregate household propensity to save and borrow. Among other findings, the author concludes that consumer confidence index has predictive power in future household saving and borrowing rates. In their research of European Union countries outside the euro area with their own currencies (Croatia not included), and three Baltic countries that recently adopted the euro, authors in [30] emphasize irrationalities of the saving behaviour.

They observe the significant impact of overall confidence indicator, perceptions about future savings and financial situation. Authors [31] found that financial optimism and saving are inversely related. They suggest that current financial expectations are helpful in predicting future consumption.

As far as studies for Croatia are concerned, the literature on the usefulness of consumer confidence indicators in explaining the real economy is relatively scarce. The study worth mentioning is [32], where authors found using vector autoregression (VAR) models that quarterly economic sentiment indicator contains some predictive power for quarterly GDP. However, they did not focus on sole consumer confidence, as is done in this article, but investigated the role of Economic Sentiment Indicator which reflects and represents total economic activity. Also, some aspects of changes in household saving behaviour in Croatia were discussed by [33-36]. Although the interrelationship of consumer confidence and macroeconomic developments is widely explored, still most of the studies have focused on the USA and other developed economies. Therefore it will be interesting to investigate, with the inclusion of the variable savings in the model, if the results for Croatia would prove to be similar to those of previous studies conducted for other countries.

DATA AND METHOD

In order to assess the role of consumer confidence in generating macroeconomic trends in Croatia, authors collect data on a quarterly basis, ranging from the first quarter of 2006 to the last quarter of 2016. The article covers the stated period as data measuring consumer confidence is available from the first quarter of 2006. Variables taken for the analysis are GDP, final consumption expenditure, gross savings and CCI, all in terms of growth rates[1]. The last mentioned variable, CCI, reflects the optimism (or pessimism) of Croatian consumers and is derived from Croatian Consumer Surveys. It is calculated as an indicator based on response balance to questions posed to consumers (randomly selected in the sample) about their evaluations and expectations on economic variables characteristics in the following period [37]. Taking into account that this variable is standardly measured in monthly frequencies, CCI was here calculated for all the necessary quarters to conduct the analysis. Due to the fact that we deal with quarterly data, all of the variables were seasonally adjusted using ARIMA X-12 method.

As authors were here mostly interested in investigating the dynamics of the variables of interest, and especially the relationships between them, VAR approach was used. As VAR model was being estimated, stationarity of all the included variables was checked. Hereby the Augmented Dickey Fuller Unit Root Test was employed. All of the variables proved to be stationary in levels (results available on demand), which is not surprising as their growth rates were initially taken for the analysis. Figure 1 shows the dynamics of the selected variables in the observed period.

There are several insights stemming from the presented graphs. First, the strong positive correlation between GDP and consumption is quite obvious. Thereby this graphical representations can serve as an affirmation of the premise that consumption is by far the most important (largest) GDP component in Croatia, as is confirmed for many other countries, e.g. [38]. Furthermore, it can be observed that the largest drop in GDP and consumption levels happened at the onset of the global financial crisis. It seems reasonable to assume that, in times of such a severe financial and economic breakdown, economic agents would start feeling pessimistic and lacking confidence, leading to the lower levels of economic sentiment. In Figure 1 one could easily notice the decreasing trend of consumer confidence starting from the second quarter of 2008.
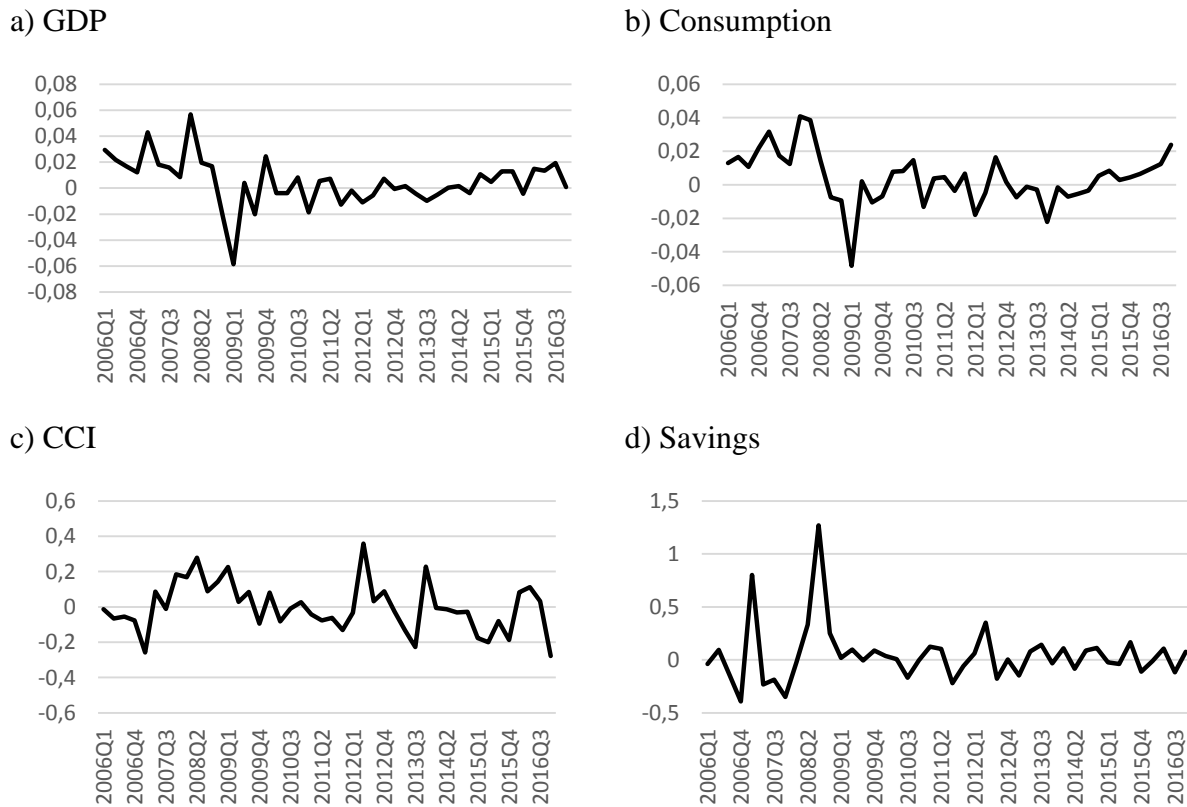
a) GDP

b) Consumption

c) CCI

d) Savings

Figure 1. Graphs of analysed variables. Source: authors' construction.

When comparing graphs b) and d) in Figure 1, the variable savings appears to be inversely proportional to consumption, as excessively low negative growth rates of consumption correspond to high levels of savings. It is expectedly most pronounced at the end of 2008. Lastly, it looks like the dynamics of GDP and CCI are slightly alike, but having only graphical representations it cannot be formally concluded whether CCI precedes GDP. Gaining now only the initial insights about the relationships between the selected variables, authors therefore conduct an econometric analysis.

In accordance with the main research question of this article, which is to determine the relationship between the subjective variable CCI and objective macroeconomic variables, multivariate reduced-form VAR model was estimated. Moreover, to resolve whether CCI makes a good leading indicator of macroeconomic activity Granger Causality Test was conducted. Hereby authors want to test the ability of the first variable to predict the dynamics of the other variable, or in other words, to examine if the dynamics of macroeconomic variables would better be explained if previous values of CCI were included in the analysis. The optimal number of lags k in this model was chosen taking into account the AIC information criterion ($k = 3$).

EMPIRICAL RESULTS

This section brings the results of the Granger Causality Test shown in Table 1 and Table 2. As is shown in Table 1 there obviously exists a bi-directional causal relationship between consumer confidence and macroeconomic variables. To be specific, CCI Granger-causes GDP, consumption and savings, thereby explaining the dynamics of those variables. Examined macroeconomic variables however also Granger-cause CCI[2] or, in other words, shifts in macroeconomic variables precede to movements in CCI. It is namely intuitive that important macroeconomic indicators such as GDP, aggregate consumption and savings,

which create certain economic climate, also sway consumer perceptions about their economic environment. That being said, it should be noted that changes in consumers' impressions and beliefs might lead them to adjust to the new economic surrounding by modifying their economic behaviour and decision making.

Table 1. Results of Granger Causality Test showing the interdependence between CCI and selected macroeconomic variables, *p*-values are in brackets. Source: authors' calculation.

	Test statistic
CCI → GDP	7,480* (0,0581)
CCI → CONSUMPTION	10,940** (0,0121)
CCI → SAVINGS	6,852* (0,0768)
GDP → CCI	7,596* (0,0552)
CONSUMPTION → CCI	7,728* (0,0520)
SAVINGS → CCI	6,410* (0,0933)

*statistically significant at 10 %
**statistically significant at 5 %

Table 2 shows the results of Granger Causality Test for sole macroeconomic variables. Although these results are not as important for this research, some existing significant relationships serve to complement results obtained in Table 1. Therefore it can be concluded that economic mechanism *CCI → consumption → GDP,* which proved to be valid for other countries (as discussed in the literature review), seems to be true for Croatia as well. In other words, as it precedes macroeconomic variables, CCI should serve as a fine leading indicator of economic activity in Croatia.

Table 2. Results of Granger Causality Test showing the interdependence between selected macroeconomic variables, *p*-values are in brackets. Source: authors' calculation.

	Test statistic
GDP → CONSUMPTION	10,90** (0,0123)
GDP → SAVINGS	1,294 (0,7305)
CONSUMPTION → GDP	6,838* (0,0772)
CONSUMPTION → SAVINGS	4,742 (0,1917)
SAVINGS → GDP	15,700*** (0,0013)
SAVINGS → CONSUMPTION	17,730*** (0,0005)

*statistically significant at 10 %
**statistically significant at 5 %
***statistically significant at 1 %

However, similar conclusions can be drawn on the basis of Granger Causality Test when including the variable savings instead of consumption in the previously mentioned mechanism (*CCI → savings → GDP*). Such results are in line with economic theory and intuition. They are also not surprising taking into consideration that Croatian people had experienced several hyperinflation episodes which makes them especially sensitive when it comes to the question of perceiving current and future inflation. Due to these past negative experiences, Croatian consumers are generally more prone to save by buying real estate rather than saving in other forms whose value could be diminished by some sudden inflation [39]. Anyway, one could definitely expect that consumer confidence in Croatia is strongly linked to the aggregate savings.

There is one more thing worthwhile noticing when summing up the obtained results. Namely, CCI (except for the observed direct Granger causation) actually generates shifts in GDP indirectly through shifts in consumption and savings, as consumers make their financial decisions and obviously modify their proneness to spend depending on their market confidence.

At the end, the diagnostics check was made. The tests proved that the estimated VAR model has no heteroscedasticity, non-normality or autocorrelation issues, as well as that model satisfies the stability condition because no root lies outside the unit circle (results available on demand). For robustness check the order of the variables in the Cholesky decomposition was made multiple times and the gained results remained almost the same.

CONCLUSION

This article represents one of the few empirical attempts to discern the interrelationship between consumer confidence and main macroeconomic indicators in Croatia. These subjective and objective variables are combined and analysed by estimating VAR model and thereby this work represents a modest step towards complementing the existing literature in the field of behavioural economics. Nevertheless, speaking in Croatian terms, research that binds economic, psychological and sociological elements is pretty scarce.

The main research question of this article was to determine whether there exists the interdependence between the selected behavioural and macroeconomic variables, and especially to find out if CCI makes a reliable predictor of Croatian macroeconomic activity. The results of Granger Causality Tests suggest that there exist significant bi-directional causal relationships between almost all the observed variables. Thereby it is corroborated that consumers' perceptions of their economic surrounding obviously reflect their decisions concerning spending and saving. Additionally, consumption and saving Granger-cause GDP. These results combined imply that CCI could adequately predict short-run macroeconomic developments.

In line with the obtained results, certain implications come to light. First, economists working in research institutes, as well as managers and policymakers are in this manner advised to include obviously an important factor – consumer confidence – in their analysis and forecasts. By paying close attention to movements in consumer confidence, they could anticipate potential changes in macroeconomic developments, which might be especially important in cases of potential economic downturns. If there is a crisis in sight, they could react to it even before time. Second, it is suggested for policymakers to find a way to either directly or indirectly increase consumer confidence, as consumers' positive economic beliefs should lead to higher aggregate consumption and consequently economic growth. Again, this finding could be of even greater importance for economic policy in times of crisis. However, designing an appropriate and efficient policy instrument for raising consumer optimism should be the subject of our further analysis.

REMARKS

[1]GDP and final consumption expenditure data were collected from Eurostat database, gross household savings from European Central Bank database, while the source of CCI data is European Commission.

[2]As presented in Table 1, although most causal relationships prove to be statistically significant at 10 %, p-value actually just slightly exceeds the 0,05 value in the cases of GDP Granger-causing CCI, CCI Granger-causing GDP and consumption Granger-causing CCI.

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REFERENCES

[1] Nofsinger, J.R.: *Household behavior and boom/bust cycles*.
Journal of Financial Stability **8**(3), 161-173, 2012,

[2] Kosny, M. and Piotrowska, M.: *Economic Security of Households and Their Savings and Credits*.
NBP Working Papers 146, 2013,

[3] Kapounek, S.; Korab, P. and Deltuvaite, V.: *(Ir)rational Households' Saving Behavior? An Empirical Investigation*.
Procedia Economics and Finance **39**, 625-633, 2016,
http://dx.doi.org/10.1016/S2212-5671(16)30309-4,

[4] Betti, G.; Dourmashkin, N.; Rossi, M. and Yin, Y. P.: *Consumer over‑ indebtedness in the EU: measurement and characteristics*.
Journal of Economic Studies **34**(2), 136-156, 2007,
http://dx.doi.org/10.1108/01443580710745371,

[5] Carroll, C.; Sommer, M. and Slacalek, J.: *Dissecting Saving Dynamics: Measuring Wealth, Precautionary and Credit Effects*.
IMF Working Papers, WP/12/219, 2012,

[6] Mody, A.; Ohnsorge, F. and Sandri, D.: *Precautionary Savings in the Great Recession*.
IMF Working Paper WP/12/42, 2012,

[7] Bande, R. and Riviero, D.: *Private Saving Rates and Macroeconomic Uncertainty: Evidence from Spanish Regional Data*.
The Economic and Social Review **44**(3), 323-349, 2013,

[8] Ceritoğlu, E.: *The impact of labour income risk on household saving decisions in Turkey*.
Review of Economics of the Household **11**(1), 109-129, 2013,

[9] Chamon, M.; Liu, K. and Prasad, E.: *Income uncertainty and household savings in China*.
Journal of Development Economics **105**, 164-177, 2013,

[10] Fossen, F. M. and Rostam-Afschar, D.: *Precautionary and Entrepreneurial Savings: New Evidence from German Households*.
Oxford Bulletin of Economics and Statistics **75**(4), 528-555, 2013,
http://dx.doi.org/10.1111/j.1468-0084.2012.00702.x,

[11] Mastrogiacomo, M. and Alessie, R.: *The precautionary savings motive and household savings*.
Oxford Economic Papers **66**(1), 164-187, 2014,
http://dx.doi.org/10.1093/oep/gpt028,

[12] Can, H.G.K. and Yüncüler, Ç.: *The Explanatory Power and the Forecast Performance of Consumer Confidence Indices for Private Consumption Growth in Turkey*.
Emerging Market Finance and Trade **54**(9), 2136-2152, 2017,
http://dx.doi.org/10.1080/1540496X.2017.1358608,

[13] Carroll, J.C.; Fuhrer, D. and Wilcox W.: *Does Consumer Sentiment Forecast Household Spending? If So, Why?*
The American Economic Review **84**(5), 1397-1408, 1994,

[14] Souleles, N.S.: *Expectations, Heterogeneous Forecast Errors, and Consumption: Micro Evidence from the Michigan Consumer Sentiment Surveys*.
Journal of Money, Credit and Banking **36**(1), 39-72, 2004,

[15] Ludvigson, S.C.: *Consumer Confidence and Consumer Spending*.
Journal of Economic Perspectives **18**(2), 29-50, 2004,

[16] Howrey, E.P. and Lovell, M.C.: *The predictive power of the Index of Consumer Sentiment / Comment and discussion*.
Brookings Paper on Economic Activity **1**, 175-216, 2001,

[17] Cotsomitis, J.A. and Kwan, A.C.C.: *Can Consumer Confidence Forecast Household Spending? Evidence from the European Commission Business and Consumer Surveys*.
Southern Economic Journal **72**(3), 597-610, 2006,

[18] Dees, S. and Soares Brinca, P.: *Consumer confidence as a predictor of consumption spending: Evidence for the United States and the Euro area.*
International Economics **134**, 1-14, 2013,

[19] Malgarini, M. and Margani, P.: *Psychology, consumer sentiment and household expenditures.*
Applied Economics **39**(13), 1719-1729, 2007,
http://dx.doi.org/10.1080/00036840600606351,

[20] Lahiri, K.; Monokroussos, G. and Zhao, Y.: *Forecasting Consumption: the Role of Consumer Confidence in Real Time with many Predictors.*
Journal of Applied Econometrics **31**(7), 1254-1275, 2016,
http://dx.doi.org/10.1002/jae.2494,

[21] Cuenca Pino, L.; Flores Salvatierra J. and Morales Vasquez, D.: *The Consumer confidence index and short-term private consumption forecasting in Perú.*
Working Paper Series, Central Bank of Perú **28**, 2013,

[22] Bruno, G.: *Consumer confidence and consumption forecast: a non-parametric approach.*
Empirica **41**(1), 37-52, 2014,

[23] Taylor, K. and McNabb, R.: *Business Cycles and the Role of Confidence: Evidence for Europe.*
Oxford Bulletin of Economics and Statistics **69**(2), 185-208, 2007,
http://dx.doi.org/10.1111/j.1468-0084.2007.00472.x,

[24] Fuhrer, J.: *What role does consumer sentiment play in the U.S. macroeconomy?*
New England Economic Review, Federal Reserve Bank of Boston, 32-44, 1993,

[25] Al-Eyd, A.; Barrell, R. and Davis, E.P.: *Consumer Confidence Indices and Short-Term Forecasting of Consumption.*
The Manchester School **77**(1), 96-111, 2009,
http://dx.doi.org/10.1111/j.1467-9957.2008.02089.x,

[26] Wilcox, J.A.: Forecasting *Components of Consumption with Components of Consumer Sentiment.*
Business Economics **42**(4), 22-32, 2007,
http://dx.doi.org/10.2145/20070403,

[27] Jang,T. and Sacht, S.: *Modeling consumer confidence and its role for expectation formation: A horse race.*
Economics Working Papers 2017-04, Christian-Albrechts-University of Kiel – Department of Economics, Kiel, 2017,

[28] Hajdu, C.: *Is* discrepancy *between confidence and spending driven by pessimism or by high aspirations? Review of the discrepancy between the admitted financial situation and actual spending in Hungary.*
Society and Economy **39**(2), 233-250, 2017,
http://dx.doi.org/10.1556/204.2017.39.2.4,

[29] Gelper, S.; Lemmens, A. and Croux, C.: *Consumer sentiment and consumer spending: decomposing the Granger causal relationship in the time domain.*
Applied Economics **39**(1), 1-11, 2007,
http://dx.doi.org/10.1080/00036840500427791,

[30] Kłopocka, A.M.: Does *Consumer Confidence Forecast Household Saving and Borrowing Behavior? Evidence for Poland.*
Social Indicators Research **133**(2), 693-717, 2017,

[31] Brown, S. and Taylor, K.: *Financial Expectations, Consumption and Saving: A Microeconomic Analysis.*
Fiscal Studies **27**(3), 313-338, 2006,
http://dx.doi.org/10.1111/j.1467-8578.2006.00037.x,

[32] Čižmešija, M. and Sorić, P.: Assessing *Croatian GDP Components Via Economic Sentiment Indicator.*
Economic Research-Ekonomska Istraživanja, **23**(4), 1-10, 2010,

[33] Čižmešija M. and Orlović Z.: *Consumer Confidence Indicator as a Leading Indicator of Changes in Retail Trade Turnover*. In Croatian.
Ekonomski Pregled **69**(1), 3-19, 2018,

[34] Sorić, P.: *Consumer confidence as a GDP determinant in New EU Member States: a view from a time-varying perspective.*
Empirica **45**(2), 261-282, 2018,

[35] Erjavec, N.; Sorić, P. and Čižmešija, M.: *Predicting the probability of recession in Croatia: Is economic sentiment the missing link?*
Zbornik radova Ekonomskog fakulteta u Rijeci **34**(2), 555-579, 2016,

[36] Kuzmanovic, M. and Sanfey, P.: *Can Consumer Confidence Data Predict Real Variables? Evidence from Croatia*.
Croatian Economic Survey **15**(1), 2013,

[37] Čižmešija, M.: *Konjunkturni testovi Europske unije i Hrvatske*. In Croatian.
Privredni vjesnik, Zagreb, 2008,

[38] Blanchard, O.: *Makroekonomija*. 5th edition. In Croatian.
MATE d.o.o, Zagreb, 2005,

[39] Čižmešija, M.; Sorić, P. and Lolić, I.: *Uloga ekonomskog sentimenta u tumačenju makroekonomskih trendova: metodološka unapređenja i nova područja primjene u Hrvatskoj*. In Croatian.
University of Zagreb – Faculty of Economics and Business, Zagreb, 2018.