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Beyond macro variables: consumer confidence index and household expenditure in Hungary

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Abstract

One of the most important aspects of consumer surveys is the computation of the consumer confidence index, which aims to provide accurate figures on the financial position and outlook of households as well as their intention concerning future consumption and savings. . Although the motion of the consumer confidence index is of interest to both policymakers and economic forecasters, it is not obvious whether the sub-questions included in the surveys and the published composite index derived from such questions can measure exactly what survey makers are curious to know. In this study we examine the properties and forecasting capability of the Hungarian consumer confidence index published by GKI Economic Research Plc. We argue that some questions are unable to measure what they theoretically should. However, others are useful in forecasting the consumption expenditure of Hungarian households. Our results suggest that, in addition to macro variables, the consumer confidence index contains information over and above macro variables.

1. Introduction[+]

Research institutes publish business and consumer survey results on a monthly or quarterly basis, which decision-makers and forecasters take into account to a certain extent in formulating their respective opinions. This practice is, however, acceptable only if we are familiar with the qualitative and quantitative properties of such surveys.

This paper focuses on the applicability of consumer surveys. For a more detailed analysis of Hungarian business surveys, refer to Reiff at al. (2000) and Ferenczi – Reiff (2000). This paper seeks to find an answer to the question whether the consumer confidence index on its own is able to forecast future trends in consumption, and whether it has additional predictive powers over other variables. Our study is based on research by Carroll, Fuhrer and Wilcox (1994) and on Loundes and Scutella's (2000) findings derived from an Australian consumer survey so that comprehensive comparisons can be made. To acquire a better understanding of Hungarian household surveys, we examine the composite consumer confidence index published in Hungary, –and, like Bram and Ludvigson (1998) evaluate the individual questions in the survey. Thus, the aims of this paper are to explore the relationship between the consumer confidence index and other macro variables, and to offer a plausible explanation of the behavior of the confidence index. This paper provides the basis for a study by Jakab and Vadas (2001), who use the consumer confidence index, in addition to other variables, so as to create a suitable econometric framework for forecasting household consumption.

This paper is structured as follows. The first part outlines the method, sample and computation of the consumer confidence index, without aspiring to completeness (for a more detailed description, see Tóth (2000)). The second part describes the econometric methods employed to gauge the predictive power of confidence index. The final part sums up the results, offering some explanations of the findings.

2. Consumer confidence surveys in Hungary

Currently two institutions study consumer confidence: one is GKI Economic Research Plc. (GKI), the other is the Marketing Department of the University of Economics and Public Administration, Budapest (BKÁE).

BKÁE has been publishing its own consumer confidence index based on the methods developed by the University of Michigan since June 1996. The sample, consists of 500 people, is representative by age, education and settlement. The questionnaire contains 30 standardized questions. Owing to the low number of those surveyed and to short sample periods, we do not examine this series.

GKI has been surveying households on a monthly basis since February 1993, using a set of twelve EU-conform questions. Every three months, there are three additional questions asked.

The questionnaire of GKI consists of the following questions:

Q1 How does the financial situation of your household now compare with the way it was 12 months ago?
Q2 How do you think the financial position of your household will change over the next 12 months?
Q3 How do you think the general economic situation in this country has changed over the last 12 months?
Q4 How do you think the general economic situation in this country will develop over the next 12 months?
Q5 How do you think the cost of living has changed relative to 12 months ago?

[+] I am greatly indebted to Barnabás Ferenczi (MNB), István Hamecz (MNB), Mihály A. Kovács (MNB) and László Skultéty (GKI) for their invaluable comments. All remaining errors are the author's responsibility.

Q6 How do you think the cost of living will change over the next 12 months?
Q7 How do you think the level of unemployment in the country will change over the next 12 months?
Q8 Do you think that it makes good sense to make major purchases (e.g. furniture, washing machines, TV sets, etc) at the present time?
Q9 How do you think the amount of money you will spend on major purchases will change over the next 12 months?
Q10 Is this a good time to save?
Q11 How likely are you to be able to save any money over the next 12 months?
Q12 What is the present financial situation of your family like?
Q13 How likely are you to be able to afford a car within the next 2 years?
Q14 Are you planning to purchase or build a home within the next 2 years?
Q15 How likely are you to spend any large sums of money on home improvements over the next 12 months?

The published composite consumer confidence index is the average of five questions (the first, second, third, fourth and eighth). The sample includes 1,000 people[1] selected in a two-step random sorting procedure. (In step 1 settlements, and in step 2 participants are selected.) The sample is representative by sex and age. Households are requested to identify changes relative to past periods, and guess how their current situation will change in the future. In most cases, possible answers to the questions can be placed on a five-degree ordinal scale. Generally, answers are balanced and nearly equally "distanced". As both extremes are represented on the answer scale, there is no need to redefine it in order that it can reflect changes in the general economic environment. As a result, a comparable index is available at the long horizon. Indexes are within the [-100 100] interval, which reflects the changes in the perception of the environment relative to the preceding period. With respect to the foregoing, this analysis uses the level values of GKI confidence index.

3. Applied methodologies

To test the predictive power of the confidence index, we rely on the research conducted by Carroll *at al.* (1994), who tested the confidence index developed by the University of Michigan (Index of Consumer Sentiment, ICS) on different types of consumer expenditure in the USA. As the first step, we define what portion of the variance of consumption expenditure can be explained by the consumer confidence index. For this purpose we use the adjusted R^2 of the regression below

$$\Delta \ln(C_t^j) = \alpha_0 + \sum_{i=1}^{n} \beta_i S_{t-i} + \varepsilon_t \qquad (1)$$

where C^j denotes different consumption categories and S is the consumer confidence index. Carroll *at al.* (1994) test four categories of consumer goods (total expenditure, motor vehicles, goods excluding motor vehicles and services). Unfortunately, the data on the last two categories are unavailable in Hungary, so only the first two categories can be compared. We include the testing of another group, namely durable consumer goods, in this paper.

To be able to decide whether the consumer confidence index has additional explanatory power and predictive ability over other variables, we will compare the values of adjusted R^2 of the following regressions:

[1] The size of the sample was increased to include 1,500 people from May 2001.

$$\Delta \ln(C_t^j) = \alpha_0 + \boldsymbol{\gamma}\mathbf{Z}_{t-1} + \varepsilon_t \quad (2)$$

and

$$\Delta \ln(C_t^j) = \alpha_0 + \sum_{i=1}^{n} \beta_i S_{t-i} + \boldsymbol{\gamma}\mathbf{Z}_{\mathbf{t-1}} + \varepsilon_t \quad (3)$$

where **Z** is a vector of macro variables containing the values of lagged dependent variable ($\Delta \ln C^j$) and growth rate of disposable income. If the adjusted R2 of equation (3) is higher than that of equation (2) and β_i are jointly significant than confidence index have additional explanatory power.

In pure econometrics sense the leading property of confidence index can be tested by Granger causality test, cross correlation coefficients and the asymmetry of cross correlation coefficients. The latter one discovers whether the examined times series is rather leading (negative value) or lagging (positive value) around the maximal cross correlation (the computation of this asymmetry indicator can be found at the appendix). This asymmetry indicator is between -1 and 1. Zero value obviously implies symmetry around the maximal cross correlation coefficient. Note that this asymmetry can be extremely informative. This indicator is a useful tool in examining the relationship between the two time series more thoroughly. It may be the case that cross correlation coefficient is at its highest level in the case of contemporaneousness, while cross correlation remains high at leading and decreases quickly at lagging. Using this method we get more information about the relationship between the examined time series than when we simply grab the number of the lagging period which belongs to the maximal correlation coefficient

4. Empirical results

In the following we examine the GKI consumer confidence index. First, we test the forecasting ability and additional explanatory power of the composite index and its partial indices. Second, the leading property of confidence index will be discussed.

4.1 Prediction ability

4.1.1 GKI composite index

The estimation results are summarized in Table 1. The first column contains the name of the examined consumption category. The second, third and fourth columns show the adjusted R^2 of the regression of American, Australian and Hungarian consumption categories respectively when explanatory variables are only the lagged values of the confidence index. The fifth, sixth and seventh columns show the increment in adjusted R^2 if we incorporate the lagged values of the confidence index in addition to control variables (**Z** vector). The numbers in parentheses are the *p* values of the joint significance of the lags of sentiment computed by the Wald test.

As in the reference study, the confidence index in our paper, too, is lagged up to four quarters, and vector **Z** contains the growing rate of the dependent variable and disposable income of households. Because of the huge differences in size of samples, the adaptation of the lag structure can be questionable because of the huge difference in sample size. While the entire time series is 1955:1-1992:3 for the USA, it is only 1993:1-2000:4 for Hungary. It

should be noted that the parameters in Table 1 are estimated on a 1978:1-1992:3 sample so that Australian and US parameters can be based on the same sample period.

Table 1: The explanatory power of GKI consumer confidence index

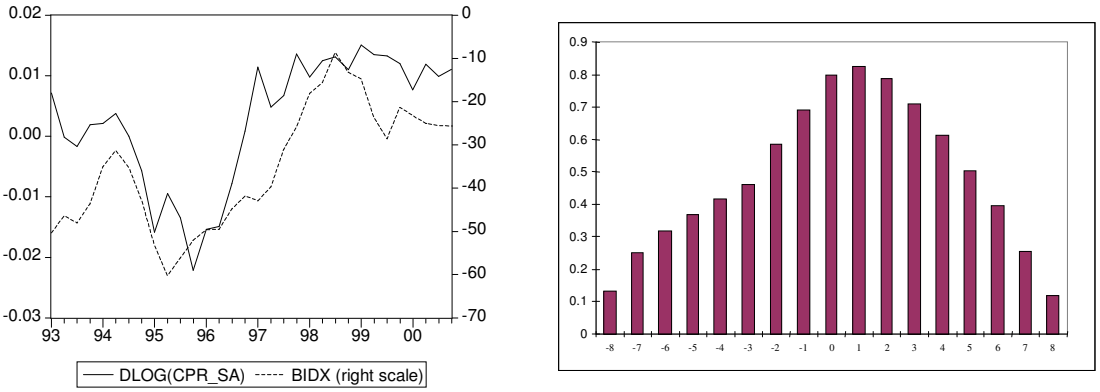
$$\Delta \ln(C_t^j) = \alpha_0 + \sum_{i=1}^{4} \beta_i S_{t-i} + \gamma \mathbf{Z}_{t-1} + \varepsilon_t$$

Consumption categories	$\overline{R}^2$			Incremental $\overline{R}^2$		
	USA	Australia	Hungary	USA	Australia	Hungary
Total expenditure	0.05	0.04	0.51	-0.03	0.02	0.25
	(0.013)	(0.119)	(0.000)	(0.056)	(0.470)	(0.011)
Motor vehicles	-0.01	0.08	0.06	0.03	0.05	0.01
	(0.130)	(0.024)	(0.248)	(0.013)	(0.212)	(0.412)
Durable cons. Goods			0.14			0.29
			(0.150)			(0.133)

Notes: parameters for the USA are from Carroll *et. al* (1984) and the ones for Australia are from Loundes and Scutella (2000). C^j denotes the different consumption categories, S_{t-i} is the consumer confidence index and Z_{t-1} vector contains the growth rate of the dependent variable and the disposable income of households. The first column contains the names of the consumption categories studied. The second, third and fourth columns show the adjusted R^2 when the explanatory variables are only the values of the confidence index. The fifth, sixth and seventh columns show the increment in adjusted R^2 if we incorporate the lagged value of the confidence index in addition control variables (vector **Z**). The numbers in parentheses are the p values of the joint significance of the lags of sentiment computed with the Wald test.

Based on Table 1, we can evaluate the explanatory power of the composite confidence index published by GKI. In the case of household expenditure, we obtain considerable results, as the confidence index can explain 51% of the variance of the household expenditure growth rate. The estimated parameters are significant, as in the USA. We also get remarkable results when we examine the additional predictive ability of the consumer confidence index above other variables. The seventh column shows that the confidence index can explain 25% of the variance of growth rate of household expenditure over the lagged growth rate of dependent variables and the lagged growth rate of disposable income. By contrast, the increase of the adjusted R^2 is –3% in the American and 2% in the Australian equation. However, Australian parameters are not significant. Chart 1 also shows a strong relationship between consumption in Hungary and the confidence index. The high explanatory power of the Hungarian confidence index relative to the other two countries may stem from the special character of the period between 1993 and 2000. A sharp decline in consumption in Hungary in the mid-nineties was followed by an upsurge. Thus, changes in households' perception of their past and future were more marked than in the case of a smooth consumption path. Naturally, this does not mean that the consumer confidence index has no predictive power in more balanced periods. The existence of such power is proven by Australian and US results (the USA parameter is positive when we use the whole sample period 1955:1-1992:3).

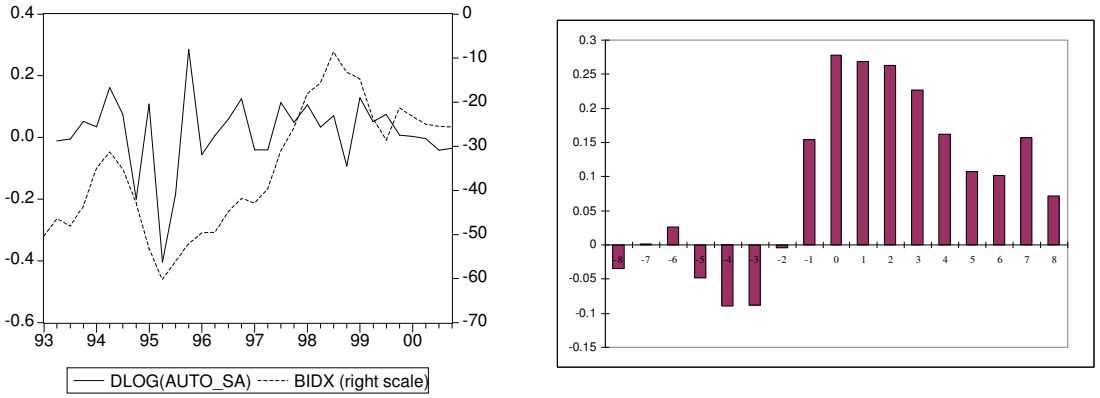
Chart 1 Household expenditure, the consumer confidence index and their cross-correlogram



Left panel: growth rate of households' consumption expenditure (*CPR_SA*) and the level of the GKI's composite consumer confidence index (*BIDX*). The right-hand-side panel shows *f(i)*= Cor(Δln(*CPR_SA*), *BIDX*(i)) function.

In the next two categories (motor vehicles and durable consumer goods) the consumer confidence index has no significant parameters either in itself or beside other variables. Chart 2 we expect a week connection between the confidence index and new car sales that approves our numerical result. The connection is not obvious in the case of Australia either. Although the confidence index is significant in itself, it loses its explanatory power beside control variables.

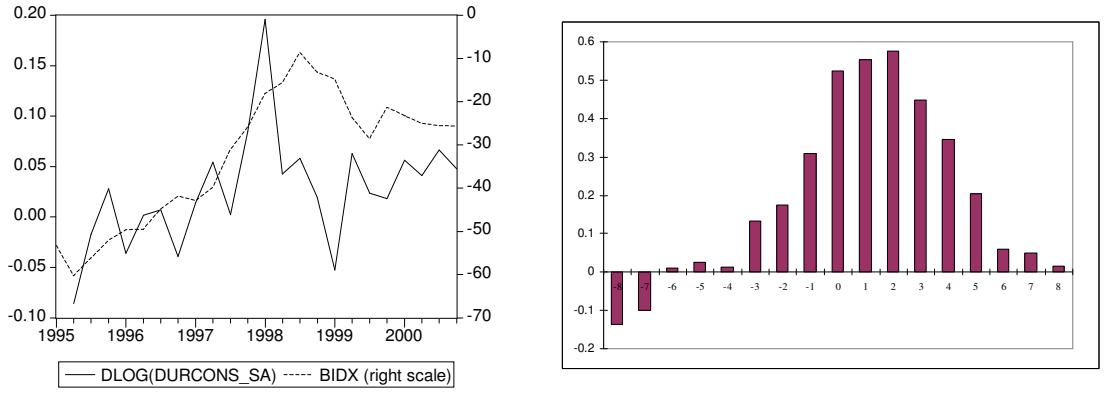
Chart 2 New car sales and the consumer confidence index and its cross correlogram



Left panel: growth rate of households' consumption expenditure (*AUTO _SA*) and the level of the GKI's composite consumer confidence index (*BIDX*). The right-hand-side panel shows the *f(i)*= Cor(Δln (*AUTO_SA*), *BIDX*(i)) function.

The prediction ability of the confidence index is higher in the case of durable consumer goods than in the case of new car sales, but the parameters are not jointly significant, although the cross correlation is considerable (see: Chart 3).

Chart 3 Durable consumer goods and the consumer confidence index and its cross correlogram



Left panel: growth rate of durable consumer goods (*DURCONS_SA*) and the level of the GKI's composite consumer confidence index (*BIDX*). The right-hand-side panel shows the $f(i)$= Cor(Δln(*DURCONS _SA*), *BIDX*(i)) function.

4.1.2 Question level examination

In the previous part we examined the question whether the published GKI composite confidence index has any predictive ability over and above other variables. As noted earlier, this composite index is the mean of 5 questions (Q1, Q2, Q3, Q4 and Q8) selected from 15 survey questions (12 monthly and 3 quarterly questions). It seems worthwhile to examine whether these 5 questions have the best properties and whether they are able to measure what they should theoretically.

To be able to evaluate the questions, we replace the composite confidence index in equation (3) with the indices of the questions:

$$\Delta \ln(C_t^j) = \alpha_0 + \sum_{i=1}^{n} \beta_i Q_{t-i}^k + \boldsymbol{\gamma} \mathbf{Z}_{t-1} + \varepsilon_t \qquad (4)$$

Table 2 displays the estimation results, which provide explanation for the weak predictive ability of the composite confidence index regarding the purchase of new cars and durable consumer goods. Among 5 indices of the published composite index, 3 sub-indices are not significant in the consumer expenditure equation, 4 in respect of new car sales and durable consumer goods purchase.

In view of the above, it seems useful to compute another composite index using more appropriate sub-indices. We might obtain higher explanatory power for the prediction of consumer expenditure than that of the index published by GKI does if we take the average of questions 3, 4, 5 and 7. It is surprising that the questions that directly inquire about future consumption intentions should not work well. However, we cannot regard this as some Hungarian characteristic because Bram – Ludvigson (1998) had similar results with American surveys[2]. The questions in the University of Michigan survey relating to future consumption plans were not significant in forecasting consumption expenditure. By contrast, the questions of the Conference Board relating to recent and future unemployment rates

[2] Both the University of Michigan and Conference Board consumer confidence indices were analysed at question level.

appeared to have predictive power in forecasting. We get similar results concerning Hungarian data. Question 7 of the GKI survey (*How do you think the level of unemployment in the country will change over the next 12 months?*) has forecasting ability while questions 8 and 9 do not. Question 8 is not significant in forecasting durable consumption goods either, however we should note that it involves the shortest time series so the reliability of the tests is weaker. We supposed that question 13 (*How likely are you to buy a car within the next 2 years?*) would be a good indicator of new car sales, but we have to reject this hypothesis according to the estimation results.

Table 2 Incremental $\overline{R}^2$ of question level

$$\Delta \ln(C_t^j) = \alpha_0 + \sum_{i=1}^{4} \beta_i Q_{t-i}^k + \boldsymbol{\gamma} \mathbf{Z}_{t-1} + \varepsilon_t$$

Question		Total household expenditure	New car sales	Durable consumer goods
Q1:	Households' past financial situation	0.16 (0.318)	0.16 (0.167)	-0.30 (0.896)
Q2:	Households' future financial situation	0.18 (0.162)	0.04 (0.346)	-0.03 (0.520)
Q3	General economic situation of Hungary in the past	0.25 (0.003)	-0.12 (0.742)	0.47 (0.030)
Q4	General economic situation of Hungary in the future	0.21 (0.035)	0.00 (0.43)	0.31 (0.113)
Q5	Changes in the cost of living in the past	0.21 (0.044)	-0.05 (0.580)	-0.05 (0.559)
Q6	Changes in the cost of living in the future	0.16 (0.310)	0.07 (0.295)	-0.14 (0.683)
Q7	Outlook for unemployment	0.22 (0.031)	0.15 (0.170)	-0.08 (0.594)
Q8	Is it worthwhile to buy valuable consumer goods?	0.14 (0.607)	0.28 (0.060)	0.03 (0.420)
Q9	Income to be spent on valuable consumer goods	0.19 (0.151)	0.13 (0.191)	0.24 (0.178)
Q10	Savings position	0.16 (0.308)	0.03 (0.360)	0.05 (0.395)
Q11	Savings outlook	0.14 (0.651)	0.25 (0.073)	0.50 (0.022)
Q12	Present financial situation of households	0.14 (0.638)	0.36 (0.025)	0.57 (0.006)
Q13	Possibility of buying a new car	-0.06 (0.867)	0.02 (0.785)	-0.10 (0.632)
Q14	Buying or building a new home	-0.01 (0.679)	0.28 (0.322)	-0.08 (0.603)
Q15	Other home-related expenditure	-0.06 (0.871)	0.23 (0.396)	-0.44 (0.993)

Notes: C^j denotes the different consumption categories, Q_{t-i}^k is the k^{th} question of the GKI consumer survey, vector $\mathbf{Z}$ contains the growth rate of the dependent variable and the disposable income of households. The numbers in parentheses are the p values of the joint significance of the lags of sentiment computed with the Wald test.

In order to be able to decide whether our composite consumer confidence index (the average of questions 3, 4, 5 and 7) has higher explanatory power than the published GKI

index, we will re-estimate the increment adjusted R^2, using our composite index in equations (1) and (3) instead of the GKI index[3]:

$$QCOMP = 1/4(Q3 + Q4 + Q5inv + Q7inv) \quad (5)$$

Table 3 summarizes the predictive ability of GKI's and our composite index.

Table 3 Predictive power of composite indices

Categories	$\overline{R}^2$		Incremental $\overline{R}^2$	
	GKI composite index	*QCOMP*	GKI composite index	*QCOMP*
Household expenditure	0.51	0.57	0.25	0.26
	(0.000)	(0.000)	(0.011)	(0.006)
New car sales	0.06	0.12	0.01	0.01
	(0.248)	(0.137)	(0.412)	(0.429)
Durable consumer goods	0.14	0.13	0.29	0.33
	(0.150)	(0.176)	(0.133)	(0.104)

Our composite confidence index explains 57% of the variance of the household expenditure against the 51-percent value of the index published by GKI. The additional explanatory power does not differ significantly from the two composite indices in addition to control variables. Another significant difference between these two indices is the asymmetry of the cross correlation coefficients (see later). We also examined the connection between the time series of new car sales and durable consumer goods and our composite index despite the fact that the selection criteria of our index are based on household expenditure. Although predictive power increased in the case of new car sales, but the parameters are not jointly significant even on a 10–percent level. Our composite confidence index cannot explain durable consumer goods better than the GKI index.

4.2 Leading property tests

The most important issue about the examination of the consumer confidence index is to decide whether this index is suitable for forecasting consumption i.e. whether it can behave as a leading indicator or not. We use two further approaches in addition to the one employed by Carroll *at al*. (1994). We examine the leading/lagging structure of the time series by the Granger causality test, cross correlation and its asymmetry.

Based on Granger causality test (Table 4) only question 6 (*How do you think the cost of living will change over the next 12 months?*) has leading property in relation to households' expenditure. Neither our composite index (*QCOMP*) nor the published GKI composite index (*BIDX*) can be considered as being a leading indicator, however, the lead/lag ratio is favorable in our index. Unfortunately, the Granger test also rejects the hypothesis that the questions related to recent and future consumption plans (Q8, Q9) could be leading indicators.

[3] The meaning of *Q5inv* and *Q7inv* denote (-Q5) and (-Q7) respectively. The reason for this will be explained later on in this study.

Table 4 *p* values of the Granger causality test related to households' expenditure

Question	n=1		n=2		n=3		n=4	
	Lead	Lag	Lead	Lag	Lead	Lag	Lead	Lag
Q1	0.67	**0.00**	0.69	**0.01**	0.66	**0.04**	0.77	*0.09*
Q2	0.59	**0.00**	0.40	**0.02**	0.30	**0.02**	0.16	*0.05*
Q3	*0.06*	**0.03**	0.40	*0.07*	0.75	*0.08*	0.50	*0.09*
Q4	0.36	**0.02**	0.84	*0.06*	0.87	*0.07*	0.21	0.17
Q5	0.21	**0.02**	0.25	0.14	0.43	0.17	0.24	0.41
Q6	*0.07*	0.56	**0.02**	0.36	**0.04**	0.44	*0.10*	0.47
Q7	0.71	**0.03**	0.29	**0.05**	0.11	**0.04**	**0.02**	0.11
Q8	0.71	**0.01**	0.22	**0.02**	0.35	*0.08*	0.69	0.12
Q9	0.50	**0.01**	0.29	**0.02**	0.23	**0.01**	0.26	**0.03**
Q10	0.54	**0.00**	0.91	**0.01**	0.88	**0.01**	0.29	**0.03**
Q11	0.98	**0.00**	0.17	**0.03**	0.15	**0.02**	0.11	**0.04**
Q12	0.88	**0.01**	0.23	*0.08*	0.38	0.44	0.33	0.12
Q13	0.77	**0.05**	0.94	**0.01**	0.77	0.25	0.99	0.66
Q14	0.90	0.94	0.59	0.30	0.52	0.39	0.21	0.73
Q15	0.89	*0.09*	0.74	**0.02**	0.35	**0.01**	0.59	**0.02**
BIDX	0.28	**0.00**	0.76	*0.06*	0.84	**0.03**	0.44	0.10
QCOMP	0.19	**0.01**	0.57	*0.05*	0.72	**0.03**	0.21	0.11

Notes: The table displays the p values of the Granger causality test between the growth rate of households' expenditure and indices. The composite indices or questions are leaded or lagged. Bold-type letters denote 5-percent and italicized ones 10-percent significance level.

Another approach for testing leading property is the cross correlation analysis, which is summarized in Table 5. The first column shows the questions of the survey and the composite index published by GKI (*BIDX*) and our composite consumption confidence index (*QCOMP*). The second column shows the number of lagging periods where the cross correlation coefficient between the confidence index and consumption expenditure is the largest. The third column displays the value of the largest cross correlation coefficient. The fourth column displays the asymmetry of the cross correlation coefficients. The fifth column displays the significance of the cross correlation coefficients. If a single part-coefficient is insignificant, we have to reject the appropriateness of the asymmetry test.

Table 5 Cross correlation coefficients related to households' expenditure

Question	*i*	Cross correlation	Asymmetry	Significance
Q1	2	0.837	0.015	all
Q2	1	0.822	0.085	all
Q3	0	0.748	-0.049	all
Q4	1	0.772	-0.106	all
Q5	1	-0.807	0.091	all
Q6	-1	-0.713	0.091	all
Q7	1	-0.591	-0.018	all
Q8	2	0.800	0.134	all
Q9	1	0.798	0.079	all
Q10	1	0.779	0.194	all
Q11	2	0.771	0.105	all
Q12	4	0.796	-0.016	all
Q13	3	0.544	0.161	all
Q14	-6	-0.612	0.189	all
Q15	3	0.645	-0.123	all
BIDX	1	0.825	0.017	all
QCOMP	1	0.786	-0.075	all

The value *i* means the leading or lagging number of the confidence indices where the cross-correlation coefficient is the highest.

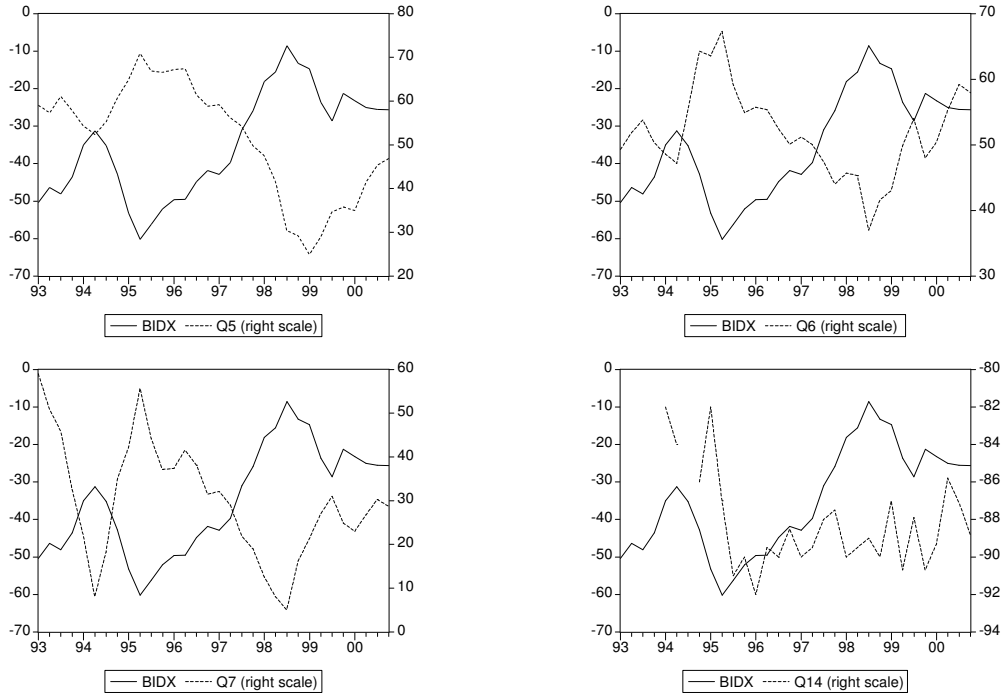
Based on the cross correlation coefficients, questions 6 (*How do you think the cost of living will change over the next 12 months?*) and 14 (*Are you planning to purchase or build a home within the next 2 years?*) are leading indicators of households' consumption. This result is quite surprising, as on the basis of the questions, we would expect other time series to be leading indicators[4].

The value of the cross correlation coefficient of the published GKI composite confidence index is slightly higher than that of ours. Both reach their maximum at a one-period lag. The main difference between the two composite indices lies in their asymmetry. The GKI composite index has a positive asymmetry, while our composite index has a negative one, which means that the QCOMP has a higher cross correlation coefficient in the lead periods.[5]

Using the cross correlation coefficients, we can detect another interesting thing, namely that in the case of Q5, Q6, Q7 and Q14, the cross correlation is negative. Let us plot these time series and the published GKI composite confidence index:

[4] Granger test rejects the leading property of Q14.
[5] For its importance in forecasting, see Table 3 .

Chart 4 Time series of the GKI composite index and some survey questions [6]



In the case of Q5, Q6 and Q7, the inverse movement is clearly discernible. In GKI's questionnaire the scale of the answers to questions 5 and 7 seems to have "turned around". The most unfavorable answer is normally coded with a number "1" and the most favorable answer is coded with a number "5". By contrast, in Q5 and Q7 code 1 denotes the most favorable and whereas code 5 denotes the most unfavorable answer. The same can be assumed about question 6, but in this case there is an increasing scale in contrast to the decreasing one in the case of the rest of the questions. Supposing that Q6 in the questionnaire is correct, households increase consumption if they expect a higher inflation rate in the future and postpone it if they expect a lower one in the future. The answer scale of Q14 seems correct, and on the basis of the chart we need not attach too much importance to negative cross correlation. It should be noted that questions 5 and 7 in EU recommendations (on which the GKI questionnaire is based) have the same scale. In the case of Q6, however, the scale is not reversed.

Owing to the above-mentioned facts, we have multiplied the time series for Q5 and Q7 by –1 so as to compute our composite consumer confidence index (*QCOMP*).

5. Some explanations

Albeit Granger test and cross correlation analysis did not indicate leading property of consumer confidence index, however, according to our results it has additional explanatory power besides lagged value of consumption and income. A considerable result is that the certain questions in the survey are not capable of measuring that what they are supposed to do. Meanwhile we found some questions which have significant explanatory power. Composite index based on these ones shows negative asymmetry hence it could be suitable in the forecast of consumption expenditure.

[6] Question 14 was not asked in either Q4, 1993 or Q3, 1994 the graph of question 14.

The question arises why consumer confidence index is significant in the consumption function. One possible explanation answer would be that there is a strong connection between households' assessment of the general situation and consumption in a given period. If households have a chance to consume more, then the feeling of satisfaction is reflected in the confidence index. If this was true, the contemporaneous relationship would be obvious. However, the lagged values of the confidence index are significant in the consumption function. One can argue that as household consumption is highly auto-correlated, the lagged confidence index predicts current consumption through past consumption. If this reasoning were correct, confidence indices should not differ from null significantly beside lagged value of consumption. Our estimation results show that both the lagged value of consumption and that of the confidence index are significant simultaneously.

Another possible answer could be that the consumer confidence index reflects current and expected future incomes. Provided that the confidence index contains information only about current incomes, based on the reasoning offered for consumption, the confidence index should lose its significance beside the income variable. Indeed, the confidence index and the income variable are significant simultaneously. If the confidence index only contained information about future income expectations, the confidence index would be a good predictor of disposable income. In the sample period the consumer confidence index cannot explain the disposable income well. Naturally, due to the wording of the question, it cannot be ruled out that the confidence index conveys information about current and expected incomes; however, it should be noted that it is not the reason why the confidence index has predictive ability.

The unique information content of the consumer confidence index is also supported by a study of Carnazza and Parigi's (2001). They prove that French, German and Italian consumer confidence indices cannot be reproduced by using other "natural" macro variables. Relying on our results, we argue that the consumer confidence index contains such additional information (e.g. the general perception of household situation, uncertainty of future income path etc) which, when used in addition to other macro variables, helped to predict consumption expenditure in the sample period.

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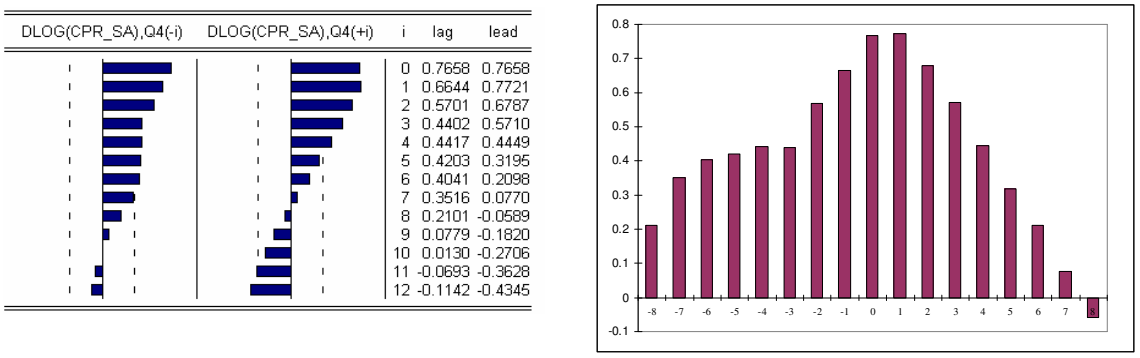
Appendix – Asymmetry of cross-correlation coefficients

Cross-correlation coefficients are frequently used to decide whether a time series is leading, contemporaneous or lagging relative to another time series. In order to obtain detailed information about the time shift between time series it is not enough to simply pick up the number of period where the cross-correlation coefficient is maximal. In that case we lose information since it is not indifferent how strong the relationship before and after the highest coefficient. It can be the case the strongest relationship is found at contemporaneously, meanwhile, the cross-correlation does not decline significantly. Moreover the symmetric decrease cannot be assumed either. Based on this, regardless to the place of maximal cross-correlation, we can consider a time series rather leading or lagging. If we grab only this lagging number we can falsely reject an indicator, however, it may have predictive power.

The left panel of Chart 5 displays the well-know cross-correlation graph between fourth question of GKI questionnaire (*How do you think the general economic situation in this country will develop over the next 12 months?*) and growth rate of consumption expenditure. Turn the leading and lagging planes into the same line by indicating the values of correlation between leaded time series (*Q4* in our case) and the reference series (growth of consumption) at minus *i* and the values of correlation between lagged time series and the reference series at plus *i*. Applying this drawing methodology the asymmetry becomes clearly observable (see the right panel of Chart 5). Albeit the highest cross-correlation is found at one period lag the cross-correlation is significantly larger in leading than lagging periods.

Chart 5 Asymmetry of cross-collerogram



The asymmetry indicator of cross-correlation can quantitatively handle this phenomenon. In the first step the place of maximal cross-correlation (k) and the range of examined periods (n) should be identified. After that, symmetrically to k, cross-correlation coefficients are subtracted from each other. As every indicator, this asymmetry indicator can be interpreted easily if it is between a certain interval, hence, these differences have to be weighted. We apply a weighting scheme which emphasizes the place of cross-correlation coefficients. Departing from zero lagging the sample size decreases thus the reliability of cross-correlation coefficients decreases as well. The ideal solution would be that if every coefficient was weighted by its own degree of freedom. Unfortunately, in this case it cannot be ensured that the indicator takes its values within an interval, say [-1, 1]. Due to that, we employ pair-wise weights which are less appropriate than the individual weights but more acceptable than

simple average. The reliability of asymmetry indicator depends on the significance of individual cross-correlation coefficients, hence, we reject the asymmetry indicator if any of the involved coefficients is under $(T\text{-}k)^{-1/2}$ threshold value.

Based on the above-description the computation of asymmetry indicator is the following

$$Asym = \frac{\sum_{i=1}^{n} 1/2(wu_{k+i} + wd_{k-i})\left[\left|Cor(x, y(k+i))\right| - \left|Cor(x.y(k-i))\right|\right]}{\sum_{i=1}^{n} 1/2(wu_{k+i} + wd_{k-i})}$$

$$wu_{k+i} \quad \begin{cases} T\text{-}k\text{-}i & \text{, if } k \geq 0 \text{ or } k<0 \text{ and } i> |k| \\ T+k+i & \text{, if } k<0 \text{ and } i< |k| \end{cases}$$

$$wd_{k\text{-}i} \quad \begin{cases} T\text{-}k+i & \text{, if } k>i \\ T+k\text{-}i & \text{, if } k<0 \text{ or } i>k \geq 0 \end{cases}$$

where T, k and n denote the sample size, the i value of maximal cross-correlation coefficient and the maximal the range of examined periods respectively.