10.1515/cer-2017-0031

IVANA LOLIĆ[*], PETAR SORIĆ[**], MIRJANA ČIŽMEŠIJA[***]

Personal Finances vs. the Overall Economic Conditions: What Drives the New EU Member States' Stock Markets?

Abstract

This paper analyses the leading characteristics of the Consumer Confidence Index (CCI) with respect to stock market returns for 11 New EU Member States. It proposes novel CCI weights by minimizing mean squared errors from regression forecasting equations, using CCI lags as regressors. With regards to the obtained "optimal" weights, the examined countries are grouped into micro- and macro-oriented clusters. A strong shift is found in the weights due to the recent recession. The micro aspects (reflecting the wealth effect) severely lose their importance in the crisis, while the consumers' macroeconomic sentiments grow in significance and constitute a separate transmission channel.

Keywords: *consumer confidence, business and consumer surveys, stock market, numerical optimization*

JEL: *C50, D53, E32, G01*

[*] Teaching and Research Assistant, University of Zagreb, Faculty of Economics and Business Zagreb, e-mail: ilolic@efzg.hr

[**] Ph.D. Assistant Professor, University of Zagreb, Faculty of Economics and Business Zagreb, e-mail: psoric@efzg.hr

[***] Ph.D. Professor, University of Zagreb, Faculty of Economics and Business Zagreb, e-mail: mcizmesija@efzg.hr

1. Introduction

There are a number of empirical economic studies which attempt to disclose the role of consumer sentiment in governing agents' economic behavior. This holds for a vast variety of economic phenomena. For example, Carroll et al. (1994) and Ludvigson (2004) corroborate the importance of consumer confidence in governing household expenditures for the US economy. Matsusaka and Sbordone (1995) find evidence of Granger causality between consumer confidence and the US Gross National Product (GNP). Batchelor and Dua (1998) extend the concept even further by finding that supplementing standard (regression-based) US GNP forecasts by consumer sentiment data yields a significantly more accurate prediction. However, their finding is true for the 1991 recession, but is not valid for the surrounding years of stable economic activity.

Apart from its influence on the real economy, consumer sentiment apparently also plays a role in political voting patterns. Blood and Phillips (1995) find a complex causal chain between the news media, consumer sentiment and presidential popularity. Namely, they explain the US presidential election defeat of George H.W. Bush in 1992 by exceptionally low levels of consumer confidence due to "unfairly" harsh news reports about the state of the national economy.

This being established, it is evident that consumer behavior is governed not solely by economic fundamentals (such as income, unemployment, interest rates, etc.), but at least to some extent by psychological factors, such as consumer confidence. Although the CCI is conceptualized to assess households' consumption expenditures, it is also quite common to relate CCI to stock market returns. For example, Fisher and Statman (2003), Jansen and Nahuis (2003), and Lemmon and Portniaguina (2006) all find a significant relationship between consumer confidence and asset prices.

This paper aims to shed some light on the influence of consumer confidence on stock market prices, but from a different angle. The analysis is focused on consumer data gathered from Business and Consumer Surveys (BCS) for 11 New EU Member States (NMS). The CCI index comprises four BCS questions. Two of them concern the state of consumers' personal finances (overall financial position of the household – Q2, and the respondents' ability to save – Q11), while the other two examine the overall economic conditions in the country (general economic situation – Q4, and the unemployment level – Q7). European Commission (2016) has harmonized the CCI quantification methodology, giving each of the four analyzed questions an equal weight and calculating it as a simple arithmetic mean. We make an effort to improve the CCI's stock market leading characteristics by alternating the weights of the analyzed response balances using regression-based forecasting equations for various lead lengths (up to 12 months). The optimal weights of the CCI's components are estimated for each of the 11 examined NMS economies,

using quadratic nonlinear programming to minimize the mean squared forecast errors. A similar strategy is then adopted to check the robustness of the initial obtained results by maximizing the correlation coefficient between stock market returns and CCI components (lagged by up to 12 months). The purpose of these empirical exercises is not to propose an alternative CCI weighting scheme, because the CCI itself is not intended to forecast stock market returns. On the contrary, the purpose of this paper is to scrutinize which of the two sets of questions in the CCI (personal finances vs. the overall economic situation) better explain the aggregate stock market returns. These conclusions offer added value to the existing knowledge on the relationship between the CCI and the stock market, as well as deepen our understanding of the structure of the linkage. The contribution of this paper with respect to the existing research is manifold. First, previous studies mostly concentrate on the relationship between the aggregate CCI indicator and asset prices (or returns), and mostly confirm a strong relationship between them. This paper builds upon the study of Jansen and Nahuis (2003), who were the first to econometrically evaluate the nature of the examined relationship and question whether consumer confidence represents a separate transmission channel, or whether its influence on stock market prices is simply a part of the wealth effect mechanism. In other words, Jansen and Nahuis (2003) disaggregate the CCI to its four components, and then analyse the degree of co-movement between individual CCI components and stock market returns. They state that a hypothetically strong relationship between the stock market and consumers' answers to questions 4 and 7 would imply that consumer confidence reflects nothing else but the mere wealth effect. It is reasonable to assume that rising disposable income stimulates consumers to invest some of their increasing wealth in the stock market. On the other side of the spectrum, a strong co-movement between the stock market and answers to questions 2 and 11 would suggest the existence of a separate confidence transmission channel. Apart from the Jansen and Nahuis (2003) paper, the literature is quite silent on this issue. This paper aims to fill that gap.

Moreover, there are no studies of this sort for the post-transition economies. This paper also bridges that gap by basing its analysis on 11 EU NMS countries, constituting the second contribution of this study. This kind of multi-country framework may reveal some interesting patterns in the similarities/differences between the analysed economies.

The third contribution of this paper lies in the innovative methodological framework. To the best of the authors' knowledge, this is the first effort to empirically assess the importance of each particular CCI question for stock market movements using mathematical programming. Finally, psychological sentiment tends to grow in significance in times of economic hardship and harsh social conditions (e.g. Garner (1991). This paper aims to examine which of the two groups of CCI questions (personal finances vs. the overall economic situation) dominates in the pre-crisis, and which is more important in the crisis period. The study provides

an answer to the question of whether the recent global crisis significantly modified the weights that consumers subjectively attach to different aspects of consumer confidence.

The paper is organized as follows. Section 2 briefly introduces some of the most influential studies of the CCI/stock market relationship. Section 3 deals with the applied methodological framework, while Section 4 presents the obtained empirical results. The final section suggests some plausible interpretations of the obtained results and offers recommendations for future research of this type.

2. Literature Review

The literature on the role of consumer sentiment in governing stock market trends is quite voluminous. The first question which should be examined is the validity of consumer confidence as an indicator of investor sentiment (optimism). Fisher and Statman (2002) find a strong positive correlation between two US consumer confidence indicators (University of Michigan Survey and the Conference Board Survey) and an indicator of investor optimism specifically designed for the US market (published by The American Association of Individual Investors).[1] Since a comparable investor optimism indicator does not exist in the EU countries analysed here, consumer confidence is examined as a barometer of investor sentiment. Additionally, many empirical studies have shown that the movements of consumer confidence and asset prices go hand in hand. The causality issue, however, has not been completely resolved and has not led the researchers to definite and unambiguous conclusions. Fisher and Statman (2002) find that consumer confidence is a reliable predictor of NASDAQ and small-cap US stock returns. However, it does not bring any added value in the predictions of S&P 500 returns. Lemmon and Portniaguina (2006) find that US consumer confidence has been able to predict stock market returns only after a structural break in 1977 (due to a change in survey frequency form bimonthly to monthly). The authors explain this growth in significance by the rising participation of households in stock markets. Since the same pattern is observed in EU NMS (with a considerable time delay in comparison to the US), it would be interesting to observe to what extent the stock market behaviour can be explained using consumer sentiment data. This type of relationship entails an analysis of consumer confidence as a leading indicator of stock market activity, explaining real economic trends using the well-known "animal spirits" paradigm.

[1] The stated investor optimism indicator is also survey-based and it quantifies the extent to which investors are optimistic about future tendencies on the stock market.

Some authors, on the other hand, find that the rising stock prices persuade the investors to believe that the overall economic climate is on the rise, ultimately leading them to invest more of their disposable income. This kind of relationship is found, for example, by Otoo (1999) and Jansen and Nahuis (2003).

To the best of our knowledge, Hsu et al. (2011) have carried out the most extensive study of the relationship between consumer confidence and stock market results. They applied a panel version of the Granger causality test on stock market and consumer confidence data from as many as 21 developed economies. Bringing additional confusion to the previously obtained results, they found strong evidence of bi-directional causality between the two observed variables.

Despite the large number of studies on the relationship between consumer confidence and stock market prices, the literature has been rather silent on one particular aspect of this riddle. The nature of the observed relationship remains rather unclear. Is there a separate transmission channel through which the consumer sentiment affects the stock market (and/or vice versa), or is their relationship only a small piece of the wealth effect puzzle? With respect consumer confidence strictly as a leading indicator of stock market prices, it is still quite unclear which underlying mechanisms determine the consumers' decision to invest a fraction of their disposable income on the stock market, or prevent them from doing so. Which of the four CCI questions are crucial for consumers' investment decisions? Bearing that question in mind, Jansen and Nahuis (2003) provided a pioneer attempt to discern the effect of each particular survey question, and in that way reveal the nature of the relationship between the stock market and the CCI. Relying on data from 11 developed EU countries, they found that the economy-wide expectations (questions about the general economic situation and the unemployment level) are strongly correlated with stock market developments. On the other hand, the two questions about their personal financial situation are hardly significant. Granger causality results point to the conclusion that there is no causality running from the CCI questions to the stock market. The opposite relationship holds, but again only for the questions regarding the general economic conditions. Jansen and Nahuis (2003) interpret their obtained results by concluding that consumer sentiment is obviously not merely a part of the wealth effect (which would explain the link between the CCI and the stock market through the changes in the disposable income of the household). On the contrary, the domination of economy-wide questions points to the existence of a distinct CCI transmission channel.[2]

This paper builds upon this premise. We apply a rather innovative methodological framework and attempt to reveal whether consumer confidence represents a distinct transmission channel to stock market results, or whether consumers sim-

[2] Van Raaij and Gianotten (1990) did a somewhat similar study, but it was aimed at explaining the behavior of Dutch consumers in terms of household expenditures, savings and credit. Using structural equations modelled on BCS data, they found that the household financial situation is a much more valuable predictor of the three stated aggregates than the overall economic situation.

ply adapt their survey answers to changes in their economic status (i.e. the wealth effect). Since literally all studies cited in this section refer strictly to highly developed economies, it will be interesting to examine whether CCI (or its individual components) possess some predictive characteristics with regards to stock market returns in the NMS as well.

3. Data Issues and Methodological Foundations

The observed dataset comprises 11 EU NMS economies: Bulgaria (BG), Croatia (HR), Czech Republic (CZ), Estonia (EE), Hungary (HU), Latvia (LV), Lithuania (LT), Poland (PL), Romania (RO), Slovakia (SK), and Slovenia (SI). For each of the stated countries, its representative stock market index is also analyzed: SOFIX (BG), CROBEX (HR), PX (CZ), OMX Tallinn_GI index (EE), Budapest SE index (HU), OMX Riga_GI index (LV), OMX Vilnius_GI index (LT), Warsaw SE WIG–20 Single Market Index (PL), Bucharest SE BET Index (RO), SAX Index (SK), and the SBI TOP Index (SI). The date concerning Business Consumer Surveys (BCS) is gathered from the European Commission (EC), while the stock market indices are gathered from the Thomson Reuters database. The dependent variable in this study is the monthly stock market return, expressed as the log-difference of the average monthly stock market index. All the examined variables are in monthly frequencies, spanning (at most) from January 2000 to December 2015. Detailed time spans and basic descriptive statistics for each analysed variable are available upon request. In accordance with the customary European BCS practice (European Commission, 2016); all variables are seasonally adjusted using the Dainties method.

BCS are qualitative surveys conducted with the main goal of obtaining recent economic attitudes of managers and consumers in order to draw meaningful conclusions about the population as a whole (European Commission, 1997). Information provided by BCS are expressed as managers' and consumers' judgments, assessments, estimates, and expectations about the business activity, business situation, employment/unemployment, order books, stocks of finish products, selling prices, financial situation, general economic situation, consumer prices, savings etc.

The first BCS in Europe was conducted in 1949 in Germany (IFO), then 1951 in France (INSEE) and in Italy (ISCO). With the aim of adopting and coordinating the new survey method, the Joint Harmonized EU Programme of Business and Consumer Surveys was launched by the EC decision of 15 November 1961. BCS are nowadays carried out in as many as seven distinct sectors: the manufacturing industry, construction, investment, retail trade, consumers sector, retail trade, and the services sector. Since 2007, the EC conducts harmonized surveys in the finan-

cial sector as well. In March 2016, the Programme includes 28 EU member states and five candidate countries.

Consumer surveys are conducted on a monthly basis, usually by a quota sample. The questionnaire has 12 questions, with three additional questions being asked on a quarterly basis. Survey answers are aggregated in the form of a "balance", defined as the difference between percentages of positive and negative answers to the corresponding question. The main goal of consumer surveys is to collect information on households' spending and savings intentions and to assess their perceptions of the factors influencing these decisions. Therefore, the questions are grouped in four sets: the households' financial situation; the general economic situation; savings; and intentions with regard to major purchases (European Commission 2016, p. 5).

The Consumer Confidence Indicator provides aggregate information on the prevailing consumer sentiment. Its aim is to summarize consumers´ subjective assessments of the economic and social trends in a country. The CCI is a composite indicator calculated as a simple average of seasonally adjusted balances of the following survey questions.

Q2 *How do you expect the financial position of your household to change over the next 12 months? It will:*

a) get a lot better, b) get a little better, c) stay the same, d) get a little worse, e) get a lot worse, f) don't know.

Q4 *How do you expect the general economic situation in this country to develop over the next 12 months? It will:*

a) get a lot better, b) get a little better, c) stay the same, d) get a little worse, e) get a lot worse, f) don't know

Q7 *How do you expect the number of people unemployed in this country to change over the next 12 months? The number will:*

a) increase sharply, b) increase slightly, c) remain the same, d) fall slightly, e) fall sharply, f) don't know

Q11 *Over the next 12 months, how likely is it that you save any money?*

a) very likely, b) fairly likely, c) not likely, d) not at all likely, e) don't know.

The explicit formula for calculating CCI is:

$$CCI = \frac{B_{FS} + B_{GES} + \left(-B_{UE}\right) + B_S}{4}, \tag{1}$$

where B_{FS} is the seasonally adjusted balance of the financial situation of households (Q2); B_{GES} is the seasonally adjusted balance of the general economic situation (Q4); B_{UE} is the seasonally adjusted balance of unemployment expectations (Q7); and B_S is the seasonally adjusted balance of expected savings (Q11).

The link between stock market and consumer confidence can be observed from various viewpoints. Most studies have dealt with the causality issues and have concluded that there is a significant relationship. This research takes a deeper perspective and inspects the structure of the bond. Two types of reasons influence consumers' willingness to invest and participate on stock market: personal circumstances, and the overall macroeconomic conditions.

The sentiment indicator CCI can also be disaggregated into these two groups of questions: questions that describe micro status expectations (Q2 and Q11), and questions about the macroeconomic conditions (Q4 and Q7). An in-depth analysis that looks at individual CCI components (instead of focusing on aggregate CCI) could help in answering the question of which expectations are more important for stock market movements. The second relevant issue is whether the prevailing effect changes with the onset of the Great Recession or remains the same. In order to provide some answers, we consider a simple linear regression framework with the stock market return as the dependent variable, and the CCI components as independent variables. CCI is, by definition, a simple arithmetic mean of the following variables: B_{FS}, B_{GES}, B_{UE}, and B_S. Therefore, the weighted mean $w_1 B_{FS} + w_2 B_{GFS} + w_3\left(-B_{UE}\right) + w_4 B_S$ is modeled as the independent variable. If the proposed optimization technique results with the solution $w' = \left(0.25 \quad 0.25 \quad 0.25 \quad 0.25\right)'$, then the official CCI is the optimal predictor among all possible weighted means, and micro conditions are equally important as macro ones.

Apart from examining the relationship in coincidental time points (CCI as a coincident indicator), it is also important to look at the link from a leading indicator perspective (Zagórski and McDonnell 1995). Therefore, the examined lead times of h months are $h \in \{0, 1, \ldots, 12\}$. This approach adds to the model's complexity and increases the understanding of the microeconomic and macroeconomic effects on stock market dynamics.

In order to answer all the proposed questions, the following linear regression model is analysed:

$$y_{t+h} = \alpha + \beta \cdot \left(w_1 B_{FS,t} + w_2 B_{GFS,t} + w_3\left(-B_{UE,t}\right) + w_4 B_{S,t}\right) + e_t \qquad t = 1, \ldots, T-h, \tag{2}$$

where y_t is stock market return, α and β are parameters, $w_1, ..., w_4$ are weights, and $e_t \sim \text{iid} N(0, \sigma^2)$. The optimal weights are than chosen by minimizing the mean square error (of the model in (2)):

$$MSE\left(w_1, \ldots, w_4\right) = \frac{1}{n-k-1} \sum_{t=1}^{T} \left(y_t - \alpha - \beta \cdot CCI_t\left(w_1, \ldots, w_4\right)\right)^2, \tag{3}$$

with the usual constraints on weights:

$$w_1 + \ldots + w_4 = 1,\ 0 \le w_1, \ldots, w_4 \le 1. \tag{4}$$

The model in (3) and (4) is an optimization problem with constraints and can be solved using a quadratic programming approach.[3] The results are calculated using Goldfarb and Idnani's algorithm (1982, 1983) implemented in R package *quadprog* (Turlach and Weingessel 2015).

An alternative approach is to get the optimal weights by maximizing the correlation function between novel CCI and stock return:

$$Corr\left(y, CCI(w)\right) = \frac{\sum_{t=1}^{T-h}\left(y_{t+h} - \bar{y}\right)\left(CCI(w)_t - \overline{CCI}(w)\right)}{\sqrt{\sum_{t=1}^{T-h}\left(y_{t+h} - \bar{y}\right)^2} \cdot \sqrt{\sum_{t=1}^{T-h}\left(CCI(w)_t - \overline{CCI}(w)\right)^2}}, \tag{5}$$

with the constrains as in (4). This optimization problem cannot be further simplified, so the nonlinear optimization is employed in R package *nloptr* (Ypma et al. 2014). The initial values are then chosen as the optimal solution from the regression approach in equation (2).

4. Empirical Results

The initial step of the empirical analysis is to run the optimization procedure given in (3). The obtained results are given in Table 1.

Although the estimation is done for forecasting horizons $h \in \{0, 1, \ldots, 12\}$, only the results for quarterly horizons are shown, in order to save space. The issue of greatest interest here is to reveal which questions dominate in the proposed "optimal" weighting scheme. The answer is not so straightforward. To begin with, it is quite clear that the consumers do not attach much importance to the financial situation of the household (with the exception of Slovenia). Although this finding can seem quite surprising at first glance, it can easily be traced back to Jansen and Nahuis (2003). Using Granger causality tests, their study proves that indeed the economy-wide components of CCI closely determine the stock market behaviour. Therefore, this study provides some additional evidence in favour of their hypothesis. Consumer confidence indeed seems to represent a distinct transmission channel, apart from the already recognized wealth effect.

When it comes to the other three CCI variables, a certain degree of variety can be observed in Table 1. Questions 4 and 7 dominate in some countries (CZ,

[3] If parameters in brackets are substituted by $z_i = \beta w_i$, then the conditions in (4) change to $sgn(z_1) = \ldots = sgn(z_4)$. It now becomes clearer that *MSE* is a quadratic function.

HR, EE, LV and RO), while in some countries the savings variable (Q11) prevails (BG, HU, LT, PL and SK). One might be surprised by this observed heterogeneity of the analysed countries. However, it has already been found in the literature that the stock markets of EU NMS are rather weakly integrated into the common European market (Horvath and Petrovski 2013), so the results obtained here are reasonable.

Table 1. Optimal weights obtained by MSE minimization

Country	Questions	*h*=0	*h*=3	*h*=6	*h*=9	*h*=12
BG	Q2 – finan. situation of hous.	0.952	0.000	0.000	0.000	0.000
	Q4 – general economic situation	0.048	0.000	0.000	0.000	0.000
	Q7 – unempl. expectations	0.000	0.164	0.133	0.195	0.194
	Q11 – savings	0.000	0.836	0.867	0.805	0.806
	RMSE(EC)/RMSE	102.0	102.1	103.9	106.4	102.8
CZ	Q2 – finan. situation of hous.	0.221	0.000	0.000	0.000	0.000
	Q4 – general economic situation	0.000	0.000	0.000	0.000	0.000
	Q7 – unempl. expectations	0.000	1.000	1.000	1.000	1.000
	Q11 – savings	0.779	0.000	0.000	0.000	0.000
	RMSE(EC)/RMSE	100.6	101.7	102.4	102.8	101.6
EE	Q2 – finan. situation of hous.	0.000	0.000	0.000	0.000	0.000
	Q4 – general economic situation	1.000	1.000	0.000	0.000	0.000
	Q7 – unempl. expectations	0.000	0.000	0.709	1.000	1.000
	Q11 – savings	0.000	0.000	0.291	0.000	0.000
	RMSE(EC)/RMSE	101.5	100.6	100.3	101.0	101.4
HR	Q2 – finan. situation of hous.	0.000	0.767	0.000	0.000	0.000
	Q4 – general economic situation	1.000	0.000	0.000	0.000	0.000
	Q7 – unempl. expectations	0.000	0.000	1.000	1.000	0.000
	Q11 – savings	0.000	0.233	0.000	0.000	1.000
	RMSE(EC)/RMSE	100.9	100.5	100.9	100.6	101.2
LV	Q2 – finan. situation of hous.	0.000	0.000	0.000	0.000	0.000
	Q4 – general economic situation	1.000	1.000	0.000	0.000	0.000
	Q7 – unempl. expectations	0.000	0.000	0.448	1.000	1.000
	Q11 – savings	0.000	0.000	0.552	0.000	0.000
	RMSE(EC)/RMSE	100.5	100.3	100.7	101.7	103.5
LT	Q2 – finan. situation of hous.	0.000	0.000	0.000	0.000	0.000
	Q4 – general economic situation	1.000	1.000	0.000	0.000	0.000
	Q7 – unempl. expectations	0.000	0.000	0.329	0.191	0.070
	Q11 – savings	0.000	0.000	0.671	0.809	0.930
	RMSE(EC)/RMSE	101.9	100.9	101.3	101.7	102.1
HU	Q2 – finan. situation of hous.	0.000	0.000	0.000	0.000	0.213
	Q4 – general economic situation	0.000	0.000	0.000	0.000	0.000
	Q7 – unempl. expectations	0.000	1.000	0.000	0.000	0.000
	Q11 – savings	1.000	0.000	1.000	1.000	0.787
	RMSE(EC)/RMSE	100.3	100.3	100.6	100.5	100.5

Country	Questions	h=0	h=3	h=6	h=9	h=12
PL	Q2 – finan. situation of hous.	0.000	0.000	0.000	0.000	0.000
	Q4 – general economic situation	0.217	0.000	0.058	0.000	0.000
	Q7 – unempl. expectations	0.000	0.318	0.219	0.097	0.188
	Q11 – savings	0.783	0.682	0.724	0.903	0.812
	RMSE(EC)/RMSE	100.7	100.6	101.1	102.8	101.3
RO	Q2 – finan. situation of hous.	0.000	0.000	0.000	0.000	0.000
	Q4 – general economic situation	0.000	0.000	0.000	0.000	1.000
	Q7 – unempl. expectations	1.000	1.000	1.000	1.000	0.000
	Q11 – savings	0.000	0.000	0.000	0.000	0.000
	RMSE(EC)/RMSE	100.9	102.5	101.3	100.6	100.2
SI	Q2 – finan. situation of hous.	1.000	1.000	0.000	0.000	0.000
	Q4 – general economic situation	0.000	0.000	0.216	0.000	0.200
	Q7 – unempl. expectations	0.000	0.000	0.784	1.000	0.140
	Q11 – savings	0.000	0.000	0.000	0.000	0.660
	RMSE(EC)/RMSE	100.8	100.6	100.8	101.2	100.6
SK	Q2 – finan. situation of hous.	0.000	0.000	0.000	0.000	0.314
	Q4 – general economic situation	0.000	0.000	0.000	0.000	0.000
	Q7 – unempl. expectations	0.000	0.000	0.000	0.000	0.014
	Q11 – savings	1.000	1.000	1.000	1.000	0.672
	RMSE(EC)/RMSE	101.9	101.6	101.1	102.4	101.1

Note: RMSE ratios above 100 correspond to an improvement in forecasting accuracy of the hereby "optimized" CCI in comparison to the official CCI indicator of the EC.

Source: authors' calculation.

In order to provide a robustness check for the obtained results, a Pearson correlation maximization problem (equation 5) is also taken into consideration. The obtained "optimal" weights are presented in Appendix 1, leaving the main conclusions intact.

An additional question is raised here. In what way do are the countries grouped with regards to "optimal" weights attached to individual questions? Cluster analysis is performed on the estimated "optimal" weights of four CCI components in order to extract homogeneous groups of economies. Cases for the four examined balance responses are obtained as average weights over the analysed 13 forecasting horizons $h \in \{0,1,\ldots,12\}$. Using hierarchical clustering (Ward's method with Euclidian distances), two separate clusters can be observed. The first one includes BG, PL, HU, SK and LT, while the other comprises CZ, RO, EE, LV, HR and SI.

It is evident that the microeconomic aspects of consumer confidence (the ability to save in particular) heavily dominate the first cluster. The second cluster, on the other hand, exhibits much higher weights for questions Q4 and Q7. It is mainly influenced by the macroeconomic aspects of consumer confidence (the overall economic climate in the country). In order to find a plausible demarcation point between these two clusters, the authors examined four standard macroeconomic equivalents of the chosen survey variables and might heavily influence agents' responses to con-

sumer survey questions: the unemployment rate (ILO definition), aggregate GDP (millions of euros), GDP per capita (in euros), and households' savings per capita (millions of euros). All four variables are obtained from Eurostat, and are examined for the whole period of analysis (2000–2015). We found that the average GDP per capita and unemployment rate figures are to some extent diverse. The obtained ratio of average GDP per capita for the first and second cluster is 0.78, while the same ratio for the average unemployment rate is 1.24. This means that consumers in the micro-oriented cluster are facing somewhat higher job uncertainty and lower per capita income. What strikes one the most is the obtained ratio of average aggregate GDP figures. The micro-oriented cluster overpowers the macro-based one by as much as 1.92 times.[4] Economic agents in the second cluster of countries obviously perceive a relatively poor national economic performance as the greatest obstacle to investing in the stock market. Therefore it comes as no surprise that the second cluster also exhibits extremely high weights for the survey question on the ability to save. This leads to the final large difference between the two clusters of countries. The macro cluster has, on average, 3.9 times larger amounts of households' savings deposits per capita than the micro group of economies. The strong link between consumer confidence and savings are already recognized by some studies (e.g. Kłopocka 2016), so this finding is hardly a surprise.

One can also easily verify the in-sample forecasting performance of the newly proposed CCI. Although the obtained RMSE ratios are above 100, the contribution of the hereby proposed optimization is mostly marginal and well below the 5% level. The highest improvement is recorded in the case of BG for $h = 9$ (106.4). Based on these results, it seems that alternating the CCI weighting scheme does not bring about a substantial increase in its forecasting accuracy vis-à-vis stock market returns. Since the CCI is not conceptualized to forecast stock market returns, this hardly comes as a surprise.

However, it is important to examine whether these results change in the case of out-of-sample forecasts. For each of the observed economies, the cut-off point has been determined to the last 18, 24 and 36 monthly observations. Pseudo out-of-sample forecasting is applied on the remaining observations up to that point in time. Despite some improvements for individual countries at particular forecast horizons, alternating the weighting scheme did not provide any added value to CCI's forecasting accuracy.[5] Previous proofs of the CCI's time precedence (causality) with regards to stock market returns (as partly found by Fisher and Statman 2002 and Lemmon and Portniaguina 2006) are also confirmed here by examining its forecasting accuracy. The officially published the CCI has considerable forecasting accuracy, and even alternating the applied weights found by numerical optimization procedures cannot further accentuate its forecasting character-

[4] This finding can also be traced to Pretorius (2002), who found that the level of stock market integration in emerging countries is heavily influenced by economic activity differentials.

[5] The results are available from the authors upon request.

istics. Although the CCI is conceptualized as a leading indicator of households' consumption expenditures (European Commission, 2016), it seems that it can help in predicting the overall (average) monthly stock market returns.

The last unresolved issue in this study concerns the possible shift of "optimal" CCI weights due to the recent crisis. The cut-off point for the pre-crisis and crisis period is established as September 2008 (determined by the bankruptcy of Lehman Brothers, which forced a powerful cause-and-effect chain in the world economy and ultimately led to a global crisis). Table 2 summarizes the average weights (for forecast horizons $h \in \{0, 1, \ldots, 12\}$) obtained by equation (2). The weights are summed up separately for the "micro" level (Q2 and Q11) and for the "macro" level (Q4 and Q7).

Table 2. Comparison of pre-crisis and crisis MSE minimization results

Country		Average sum of weights	
		pre-crisis	Crisis
BG	Micro	0.626	0.290
	Macro	0.374	0.710
CZ	Micro	0.289	0.084
	Macro	0.711	0.916
EE	Micro	0.340	0.390
	Macro	0.660	0.610
HR	Micro	–	0.276
	Macro	–	0.724
LV	Micro	0.654	0.270
	Macro	0.346	0.730
LT	Micro	0.606	0.073
	Macro	0.394	0.927
HU	Micro	0.992	0.154
	Macro	0.008	0.846
PL	Micro	0.849	0.587
	Macro	0.151	0.413
RO	Micro	0.414	0.656
	Macro	0.586	0.344
SI	Micro	–	0.702
	Macro	–	0.298
SK	Micro	0.869	0.850
	Macro	0.131	0.150

Note: HR and SI do not have enough data to estimate model (2) in the pre-crisis period.

Source: authors' calculation.

It seems that the "on average" results presented in Table 1 do not capture the examined dynamics quite well. Namely, the pre-crisis sums of weights speak in favour of the prevailing "micro" effect. In other words, the wealth effect is a dominant determinant of the consumer confidence-stock market interrelationship when the economy is on the rise. In such circumstances, economic agents are primarily concerned

with their own financial status. Additional income inflows are (to a certain extent) transferred to savings (see Figure 2) or investments such as the stock market.

On the other hand, when facing a financial turmoil, consumers shift the CCI weights to the overall economic climate in their country. The "macro" aspect starts to play a much more accentuated role and a distinct CCI (psychological) transmission channel comes into play. This is completely in line with previous theoretical essays (Kindleberger and Aliber 2011) and empirical studies (Garner 1991), which found that psychological sentiment tends to grow in significance in times of economic hardship. Although there are minor exceptions (EE and RO), the overall evidence is quite convincing. It is most pronounced (even striking) in cases of BG, LT and HU.

5. Conclusions

This study analyses the leading indicator properties of the CCI with respect to stock market returns in 11 EU NMS countries. The authors use quadratic and nonlinear programming to propose alternations of the CCI weighting scheme. In doing so, several important conclusions arise.

Although the official CCI index of the EC is not conceptualized as a leading indicator of stock market returns, a large number of authors use it in that context, and some of them have found considerable evidence of causality running in that direction. This paper finds that alternating the CCI weighting scheme does not contribute to increasing its predictive potential regarding stock market returns. The evidence is quite convincing both for the in-sample and out-of-sample forecasting exercises, for the vast majority of analyzed countries, and for most forecasting horizons. Considering the potential operational and financial costs of changing the official CCI weights, the decision to leave them intact seems fully justified.

Regarding the obtained "optimal" CCI weights, the examined 11 countries group into two separate clusters. The first places higher weights on the microeconomic aspects of consumer confidence (primarily on households' ability to save), while the second cluster of countries cares more about the general economic situation in the country and unemployment expectations (accentuating macroeconomic features). We explain this finding by observing that the average aggregate GDP of the micro-oriented cluster is almost twice higher than the same variable in the macro cluster. The way people perceive the overall (bad) performance and (in)efficiency of national economies in the second cluster obviously heavily influences their decision to invest or not to invest in the stock market.

The final issue dealt with in this paper is whether consumer confidence represents a separate transmission channel to the stock market, or whether it is mere-

ly a reflection of the wealth effect. The obtained estimates speak in favour of the wealth effect in the period prior to the Great Recession of 2008. However, a remarkable shift occurred after 2008. The consumers altered their "optimal" weights from microeconomic survey questions to the macro-oriented ones. When faced with the recession turmoil, agents' financial situation reflected their investment decisions only marginally. Their assessments of the overall economic climate, on the other hand, grew in significance, establishing a distinct transmission channel to the stock market.

Acknowledgment: This work has been fully supported by the Croatian Science Foundation under the project No. 3858.

References

Batchelor R, Dua, P. (1998), *Improving macro-economic forecasts: The role of consumer confidence*, 'International Journal of Forecasting', Elsevier, Amsterdam, Vol. 14.

Carroll C.D., Fuhrer J.C., Wilcox D.W. (1994), *Does Consumer Sentiment Forecast Household Spending? If So, Why?,* 'American Economic Review', American Economic Association, New York, Vol. 84.

European Commission (1997), *The Joint Harmonised EU Programme of Business and Consumer Surveys: Reports and studies*, 'European Economy', Directorate-General for Economic and financial affairs, Brussels, No. 6.

European Commission (2016), *The Joint Harmonised EU Programme of Business and Consumer Surveys: User Guide*, 'European Economy', Directorate-General for Economic and financial affairs, Brussels.

Fisher K.L., Statman M. (2002), *Consumer Confidence and Stock Returns*, 'Journal of Portfolio Management', Institutional Investor LLC, New York, Vol. 30.

Garner A.C. (1991), *Forecasting consumer spending: should economists pay attention to consumer confidence surveys?*, 'Federal Reserve Bank of Kansas City Economic Review', Federal Reserve Bank of Kansas City, Kansas City, No. May/June.

Goldfarb D., Idnani, A. (1982), *Dual and Primal-Dual Methods for Solving Strictly Convex Quadratic Programs* [in:] Hennart, J.P. (eds), *Numerical Analysis*, Springer-Verlag, Berlin.

Goldfarb D. and Idnani A. (1983), *A numerically stable dual method for solving strictly convex quadratic programs*, 'Mathematical Programming', Springer, Berlin, Vol. 27.

Horvath R., Petrovski, D. (2013), *International stock market integration: Central and South Eastern Europe compared*, 'Economic Systems', Elsevier, Amsterdam, Vol. 37.

Hsu C.C., Lin H.Y., Wu J.Y. (2011), *Consumer Confidence and Stock Markets: The Panel Causality Evidence,* 'International Journal of Economics and Finance', Canadian Center of Science and Education, Toronto, Vol. 3.

Jansen W.J., Nahuis N.J. (2003), *The stock market and consumer confidence: European evidence*, 'Economics Letters', Elsevier, Amsterdam, Vol. 79.

Kindleberger C.P., Aliber R.Z. (2011), *Manias, Panics and Crashes: A history of financial crises*, Palgrave Macmillan, UK.

Kłopocka A.M. (2016), *Does Consumer Confidence Forecast Household Saving and Borrowing Behavior? Evidence from Poland*, 'Social Indicators Research', Springer, Berlin, Vol. 132(392)

Lemmon M., Portniaguina E. (2006), *Consumer Confidence and Asset Prices: Some Empirical Evidence*, 'The Review of Financial Studies', Society for Financial Studies, Raleigh, Vol. 19.

Ludvigson, S.C. (2004), *Consumer Confidence and Consumer Spending*, 'Journal of Economic Perspectives', American Economic Association, New York, Vol. 18.

Matsusaka J.G., Sbordone A.M. (1995), *Consumer confidence and economic fluctuations*, 'Economic Inquiry', John Wiley & Sons, Ltd., London, Vol. 33.

Otoo M.W. (1999), *Consumer Sentiment and the Stock Market*, 'Federal Reserve System working paper', https://www.federalreserve.gov/pubs/FEDS/1999/199960/199960pap.pdf (24.6.2016).

Pretorius E. (2002), *Economic determinants of emerging stock market interdependence*, 'Emerging Markets Review', Elsevier, Amsterdam, Vol. 3.

Turlach B.A., Weingessel, A. (2015), *Quadprog: Functions to solve Quadratic Programming Problems*, R package version 1.5–5, https://cran.r-project.org/web/packages/quadprog/quadprog. pdf (20.09.2016).

Van Raaij, W.F., Gianotten H.J. (1990), *Consumer confidence, expenditure, saving, and credit*, 'Journal of Economic Psychology', Elsevier, Amsterdam, Vol. 11.

Ypma J., Borchers H.W., Eddelbuettel D., Ypma M.J. (2014), *Package 'nloptr': R interface to NLop.* R package version 1.0.4., https://cran.r-project.org/web/packages/nloptr/nloptr.pdf (20.09.2016).

Zagórski K., McDonnell J.S. (1995), *Consumer Confidence Indexes as Social Indicators*, 'Social Indicators Research', Springer, Berlin, Vol. 36.

Appendix 1. Optimal weights obtained by Pearson correlation coefficient maximization

Country	Questions	h=0	h=3	h=6	h=9	h=12
BG	Q2 – finan. situation of hous.	0.952	0.566	0.576	0.928	0.506
	Q4 – general economic situation	0.048	0.434	0.424	0.072	0.494
	Q7 – unempl. expectations	0.000	0.000	0.000	0.000	0.000
	Q11 – savings	0.000	0.000	0.000	0.000	0.000
	RMSE(EC)/RMSE	102.0	101.7	101.1	99.7	100.5
CZ	Q2 – finan. situation of hous.	0.221	0.050	0.056	1.000	0.630
	Q4 – general economic situation	0.000	0.950	0.944	0.000	0.370
	Q7 – unempl. expectations	0.000	0.000	0.000	0.000	0.000
	Q11 – savings	0.779	0.000	0.000	0.000	0.000
	RMSE(EC)/RMSE	100.6	100.1	99.5	100.0	99.8
EE	Q2 – finan. situation of hous.	0.000	0.000	0.000	0.042	0.040
	Q4 – general economic situation	1.000	1.000	1.000	0.608	0.960
	Q7 – unempl. expectations	0.000	0.000	0.000	0.339	0.000
	Q11 – savings	0.000	0.000	0.000	0.011	0.000
	RMSE(EC)/RMSE	101.5	100.6	99.6	99.8	98.7

Country	Questions	*h*=0	*h*=3	*h*=6	*h*=9	*h*=12
HR	Q2 – finan. situation of hous.	0.000	0.767	0.000	0.000	0.648
	Q4 – general economic situation	1.000	0.000	0.767	1.000	0.241
	Q7 – unempl. expectations	0.000	0.000	0.000	0.000	0.111
	Q11 – savings	0.000	0.233	0.233	0.000	0.000
	RMSE(EC)/RMSE	100.9	100.5	99.7	99.7	99.8
LV	Q2 – finan. situation of hous.	0.000	0.000	0.000	0.000	0.000
	Q4 – general economic situation	1.000	1.000	1.000	0.892	0.939
	Q7 – unempl. expectations	0.000	0.000	0.000	0.000	0.000
	Q11 – savings	0.000	0.000	0.000	0.108	0.061
	RMSE(EC)/RMSE	100.5	100.3	99.7	99.5	98.8
LT	Q2 – finan. situation of hous.	0.000	0.000	0.000	0.000	0.114
	Q4 – general economic situation	1.000	1.000	1.000	1.000	0.886
	Q7 – unempl. expectations	0.000	0.000	0.000	0.000	0.000
	Q11 – savings	0.000	0.000	0.000	0.000	0.000
	RMSE(EC)/RMSE	101.9	100.9	98.9	98.4	98.7
HU	Q2 – finan. situation of hous.	0.000	0.087	0.000	0.000	0.213
	Q4 – general economic situation	0.000	0.000	0.000	0.000	0.000
	Q7 – unempl. expectations	0.000	0.000	0.000	0.000	0.000
	Q11 – savings	1.000	0.913	1.000	1.000	0.787
	RMSE(EC)/RMSE	100.3	100.1	100.6	100.5	100.5
PL	Q2 – finan. situation of hous.	0.213	1.000	0.227	0.000	0.000
	Q4 – general economic situation	0.064	0.000	0.000	0.000	1.000
	Q7 – unempl. expectations	0.723	0.000	0.000	0.000	0.000
	Q11 – savings	0.000	0.000	0.773	1.000	0.000
	RMSE(EC)/RMSE	99.8	98.8	100.1	102.5	99.1
RO	Q2 – finan. situation of hous.	0.000	0.000	0.000	0.000	0.000
	Q4 – general economic situation	1.000	1.000	1.000	1.000	1.000
	Q7 – unempl. expectations	0.000	0.000	0.000	0.000	0.000
	Q11 – savings	0.000	0.000	0.000	0.000	0.000
	RMSE(EC)/RMSE	99.8	98.9	99.6	100.2	100.2
SI	Q2 – finan. situation of hous.	1.000	1.000	0.750	1.000	1.000
	Q4 – general economic situation	0.000	0.000	0.000	0.000	0.000
	Q7 – unempl. expectations	0.000	0.000	0.000	0.000	0.000
	Q11 – savings	0.000	0.000	0.250	0.000	0.000
	RMSE(EC)/RMSE	100.8	100.6	98.8	99.0	98.8
SK	Q2 – finan. situation of hous.	0.000	0.000	0.000	0.000	0.000
	Q4 – general economic situation	0.000	0.103	0.000	0.000	0.271
	Q7 – unempl. expectations	1.000	0.897	1.000	1.000	0.729
	Q11 – savings	0.000	0.000	0.000	0.000	0.000
	RMSE(EC)/RMSE	100.6	100.3	100.2	99.8	99.2

Data source: authors' calculation.

Streszczenie

FINANSE OSOBISTE A OGÓLNE WARUNKI GOSPODARCZE: CO NAPĘDZA RYNKI GIEŁDOWE NOWYCH PAŃSTW CZŁONKOWSKICH UE?

W artykule przedstawiono analizę głównych cech wskaźnika zaufania konsumentów (CCI) w odniesieniu do stóp zwrotu z rynku papierów wartościowych dla 11 nowych państw członkowskich UE. Zaproponowano nowe wagi dla wskaźnika CCI, minimalizując średnie błędy kwadratowe z równań regresji, używając opóźnień CCI jako regresorów. Biorąc pod uwagę otrzymane wagi „optymalne", badane kraje zostały zgrupowane w mikro- i makro-zorientowane klastry. Zaobserwowano dużą zmianę wag będącą efektem niedawnej recesji. Aspekty mikro (odzwierciedlające efekt bogactwa) poważnie tracą na znaczeniu w czasie kryzysu a nastroje makroekonomiczne konsumentów zyskują na znaczeniu i stają się osobnym kanałem transmisji.

***Słowa kluczowe**: zaufanie konsumentów, badania biznesowe i konsumenckie, giełda, optymalizacja liczbowa*