An assessment of the contribution of consumer confidence towards household spending decisions using UK data

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The European Commission's consumer confidence indicator (CCI) is assembled from responses to four questions about individual and general economic prospects which form part of the EU's Consumer Survey. However, concerns may be raised about whether the four components should be constrained to exerting the same influence in a forecasting model of household consumption. Also, in this context, it would seem to be appropriate to permit a role to other information that is obtained from the EU survey. Consequently, in this paper, different regression functions are specified in order to assess whether there is any gain to be achieved in predictive accuracy from adopting a more flexible approach towards using the data from the EU questionnaire. With an emphasis upon parsimony, an econometric analysis is performed in conjunction with UK quarterly data on household consumption expenditure. For two categories of spending, it is discovered that the quality of forecasts benefits from having undertaken disaggregation involving survey data beyond those which contribute towards the calculation of the CCI. Indeed, the respective consumption variables (relating to non-durable goods and durable goods excluding vehicles) are seen to be associated with relatively volatile behaviour over the forecast interval, 2008 – 2013.

Keywords: Consumption; Consumer Confidence; Permanent Income; Consumer Survey; Forecasting.

JEL classification codes: E21; E27.

I. Introduction

A substantial quantity of academic research has been devoted to the subject of whether or not consumer sentiment possesses any independent short-run explanatory or predictive power with respect to the growth of household consumption expenditure. Some of the studies have limited their analysis to involving merely an aggregate measure of consumer confidence (e.g., Carroll, Fuhrer, and Wilcox [1994]; Al-Eyd, Barrell, and Davis [2009]). Others have sought to investigate additionally whether or not the components of the headline index are of greater benefit in a forecasting exercise (e.g., Easaw and Heravi [2004]; Cotsomitis and Kwan [2006]; Wilcox [2007]).

An established quantitative representation of consumer sentiment is the European Commission's Consumer Confidence Indicator (CCI). The basis of the latter is the harmonised Consumer Survey which is conducted regularly by the Directorate General for Economic and Financial Affairs for countries within the EU and applicant countries. The Consumer Survey requests answers from a sample of individuals to twelve monthly questions, the responses to four of which are combined through an averaging mechanism to produce a value of the CCI.

However, concerns may be expressed about the use of this aggregate measure in a forecasting equation for consumption expenditure. First, it may be considered to be inappropriate to constrain the weights that are attached to the four components to being the same when predicting future spending by households. Also, an element of flexibility would seem to be merited for the purpose of forecasting different types of consumption that are undertaken by the personal sector. Furthermore, it is evident that the majority of the data that are collected via the Consumer Survey is not being allowed to contribute towards the value of the CCI. Granted that the responses which are supplied to the four constituent questions do not fully subsume the information which emanates from the eight unused questions then there is an argument for adopting a broader strategy.

Out of recognition, then, of possible deficiencies which are associated with the CCI in the context of generating forecasts of the growth of consumption, this paper seeks to answer the following research questions. First, for different categories of household expenditure, can an improvement in predictive accuracy be achieved through adopting an empirical approach towards determining the weights which are attached to the components of the CCI? Second, can any additional gain be obtained through accessing data relating to the survey questions which are disregarded for the purpose of constructing the aggregate sentiment measure? In order to address these issues, quarterly time-series data are analysed on the UK. For different categories of consumption, optimal specifications are obtained through the application of a general-to-specific modelling procedure, using data from 1986q2 to 2007q4. The forecasting performances of the different models are subsequently contrasted over the post-sample interval, 2008q1 – 2013q1. The results of these formal comparisons govern the conclusions that are reached in this article.

This study can be distinguished from other empirical investigations in this subject area on account of its allowance for simultaneous and separate entry of the different elements of a headline sentiment indicator into a forecasting model of consumption and the implementation of a recognised statistical procedure in pursuit of a more parsimonious specification. Additionally, few econometric analyses have sought to look beyond the components of the respective consumer confidence measure in an attempt to acquire an increase in predictive accuracy. It should be respected that Jonsson and Linden (2009), in a multi-country exercise, set themselves the objective of exploring how best to exploit the information that is derived from the responses to *eleven* of the questions that feature in the

EU Consumer Survey. However, the averaging process which was generally adopted denied any variation in the weights or dynamics that were accorded to the various sub-indices.

Following a comparison of values of mean square error statistics corresponding to the post-sample forecasts that are generated by competing regression equations, this paper finds that a disaggregated approach is merited in the case of two categories of spending, namely, household consumption expenditure on non-durable goods and durable goods less vehicles. Moreover, for each of these variables, in order to surpass consistently the predictive accuracy that is achieved by a model which includes the CCI, reference should be made to survey data beyond those which are associated with merely the four constituent questions.

The format of the remainder of this paper accords with the convention in related articles (e.g., Easaw and Heravi [2004], Cotsomitis and Kwan [2006]). Hence, the following section outlines and discusses the construction of the European Commission's headline measure of consumer confidence. Section III presents the foundations of the empirical models and clarifies the econometric methodology. In section IV, details are supplied of the data and the results of the statistical analysis are reported. Finally, section V contains some concluding remarks.

II. The European Commission's Consumer Confidence Indicator

The foundation of the European Commission's CCI is information which is obtained from the EU's harmonised Consumer Survey. The latter features twelve qualitative questions concerning an individual's personal financial position, his/her spending and saving plans/opportunities, the general economic situation, and developments to prices and unemployment. The precise form of these questions can be seen in Table A1 in Appendix A of this paper.

In fact, only the responses relating to four of the twelve questions are employed in the calculation of the value of the CCI. These are the forward-looking questions: Question 2 (the household's financial position); Question 4 (the general economic situation); Question 7 (national unemployment); and Question 11 (the household's savings). To be more specific, in the UK, in each month, two thousand randomly chosen individuals are presented with the EU questionnaire. On the basis of their answers, for each question, it is possible to achieve a percentage balance, which can range from -100 to 100. If the balances corresponding to questions 2, 4, 7 and 11 are denoted by Q2, Q4, Q7 and Q11, respectively, then the CCI is formed from the linear combination, ¼ (Q2 + Q4 – Q7 + Q11), such that each component is allocated an equal weight. Given the manner of its construction, the higher is the value of the CCI, the more optimistic is the household sector regarding individual and collective financial/economic prospects.

Seemingly, an appeal of the CCI is the simple nature of its construction. However, the suitability of applying the same weight to each of the four balances is open to debate. For example, it may be argued that an individual will have superior knowledge of his/her own financial position, compared to the state of the economy, thus, suggesting that more emphasis be given to Q2 and Q11.[1] In contrast, within the field of cognitive psychology, it has been contended that individuals who participate in surveys display a tendency to be unduly sanguine about the future, with such over-optimism being even more pronounced when asked about their own personal circumstances. (Accepting such a viewpoint entails attaching greater credence to Q4 and Q7.)[2]

[1] Indeed, Dominitz and Manski (2004) saw no obvious rationale for asking individuals about general business conditions and advocated posing more questions about personal expectations.

[2] According to Langer (1975, 313), there is 'an expectancy of a personal success probability inappropriately higher than the objective probability would warrant'.

Additionally, it should be respected that the time series on the four components of the CCI do not share the same statistical characteristics.[3] On account of the manner of the design of the indicator, the balance that exhibits the highest degree of volatility (and so could be construed as being the least reliable) will, perhaps perversely, be making the largest contribution towards the changes which occur to the CCI.[4] Finally, there is the issue of the usefulness of including Q11 in the calculation of the aggregate confidence measure. As can be seen in Table A1 in Appendix A, Question 11 is concerned with the probability that savings are made in the future. Unfortunately, identical answers to this question can have different connotations for household spending. For example, a very strong likelihood could arise from holding either of two contrasting views: (i) income is not going to grow, such that savings will occur at the expense of consumption; (ii) income will rise sufficiently to be able to support both positive savings and an increase in expenditure.

The various concerns which have been raised above encourage the recommendation that, when designing a measure of consumer confidence, uniform weights should not necessarily be assigned to the different components. Hence, this paper advocates an alternative policy of allowing the contributions of the sub-indices to be determined empirically. In particular, as will be seen when the econometric methodology is outlined in the next section, a preference is exhibited for the application of a general-to-specific modelling strategy.[5] Implementation of the latter enables a broad model of household consumption to be refined in terms of not only the elements of the aggregate CCI that are deemed to be of relevance but also the lengths of the lags on the respective variables.

[3] Table A2 in Appendix A shows, for each of the twelve balances, values of the arithmetic mean and standard deviation.
[4] A study of Table A2 indicates that the most volatile component of the CCI is Q7.
[5] This type of modelling is sometimes referred to as the London School of Economics approach, which is most closely identified with David Hendry. An overview of this procedure is supplied by Mizon (1995a).

III. Foundations of the empirical model and econometric methodology

In the post-World War 2 period, the dominant models of aggregate household consumption were founded upon microeconomic principles. More specifically, the underlying assumption was that an individual would seek to maximise utility over his/her lifetime, subject to an intertemporal budget constraint.[6] Subsequently, in a pioneering article, Hall (1978) elected to combine the Life-Cycle/Permanent Income theory with the hypothesis of rational expectations to produce an 'Euler equation'. The latter constitutes a first-order condition for optimal consumption behaviour, which essentially indicates that, beyond the consumption occurring in the previous time period, no past information should be of relevance for explaining the variation in current spending.

This simple implication of the Rational Expectations-Permanent Income Hypothesis (REPIH) was frequently contradicted in aggregate empirical studies which were undertaken shortly after the publication of Hall's seminal paper.[7] Consequently, when conducting applied research in the area of consumption, the policy was adopted of constructing a more general model which accepts that there is one element of the household sector which complies with the established theory, while another merely spends all of the corresponding period's income.[8]

This broader specification is central to three papers by Campbell and Mankiw (1989, 1990, 1991). The hybrid equation is presented as:

$$\Delta C_t = \mu + \lambda \Delta Y_t + \varepsilon_t, \qquad (3.1)$$

[6] Key references are Modigliani and Brumberg (1954) and Friedman (1957).
[7] Examples can be found in Section III(ii) of the survey article by Muellbauer (1994).
[8] This latter group of households, which is constrained to the extent of only being able to consume its current income, is referred to as employing a rule-of-thumb approach towards spending.

where C and Y are aggregate consumption and income variables, respectively (which are typically contained in a logarithmic form). λ is a parameter which has the interpretation of the share of income accruing to the rule-of-thumb households. ε_t is a random disturbance term which may be considered to behave in accordance with a first-order moving average process for the reasons of time aggregation, the durability of consumption goods, and the possible occurrence of transitory consumption.

With reference to equation (3.1), any estimate of λ which is significantly different from zero is regarded as a contradiction of the REPIH and the assumption of a single representative consumer. In their earliest paper, Campbell and Mankiw (1989) sought to produce Instrumental Variables estimates of λ initially using data on the US and later the remaining six G-7 countries.[9] For all of the countries, with the exception of the UK, the estimate of λ was found to be significantly different from zero and insignificantly different from 0.5. Thus, in general, the data conflicted with Hall's simple Euler equation.

In their second study, Campbell and Mankiw (1990) performed estimation solely in conjunction with quarterly data on the US. Instrumental Variables estimates of λ ranged from 0.317 to 0.637. Monte Carlo simulations revealed an absence of small-sample bias affecting the results. The initial framework was extended by allowing for non-separability in the utility function with respect to labour supply, the stock of consumer durable goods, and government purchases of goods and services. From the ensuing statistical analysis, in no case was there obtained evidence of non-separability.

The final investigation of Campbell and Mankiw (1991) involved quarterly data on Canada, France, Japan, Sweden, the UK and the US. Once more, Instrumental Variables estimates were achieved of the parameter, λ. Generally, significant results were obtained.

[9] Data took the form of quarterly averages. As a first choice, the consumption variable was household expenditure on non-durable goods and services per capita, while the income variable was disposable personal income per capita. The G-7 countries consist of Canada, France, Germany, Italy, Japan, the UK and the US.

France was associated with a particularly large estimate of 0.97, while Japan was ultimately ignored on account of the limitations of the instruments. A largely successful attempt was made to match the estimates of λ across the countries to the severity of liquidity constraints. Also, there was a lack of empirical support for a change in the value of λ over the course of time.[10]

In the current paper, the models which are constructed and form the basis for producing forecasts of consumption growth may be regarded as reduced-form versions of equation (3.1). For example, if current and past changes in consumption are viewed as providing a reliable indication of future income developments then the following equation can be assembled:[11,12]

$$\Delta \ln(C_t) = \beta_0 + \sum_{j=1}^{n} \beta_j \Delta \ln\left(C_{t-j}\right) + \varepsilon_t \qquad (3.2)$$

However, should past data on a measure of consumer confidence contain information on future income movements, independent of that which is included within $\Delta \ln\left(C_{t-j}\right), j = 1, 2, \dots \dots \dots, n,$ then the more general equation (3.3) can be justified:

$$\Delta \ln(C_t) = \beta_0 + \sum_{j=1}^{n} \beta_j \Delta \ln\left(C_{t-j}\right) + \sum_{j=1}^{4} \gamma_j CCI_{t-j} + \varepsilon_t \qquad (3.3)$$

[10] Periods of analysis were 1953-1985 for the US, 1957-1988 for the UK, and 1972-1988 for Canada, France, Japan and Sweden.

[11] Permanent income theory would indeed maintain such a role for consumption. See, for example, the ‘saving for a rainy day’ equation (5) in the article by Campbell and Deaton (1989, 359).

[12] In their empirical analyses, Campbell and Mankiw (1989, 1991) observed lagged income growth to be a poor predictor of current income growth and found the past behaviour of consumption to be of greater relevance.

It should be respected that the form which the consumption and sentiment variables take in these two equations is governed by a desire to achieve stationary time series. The number of (quarterly) lags which are admitted on the CCI is motivated by a desire to conform to the convention in earlier studies (e.g., Carroll, Fuhrer, and Wilcox [1994]). Additionally, such a number seems to be appropriate, granted that the forward-looking questions within the EU Consumer Survey make reference to expected developments one year ahead. In contrast, the number of lags (n) on the dependent variable are determined empirically. For the purpose of symmetry, the starting position consists of setting n equal to 4. However, t tests are performed sequentially, at the ten per cent level of significance, in order to assess whether a more parsimonious model is acceptable. Consequently, the chosen value of n corresponds to the largest integer for which it is possible to reject Ho: $\beta_n = 0$ in favour of Ha: $\beta_n \neq 0$.[13] A further criterion which the favoured equation must satisfy is that, from application of a Breusch-Godfrey test, the inference is drawn that the disturbance terms are non-autocorrelated.[14]

Out of respect that the essential aim of this paper is to investigate whether or not superior predictions of consumption growth can be achieved through recourse to data on the components of the CCI, rather than the aggregate measure, itself, a third empirical equation is constructed which permits the balances, Q2, Q4, Q7 and Q11, separate influences on household spending.

[13] Of course, should it not be possible to dismiss Ho: $\beta_1 = 0$ in favour of a two-sided alternative hypothesis then the preferred version of equation (3.3) would not include any lags on the dependent variable. Also, equation (3.2) would represent a function which concurs with the REPIH.

[14] For the reason that all right-hand-side variables correspond to the past then Ordinary Least Squares estimation can be justified of the equations that enter this study. Also, there is a preference for confronting the potential problem of autocorrelated errors through the dynamic specification of the regression model, rather than the estimation technique. In support of this approach, see the paper by Mizon (1995b).

$$\Delta \ln(C_t) = \beta_0 + \sum_{j=1}^{n} \beta_j \Delta\ln(C_{t-j}) + \sum_{j=1}^{4} \delta_{2j} Q2_{t-j} + \sum_{j=1}^{4} \delta_{4j} Q4_{t-j} + \sum_{j=1}^{4} \delta_{7j} Q7_{t-j} + \sum_{j=1}^{4} \delta_{11j} Q11_{t-j} + \varepsilon_t \quad (3.4)$$

Equation (3.4) shows that four quarterly lags are allowed for on each of the four balances. In order to prevent a situation of overparameterisation and an unnecessary loss of degrees of freedom, a general-to-specific modelling strategy is implemented. More precisely, for each of the four component variables, an F test is performed of Ho: $\delta_{ij} = 0$ (j = 1, 2, 3, 4) against Ha: at least one of $\delta_{ij} \neq 0$ (j = 1, 2, 3, 4), where i = 2, 4, 7 and 11. If it is possible, at the ten per cent level of significance, to reject Ho then all four of the lags on the variable are retained. In contrast, if the computed value of the F statistic does not exceed the corresponding critical value then consideration is given to reducing the number of lags to the extent that a positive outcome is achieved.[15] The approach which is being adopted guarantees that, in the final version of equation (3.4), the one or more lags on each of the surviving balances are collectively associated with a probability value which is below 0.10.[16]

It is apparent that only a minority of the questions which comprise the EU Consumer Survey contribute towards the headline measure of consumer confidence. Indeed, there are eight questions which are not permitted any role. It would seem to be unlikely that all of the information relating to the unused questions is fully absorbed by the data on Q2, Q4, Q7 and Q11, and so provides no additional benefit for predicting the growth of household consumption expenditure. In particular, on account of their design, questions 8 and 9 may reasonably be expected to attract responses which serve to improve the forecasts of spending

[15] An alternative approach to sequential testing would have been to choose the optimal specification in accordance with an information criterion. However, the general-to-specific methodology more directly confronts the issue of serial correlation in the disturbance terms.
[16] Of course, the implication of repeatedly accepting Ho is that the respective balance does not feature in the final equation.

on durable goods. Consequently, the decision is taken to extend the empirical analysis which is conducted in this study. More specifically, equation (3.4) is augmented through the inclusion of four lags on each of Q1, Q3, Q8 and Q9.[17] Questions 5, 6, 10 and 12 continue to be disregarded in order to restrict the equation to a manageable size.[18] The resultant specification is shown as equation (3.5). Once again, sequential testing is undertaken in order to produce a concise model for which the one or more lags on each of the retained attitudinal variables are collectively significant at the ten per cent level.

$$\Delta \ln(C_t) = \beta_0 + \sum_{j=1}^{n} \beta_j \Delta\ln(C_{t-j}) + \sum_{j=1}^{4} \delta_{2j} Q2_{t-j} + \sum_{j=1}^{4} \delta_{4j} Q4_{t-j} + \sum_{j=1}^{4} \delta_{7j} Q7_{t-j} + \sum_{j=1}^{4} \delta_{11j} Q11_{t-j} + \sum_{j=1}^{4} \delta_{1j} Q1_{t-j} + \sum_{j=1}^{4} \delta_{3j} Q3_{t-j} + \sum_{j=1}^{4} \delta_{8j} Q8_{t-j} + \sum_{j=1}^{4} \delta_{9j} Q9_{t-j} + \varepsilon_t \quad (3.5)$$

Each of the four econometric equations that have been constructed, (3.2) – (3.5), is to be estimated initially for each of five categories of consumption. Use is made of quarterly, seasonally-adjusted data, with the common sample period extending from 1986q2 to 2007q4. For the purpose of comparing the abilities of rival models which contain different numbers of parameters to explain the variation in the respective dependent variable, it is customary to compute values of the adjusted R-squared statistic or a recognised information criterion. However, the principal reason for conducting the within-sample analysis is, in each context,

[17] Q1, Q3, Q8 and Q9 denote the balances corresponding to the respective questions, 1, 3, 8 and 9.
[18] The preference for questions 1, 3 and 8 stems from their involvement in the alternative GfK indicator of consumer confidence. Also, question 9 asks individuals directly about their anticipated spending over the next twelve months.

to yield an optimal specification. Ultimately, an assessment of the merits of a regression function will be determined by the relative accuracy of the forecasts that it generates.

Consequently, for each type of consumption and each of the four specifications, one-step-ahead predictions are produced over the interval, 2008q1 – 2013q1, which thereby incorporates the recent period of economic crisis in the UK. Series of forecasts are compiled from models which have been estimated over the fixed time span, 1986q2 – 2007q4, as well as through adopting a recursive approach. In applying the latter procedure, the sample period, 1986q2 – 2007q4, is relied upon merely for obtaining predictions for 2008q1. Subsequent forecasts are achieved by systematically moving the end date forward by one quarter at a time.[19]

For each of the consumption variables, the predictive accuracy that is achieved by the different equations can be compared through computing values of root mean square error statistics. However, of particular interest is whether the optimal versions of equations (3.3) – (3.5) produce *significantly* superior forecasts to the baseline equation (3.2). Hence, the test procedure which is recommended by Harvey, Leybourne, and Newbold (1997) is implemented. Thus, for each type of household spending and each of the three regression equations containing a representation of consumer sentiment, the validity of the null hypothesis is examined which maintains that there is no distinction between the quality of predictions that emanate from the respective restricted and unrestricted equations.[20]

More specifically, the test statistic which is favoured by Harvey, Leybourne, and Newbold is an adaptation of the asymptotic standard normal variate (S_1) that was proposed by Diebold and Mariano (1995).[21] In the context of a prediction interval of moderate length, the Diebold-Mariano test has been found to be considerably oversized. Thus, Harvey, Leybourne,

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[19] Thus, the final prediction is founded upon an equation that has been estimated utilising data from 1986q2 to 2012q4.

[20] The restricted version of equation (3.3), (3.4) or (3.5) is the same function, excluding any reference to consumer confidence, and so amounts to equation (3.2).

[21] See page 254 of the article by Diebold and Mariano.

and Newbold advocated transforming S_1 such that it incorporated the feature of an unbiased estimator of the variance of the sample mean of the difference between corresponding squared forecast errors. Subsequently, it was considered to be intuitively reasonable to contrast the computed value of the resultant statistic (S_1^*) with a critical value pertaining to the student t distribution, for which the number of degrees of freedom equates with one less than the number of predictions.[22]

IV. Data and results of the empirical analysis

The empirical methodology which has been outlined in the previous section is firstly applied to five different consumption variables, namely, total household consumption expenditure, as well as household consumption expenditure on each of durable goods, semi-durable goods, non-durable goods, and services. Quarterly, seasonally-adjusted data have been assembled, extending from 1985q1 to 2013q1.[23] Each of the respective time series is presented diagrammatically in Figure 1. Upon viewing the five line graphs, it is apparent that each of the series incorporates an upward trend. Also, expenditure on each of durable goods and semi-durable goods seems to have shown the greatest resistance to the most recent recession. For both of these two variables, the maximum value corresponds to the end date, 2013q1. In contrast, for the other three types of spending, the peak occurs in 2007q4.

Figure 1. Quarterly Data on UK Household Consumption Expenditure (£million, constant (2010) prices, seasonally adjusted)

[22] Having conducted simulation experiments, Harvey, Leybourne, and Newbold found the modified test to be superior to the original in all cases. Even though the test that was favoured by Harvey, Leybourne, and Newbold was still somewhat oversized, they maintained that it would be acceptable to practitioners.

[23] All data are contained in the form of constant prices and are obtained from the Office for National Statistics. The associated code-names consist of: ZAKW (total consumption expenditure); UTID (expenditure on durable goods); UTIT (expenditure on semi-durable goods); UTIL (expenditure on non-durable goods); and UTIP (expenditure on services).

A time plot of the quarterly data series on the CCI is provided in Figure 2. From a study of this chart, neither an upward nor a downward trend is visible. Indeed, it is possible to conclude that this series exhibits the property of stationarity, granted that the variable avoids prolonged departures from its mean value.[24] However, it is evident that the CCI is subject to some sizable upswings and downswings. For example, from 1994q2 to 1997q3, the value of the indicator increased by 25.0 points. Also, from 1988q3 to 1990q3 and from 2007q3 to 2009q1, the CCI dropped by 22.0 and 28.4 points, respectively.

Figure 2. The European Commission Consumer Confidence Indicator (CCI)

Tables 1, 2 and 3 show the results of estimating equations (3.2) and (3.3), (3.4) and (3.5), respectively. An examination of the contents of these tables confirms that the five expenditure variables do not all share the same dynamics. In Table 1, the evidence suggests that the growth of spending on semi-durable goods is linearly unrelated to its earlier behaviour. In contrast, proportional changes in the consumption of durable and non-durable goods are systematically linked to the corresponding movements in the previous quarter. Furthermore, in terms of the equations for both household expenditure in aggregate and, more specifically, on services, for different reasons, it was found necessary to retain all four of the lags on the dependent variable.

Table 1. Results Obtained from Estimating Equations (3.2) and (3.3) (1986q2 – 2007q4)

Table 2. Results Obtained from Estimating Equation (3.4) (1986q2 – 2007q4)

[24] The arithmetic average over the data period is -9.8. Also, from the application of an augmented Dickey-Fuller test, the null hypothesis of a unit root can be comfortably rejected at the five per cent level of significance. (The associated probability value is 0.0279.)

Table 3. Results Obtained from Estimating Equation (3.5) (1986q2 – 2007q4)

Following observation of, in particular, Table 1, it is apparent that, for all five of the consumption variables, the addition of the four past values of the CCI to the analysis serves to increase the value of the adjusted R-squared statistic. This positive effect is most marked for spending in total and expenditure on durable goods. Also, from conducting Breusch-Godfrey tests at a conventional level of significance, in no case is it possible to draw the conclusion that the disturbance terms within equation (3.3) are autocorrelated. Thus, there is evidence to support the dynamic specifications.

Table 2 shows the results which are obtained from estimation of equation (3.4). From an examination of the contents of the table, it seems that, out of the four components of the CCI, Q7 is empirically the most useful. Following the implementation of the general-to-specific modelling procedure, this variable is retained in four out of the five consumption equations. Both Q2 and Q4 share the property of featuring in three of the eventual regression models, while Q11 enters only the function relating to expenditure on semi-durable goods. A pairwise comparison of values of the adjusted R-squared statistics corresponding to equations (3.3) and (3.4) generally lends support to the strategy of decomposing the CCI in explaining the behaviour of different types of household spending. Only for the consumption of non-durable goods does the goodness of fit deteriorate in moving from equation (3.3) to equation (3.4). Indeed, for three of the forms of expenditure, the increase in the value of the adjusted R-squared statistic exceeds ten percentage points.

The results which are presented in Table 3 arise from having performed the favoured general-to-specific methodology in conjunction with equation (3.5). Recall that the latter represents a broader framework than equation (3.4) for conducting analysis. In addition to the four components of the CCI, a further four balances that can be obtained from the EU's

Consumer Survey are permitted to influence, with a time delay, different types of household expenditure.

The lack of reference in Table 3 to household consumption expenditure on durable goods and semi-durable goods implies that, in terms of within-sample explanatory power, there was found to be no gain from involving any of Q1, Q3, Q8 or Q9 in the empirical exercise.[25] In contrast, for total household consumption expenditure, the inclusion of Q1 at the expense of Q2 yields an improvement in the value of the adjusted R-squared statistic. Also, for spending on services, statistically, the benefit from the incorporation of $Q8_{t-2}$ exceeds the loss which is associated with the elimination of $Q7_{t-4}$. However, perhaps the greatest justification for widening the analysis, is that stronger evidence is now achieved of a dependence of consumption of non-durable goods on consumer sentiment, with lags on both Q3 and Q8 showing significance at the five per cent level.

For each of the five consumption variables, consideration is now given to the forecasting performances of the optimal versions of equations (3.2), (3.3), (3.4) and (3.5). As was mentioned in the previous section, an evaluation is formed of the advantage that is acquired from a separate representation of individual questions within the EU Consumer Survey through contrasting the post-sample predictive accuracy of different regression models.

Table 4. Predictive Performances of Different Regression Models

From an inspection of the values of root mean square error statistics that have been assembled in Table 4, it is evident that, with reference to those forecasts which are the

[25] A further implication of this table is that ultimately the balances, Q2, Q11 and Q9, are discovered not to be of any worth for the purpose of accounting for the behaviour of the other three forms of consumption.

product of recursive estimation, for all but one category of consumption,[26] there is a gain in accuracy from utilising data on consumer sentiment. However, only in the case of spending on non-durable goods is a disaggregated approach seen to be helpful. Indeed, in order to obtain a decisive result, it is necessary to appeal to balances outside of the four which contribute towards the CCI. The corresponding values which are founded upon fixed-period estimation do not appear to be markedly dissimilar. The most striking difference is that, for the consumption of services, as well as expenditure on durable goods, a simple autoregressive model exerts superiority over all of the equations which incorporate representations of consumer confidence.

Respecting the period which has been chosen as the prediction interval, a difficulty with regard to assessing the forecasting capability of a model of consumption is seemingly the temporal redistribution of household expenditure which occurred in the UK as a consequence of the vehicle scrappage scheme that was introduced by the 2005 - 2010 Labour Government. This policy was implemented on 18 May 2009. It involved a £2,000 discount on the price of a new vehicle, on condition that there was traded in a car which was at least ten years' old. The measure was designed to combat the problem of a decline in car production and new car sales that had been observed towards the end of 2008 and during the early part of 2009.

The vehicle scrappage scheme thus offered encouragement to consumers to bring forward any plans to acquire a new car in order to take advantage of the available price reduction. Consequently, the models of total consumption expenditure and spending on durable goods which have been estimated in this study may be prone to underprediction during the second half of 2009, while displaying a tendency to overpredict during 2010.[27]

[26] Namely, household expenditure on durable goods.
[27] Indeed, upon examining the recursive forecast errors relating to expenditure on durable goods, for each of the three different functions, two sizable positive values in 2009q3 and 2009q4 are followed by an even larger negative outcome in 2010q1.

Additionally, when adopting a recursive approach, the accuracy of all subsequent forecasts may be adversely affected. Hence, in an attempt to circumvent this complication and to permit a fairer comparison of the competing equations, amendments are made to the series on the two aforementioned variables. More specifically, it is considered to be suitable to subtract the purchases of vehicles from each of total consumption expenditure and spending on durable goods, prior to estimation, dynamic specification and prediction.[28]

Table 5. Results Obtained from Estimating Equations (3.2) and (3.3) (1986q2 – 2007q4)

Table 6. Results Obtained from Estimating Equations (3.4) and (3.5) (1986q2 – 2007q4)

Table 5 reports the results which are obtained from estimation of equations (3.2) and (3.3), involving the two modified consumption series. Table 6 does likewise for equations (3.4) and (3.5). Observation of the contents of Table 5 shows that, for each of the two refined expenditure variables, two quarterly lags are deemed to be necessary on the dependent variable. Also, in both cases, the addition of four lags on the CCI to the baseline equation succeeds in raising the value of the adjusted R-squared statistic.

Table 6 indicates that, having performed the general-to-specific procedure in conjunction with equation (3.4), for neither of the two refined consumption variables is there statistical justification for the inclusion of Q11. Additionally, Q7 plays no role in the eventual specification for household expenditure on durable goods less vehicles. With regard to the latter, the presence of Q2 seems to contradict the empirical methodology that was outlined earlier. However, individually, $Q2_{t-1}$ and $Q2_{t-2}$ are found to make significant contributions at the five per cent level. Also, the explanatory power of $Q4_{t-j}$ is enhanced by the retention of $Q2_{t-j}$ (j = 1, 2, 3).

[28] The quarterly data on purchases of vehicles are seasonally adjusted and contained in the form of constant prices. The codename which is employed by the Office for National Statistics is TMMI.

Upon turning attention to equation (3.5), it is apparent that the greater choice of balances results in Q1 and Q9 entering the regression function for total consumption expenditure minus spending on vehicles, at the expense of Q2. Also, in the model for household expenditure on durable goods less vehicles, a role is found for $Q9_{t-2}$, in support of $Q2_{t-j}$ and $Q4_{t-j}$ (j = 1, 2, 3).

Table 7. Predictive Performances of Different Regression Models

In connection with the two revised consumption series, the predictive performances of equations (3.2), (3.3), (3.4) and (3.5) are summarised in Table 7. Upon comparing the figures in the first row of this table with those which are presented in the first row of Table 4, it is apparent that, irrespective of whether or not the series on total household expenditure is adjusted, the most accurate forecasts are produced by a model incorporating the aggregate measure of consumer confidence. However, as a consequence of having refined the data, equations (3.4) and (3.5) are now capable of outperforming an autoregressive model. Upon turning attention to spending on durable goods, prior to the modification of the time series, it was found that in no context was past information on consumer sentiment of any benefit for the purpose of prediction. Following the removal of the expenditure on vehicles, though, the value of the root mean square error for equation (3.2) exceeds that for each of the other three regression models, with equation (3.5) being able to lay claim to superiority.

Table 8. Computed Values of the S_1^* Statistic

Table 8 shows the results that are obtained from the application of the test for equal forecast accuracy that was proposed by Harvey, Leybourne, and Newbold (1997). More specifically, for each of five categories of consumption, the predictive performance of the benchmark model, equation (3.2), is formally contrasted with that of each of equations (3.3), (3.4) and (3.5). The forecast interval extends from 2008q1 to 2013q1, and predictions are generated following both recursive and fixed-period estimation of the respective functions.

From a study of the contents of the table, it can be identified that there are six (eleven) instances of S_1^* being significant at the five (ten) per cent level. Information on consumer confidence seems to be the most (least) useful for predicting the growth of expenditure on non-durable goods (services). Also, there appears to be a benefit from consulting the balances corresponding to the individual questions within the EU Consumer Survey as far as forecasting changes in spending on non-durable goods and durable goods less vehicles are concerned. However, with regard to household consumption of all goods and services less vehicles and expenditure on semi-durable goods, there is an absence of statistical support for adopting a disaggregated framework. Instead, the evidence advocates reliance upon a model incorporating the headline CCI for the purpose of prediction.

If the empirical findings are considered in association with the line graphs in Figure 1 then it seems that an approach which rests upon the use of individual balances towards characterising consumer sentiment may be beneficial for predicting the more volatile elements of household expenditure. In contrast, the summary measure (the CCI) may be suitable for forecasting those aspects of spending which follow a smoother path. Also, it is interesting to observe that the questions which are most productive for predicting the growth of consumption on non-durable goods require backward reflection (Question 3) or a current evaluation (Question 8). However, for forecasting movements in the expenditure on durable goods less vehicles, the pertinent questions are entirely forward-looking (Question 2, Question 4 and Question 9).

Robustness Checks[29]

When conducting an empirical analysis, it is essential to perform a check on the robustness of the results that have been obtained. Without confirmation that the same broad findings would have emerged from the implementation of an alternative framework or methodology, the fundamental conclusions could not be trusted to guide government policy or influence business decisions.

Some of the previous studies in the area of the relationship between household expenditure and consumer sentiment have sought to utilise a wider range of control variables than simply past values of the respective consumption variable. For example, Easaw and Heravi (2004) additionally incorporated in their models lags on measures of income and wealth, as well as a rate of interest. Consequently, an augmentation is applied to each of the equations, (3.2) – (3.5), to allow for the dependent variable to be influenced by earlier movements in cyclical and financial indicators.[30]

Second, as an alternative approach towards developing optimal combinations of balances corresponding to questions within the EU Consumer Survey, a principal components analysis is undertaken.[31] More specifically, initially, the first principal component is formed from simply the four constituent parts of the CCI. Subsequently, the exercise is repeated by using additionally the data on Q1, Q3, Q8 and Q9. Each of these linear combinations is subsequently employed as a replacement for the CCI in equation (3.3). Following Ordinary Least Squares estimation of the resultant models and the usual quantification of predictive

[29] In order to keep this sub-section to a manageable length, reporting of results is compelled to be somewhat selective. Comprehensive findings can be obtained, on request, from the corresponding author.

[30] For the purpose of investigating the relationship between US industrial production, the civilian rate of unemployment and the index of consumer expectations, Leeper (1992) demonstrated the sensitivity of the results to the addition of financial variables to the original vector autoregressive model.

[31] A standard reference for this topic is the textbook by Anderson (1984).

accuracy, once again, it is possible to reach a verdict concerning the benefit from accessing survey information beyond that which is contained within Q2, Q4, Q7 and Q11.

Table 9. Results Obtained from Estimating Equations (3.2) and (3.3) with Additional Control Variables (1986q2-2007q4)

In relation to the issue of suitable control variables, firstly, equations, (3.2) and (3.3), are extended to incorporate separately four lags on each of the first-difference of the percentage rate of unemployment (ΔU), the first-difference of the logarithm of real household disposable income (Δln(RHDI)) and the first-difference of the three-month Treasury bill yield (ΔTB).[32,33]

Comparable values of adjusted R-squared statistics to those which were shown earlier in Table 1 and Table 5 are presented in Table 9. From a consideration of the contents of this table, it seems that the findings are largely insensitive to the inclusion of the additional variables. In all but one of the twenty-one cases, the introduction of the lags on the CCI raises the value of the adjusted R-squared statistic. Furthermore, based upon the changes which occur to the latter, past movements in the confidence indicator are most closely connected to the current behaviour of total consumption expenditure and spending by households on durable goods.

Equations (3.4) and (3.5) are also accordingly amended to accommodate separately the further three control variables. Perhaps unsurprisingly, over the sample period, 1986q2 –

[32] The unemployment and income variables are selected on the grounds that they exhibit cyclical behaviour. With respect to the time period, 1986q2 – 2007q4, the sample correlation coefficients corresponding to CCI and ΔU and to CCI and Δln(RHDI) are -0.4607 and 0.0852, respectively. The Treasury bill yield was chosen as an instrument by Campbell and Mankiw (1989). In relation to CCI and ΔTB, the sample correlation coefficient equals 0.3627.

[33] Data on unemployment are the product of the Labour Force Survey, are seasonally-adjusted and correspond to males and females, aged 16-64 (LF2Q). The series on real household disposable income is also seasonally adjusted and is obtained from the Office for National Statistics (Quarterly National Accounts) (NRJA). The source of the quarterly data on the Treasury bill yield is the Bank of England's database (IUQAAJNB).

2007q4, a reasonably strong positive linear relationship is observed between Q7 and ΔU.[34] Such a connection possibly encourages the expectation that the incorporation of the latter in a regression model will serve to diminish the relevance of the former. In fact, within-sample results are found to be remarkably robust to the inclusion of four quarterly lags on each of ΔU, Δln(RHDI) and ΔTB. As merely one example, in the original equation (3.5) for the consumption of non-durable goods, the F probability values corresponding to Q3 and Q8 consisted of 0.0191 and 0.0483, respectively.[35] Following the addition to the specification of four lags on the extra control variables, the probability value for Q3 increases to no higher than 0.0459, while the maximum that is achieved for Q8 is 0.0643.

Also, with reference to the control variables which are engaged in this analysis, it can be reported that any of the supplements which occurs does not fundamentally alter the evaluation of the predictive capabilities of the different regression models. It may be recalled that a disaggregated approach towards forecasting was found to be most productive in the case of the growth of household expenditure on non-durable goods (Table 4) and durable goods less vehicles (Table 7). This assessment is undisturbed by, for example, extending equations (3.2) – (3.5) through the inclusion of lagged values of ΔTB. In the expanded context, for both of these consumption variables, the optimal specification is equation (3.5). More specifically, in terms of root mean square error, for the consumption of non-durable goods, the figure for equation (3.3) exceeds that for (3.5) by approximately 6.9 or 13.1 per cent, while, for spending on durable goods less vehicles, the surplus amounts to 5.5 or 12.4 per cent.[36]

Attention now turns to the principal components analysis which is undertaken. Adopting a sample period of 1985q1 – 2007q4, initially, the first principal component (PC1)

[34] The value of the respective sample correlation coefficient is 0.7805.
[35] See Table 3.
[36] In each case, there are two values on account of having undertaken both recursive and fixed-period estimation of the equations.

is created out of merely the four constituent elements of the CCI. More specifically, PC1 is formed from the linear combination, 0.6473Q2 + 0.3200Q4 – 0.3459Q7 + 0.5992Q11, which succeeds in accounting for 49.6 per cent of the variation in the respective four balances. Subsequently, the dataset is expanded to include Q1, Q3, Q8 and Q9, which permits a first principal component (PC2) to be assembled from a weighted sum of eight variables. More specifically, PC2 (= 0.4424Q1 + 0.3791Q2 + 0.4415Q3 + 0.2561Q4 – 0.3073Q7 + 0.2973Q8 + 0.3538Q9 + 0.3036Q11) is capable of explaining 54.3 per cent of the variation in the respective eight balances.

Table 10. Results Obtained from Estimating Equation (3.3) with PC1 and PC2 replacing CCI (1986q2 - 2007q4)

Following their construction, each of PC1 and PC2 is employed as a replacement for CCI in equation (3.3). Subsequently, Ordinary Least Squares estimation yields values of the adjusted R-squared statistic, which are shown in Table 10. The figures that are presented in the table reveal that there are only two cases out of seven in which the goodness of fit does not benefit from access to a wider range of survey data.

Table 11. Predictive Performances of Different Regression Models with PC1 and PC2 replacing CCI

Subsequently, the estimated equations including the four quarterly lags on PC1 and PC2 are employed for the purpose of predicting the growth of the different forms of consumption expenditure. Values of root mean square error statistics are recorded in Table 11. The figures in the table can be interpreted as recommending that, for the purpose of forecasting, consideration should be given to information from the EU Consumer Survey beyond that which contributes towards the value of the CCI. In particular, the accuracy of the predictions of the consumption of non-durable and semi-durable goods, as well as expenditure on durable goods less vehicles, appears to be enhanced through recourse to past data on PC2, rather than the CCI. Thus, to a large extent, the findings that are obtained from the principal components analysis seem to corroborate those which resulted from the implementation of the general-to-specific methodology.

V. Conclusion

The objective of this paper has been to give consideration to the usefulness of EU Consumer Survey data for the purpose of forecasting different categories of household consumption expenditure. Currently, the European Commission produces a measure of consumer sentiment – the CCI – by effectively calculating the average of the balances pertaining to four of the questions entering the survey. However, weaknesses that are identified with this approach suggest that the weights that are assigned to these components would be more suitably determined empirically. Also, there is an argument for looking beyond merely these four sub-indices for the purpose of assembling a predictive model of consumption.

It should be recognised that this is not the first study to attempt to establish the more pertinent aspects of the EU Consumer Survey for the purpose of forecasting household spending. However, the multi-country analyses that were performed by Dreger and Kholodilin (2013) and Jonnson and Linden (2009) were restricted to focusing upon predicting personal consumption expenditure on all goods and services. Also, in conjunction with UK data, although Easaw and Heravi (2004) undertook a disaggregated study with respect to consumer spending, they did not seek to combine the different balances in their specifications or to implement a formal testing procedure in an effort to refine a given model.

In the current paper, an econometric analysis was subsequently performed in conjunction with quarterly data on the UK. Through the application of a general-to-specific modelling procedure, optimal specifications were obtained for (the growth of) total household expenditure, as well as consumer spending on each of durable goods, non-durable goods, semi-durable goods, and services. Unfortunately, the forecast interval, which extended from 2008q1 to 2013q1, incorporated a period during which the Labour Government was attempting to provide a stimulus to the motor industry in the UK. For this reason, it was considered to be appropriate to apply a modification to the first two consumption variables by deducting the expenditure that was undertaken on vehicles.

From a comparison of the predictions that were achieved following estimation of the different econometric models, it was possible to conclude that:

- the accuracy of forecasts can generally be improved upon through utilising data on consumer sentiment;
- in particular, the forecasts of spending on non-durable goods and durable goods minus vehicles prosper from a disaggregated approach involving survey data beyond those which contribute towards the calculation of the CCI.

It should be noted that these inferences survive the extension of the analysis to include control variables, in addition to merely lags on the dependent (consumption) variable. Also, in large part, the same findings emerge from constructing principal components as are obtained from the application of general-to-specific modelling. Consequently, it would seem that use of the collective measure, the CCI, is still merited for those categories of consumption for which the behaviour over time is relatively smooth. However, for those types of expenditure which are more volatile, a disaggregated strategy appears to be beneficial.

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Appendices

A. The European Union Consumer Survey

Table A1. Questions Relating to the Joint Harmonised EU Consumer Survey

Table A1 indicates the twelve questions which comprise the EU's Consumer Survey. Nine of these questions (1, 2, 3, 4, 5, 6, 7, 9, 12) permit six possible answers, which have the interpretation of very positive (PP), positive (P), neutral, negative (M), very negative (MM) and don't know. A further two questions (10 and 11) offer only five options, by denying the opportunity for a neutral response. Finally, there are merely four potential replies to Question 8, which can be regarded as very positive, very negative, neutral and don't know.

For each of the twelve questions, through categorisation of the data that emanate from two thousand respondents in the UK, percentages can be attached to PP, P, M and MM. In each case, a percentage balance is calculated from PP + ½P – ½M – MM. The overall indicator of consumer confidence (the CCI) is produced by effectively forming an arithmetic average of the balances corresponding to four of the forward-looking questions, 2, 4, 7 and 11. On account of the limits applying to the balance which is connected to an individual question, the maximum value of the CCI is 100, while its lower bound is -100.

Table A2. Descriptive statistics relating to the balances arising from responses to questions entering the EU Consumer Survey (1985q1-2013q1)

Table 1. Results Obtained from Estimating Equations (3.2) and (3.3) (1986q2 - 2007q4)

Consumption Variable		n	Adjusted R-squared		BG(4)*
			Equation (3.2)	Equation (3.3)	
Total		4	0.1446	0.2412	6.0977 (0.1920)
Durable Goods		1	0.0071	0.1622	7.3950 (0.1164)
Semi-Durable Goods		0	0.0000	0.0137	3.6424 (0.4566)
Non-Durable Goods		1	0.1505	0.1827	5.0756 (0.2796)
Services		4	0.1450	0.1736	0.6202 (0.9608)

* BG(4) is the value of the Breusch-Godfrey chi-square statistic, which has been computed for the purpose of testing for up to fourth-order autocorrelation in the disturbance terms in equation (3.3). The accompanying figure in parentheses is the associated probability value.

Table 2. Results Obtained from Estimating Equation (3.4) (1986q2 - 2007q4)

		Value of F Statistic[+] (Probability Value)				
		Type of Household Consumption Expenditure				
Component		Total	Durable Goods	Semi-Durable Goods	Non-Durable Goods	Services
Q2		F(4, 70) = 2.7105 (0.0369)	F(4, 73) = 4.2964 (0.0035)	F(4, 78) = 2.6138 (0.0415)	-	-
Q4		F(4, 70) = 2.7729 (0.0336)	F(4, 73) = 3.4154 (0.0129)	-	-	F(4, 74) = 3.5201 (0.0110)
Q7		F(4, 70) = 6.2948 (0.0002)	F(4, 73) = 2.1783 (0.0798)	-	F(2, 83) = 2.4810 (0.0898)	F(4, 74) = 3.7294 (0.0081)
Q11		-	-	F(4, 78) = 2.0738 (0.0922)	-	-
n		4	1	0	1	4
Adjusted R-squared		0.3981	0.2703	0.0872	0.1791	0.2937
BG(4)		6.8711 (0.1429)	9.4308 (0.0512)	4.3206 (0.3644)	4.5962 (0.3313)	2.5148 (0.6420)

[+] This statistic relates to equation (3.4) and permits an exclusion test to be performed in conjunction with variable in the respective row.

Table 3. Results Obtained from Estimating Equation (3.5) (1986q2 - 2007q4)

		Value of F Statistic+ (Probability Value)		
		Type of Household Consumption Expenditure		
Balances		Total	Non-Durable Goods	Services
Q4		F(4, 70) = 3.5151 (0.0113)	-	F(4, 74) = 2.9496 (0.0255)
Q7		F(4, 70) = 5.2934 (0.0009)	-	F(3, 74) = 3.7714 (0.0141)
Q1		F(4, 70) = 3.2809 (0.0159)	-	-
Q3		-	F(3, 81) = 3.5036 (0.0191)	-
Q8		-	F(1, 81) = 4.0204++ (0.0483)	F(1, 74) = 2.9329++ (0.0910)
n		4	1	4
Adjusted R-squared		0.4146	0.2529	0.3182
BG(4)		3.9830 (0.4083)	4.6691 (0.3230)	2.7771 (0.5958)

+ This statistic relates to equation (3.5) and permits an exclusion test to be performed in conjunction with variable in the respective row.
++ With respect to the equations for the consumption of non-durable goods and expenditure on services, the single lag on Q8 corresponds to four and two quarters in the past, respectively.

Table 4. Predictive Performances of Different Regression Models

		Root Mean Square Prediction Error			
Consumption Variable		Equation (3.2)	Equation (3.3)	Equation (3.4)	Equation (3.5)
Total		0.0097 (0.0097)	**0.0089** (**0.0090**)	0.0103 (0.0107)	0.0105 (0.0108)
Durable Goods		**0.0362** (**0.0363**)	0.0399 (0.0394)	0.0443 (0.0462)	- (-)
Semi-Durable Goods		0.0133 (0.0138)	**0.0116** (**0.0117**)	0.0131 (0.0134)	- (-)
Non-Durable Goods		0.0167 (0.0174)	0.0142 (0.0150)	0.0141 (0.0154)	**0.0133** (**0.0133**)
Services		0.0115 (**0.0118**)	**0.0114** (0.0120)	0.0125 (0.0131)	0.0124 (0.0124)

The figures which are not contained in brackets are derived from recursive estimation of the respective equations. In contrast, the figures in parentheses are founded upon fixed-period estimation.
Values of statistics relate to the forecast interval, 2008q1-2013q1.
Minimum figures have been highlighted in bold.

Table 5. Results Obtained from Estimating Equations (3.2) and (3.3) (1986q2 - 2007q4)

Consumption Variable		n	Adjusted R-squared		BG(4)
			Equation (3.2)	Equation (3.3)	
Total less Vehicles		2	0.1125	0.1856	3.0163 (0.5551)
Durable Goods less Vehicles		2	0.0865	0.1013	3.6895 (0.4497)

Table 6. Results Obtained from Estimating Equations (3.4) and (3.5) (1986q2 - 2007q4)

		Value of F Statistic[+] (Probability Value)			
		Type of Household Consumption Expenditure			
Balances		Total less Vehicles	Durable Goods less Vehicles	Total less Vehicles	Durable Goods less Vehicles
		Equation (3.4)		Equation (3.5)	
Q2		F(4, 72) = 2.7534 (0.0344)	F(3, 78) = 2.0406 (0.1150)	-	F(3, 77) = 1.7381 (0.1662)
Q4		F(4, 72) = 3.3187 (0.0149)	F(3, 78) = 2.8664 (0.0419)	F(4, 69) = 4.7730 (0.0019)	F(3, 77) = 2.6230 (0.0565)
Q7		F(4, 72) = 6.6253 (0.0001)	-	F(4, 69) = 5.1167 (0.0011)	-
Q1				F(4, 69) = 3.2076 (0.0178)	-
Q9				F(3, 69) = 2.4906[++] (0.0674)	F(1, 77) = 2.9741[++] (0.0886)
n		2	2	2	2
Adjusted R-squared		0.3489	0.1275	0.4066	0.1490
BG(4)		2.0910 (0.7190)	1.0434 (0.9031)	5.0988 (0.2773)	1.3140 (0.8590)

[+] This statistic relates to equation (3.4) or (3.5) and permits an exclusion test to be performed in conjunction with variable in the respective row.
[++] With respect to the equation for total consumption less vehicles, the three lags on Q9 correspond to one, three and four quarters in the past. In the equation for the consumption of durable goods less vehicles, the single lag on Q9 corresponds to two quarters in the past.

Table 7. Predictive Performances of Different Regression Models

		Root Mean Square Prediction Error			
Consumption Variable		Equation (3.2)	Equation (3.3)	Equation (3.4)	Equation (3.5)
Total less Vehicles		0.0083 (0.0087)	**0.0070** (**0.0073**)	0.0080 (0.0085)	0.0078 (0.0077)
Durable Goods less Vehicles		0.0349 (0.0378)	0.0302 (0.0334)	0.0307 (0.0333)	**0.0281** (**0.0280**)

The figures which are not contained in brackets are derived from recursive estimation of the respective equations. In contrast, the figures in parentheses are founded upon fixed-period estimation.
Values relate to the forecast interval, 2008q1-2013q1.
Minimum figures have been highlighted in bold.

Table 8. Computed Values of the S_1^* Statistic

Consumption Variable		Comparison between the forecast accuracy of Equation (3.2) and that of:		
		Equation (3.3)	Equation (3.4)	Equation (3.5)
Total less Vehicles		1.9839* (2.2506**)	0.4072 (0.2621)	0.5882 (1.0750)
Durable Goods less Vehicles		1.4673 (1.7780*)	1.2121 (1.6203)	1.2634 (1.9731*)
Semi-Durable Goods		1.5217 (1.7935*)	0.1145 (0.1458)	- (-)
Non-Durable Goods		1.9811* (2.2377**)	2.5048** (2.8524**)	2.2559** (3.3779**)
Services		0.1064 (-0.3067)	-0.6245 (-0.9605)	-0.4748 (-0.3549)

The figures which are not contained in brackets are derived from recursive estimation of the respective equations. In contrast, the figures in parentheses are founded upon fixed-period estimation.
The forecast interval is 2008q1-2013q1.
The S_1^* statistic has been constructed such that a positive (negative) value indicates that equation (3.2) produces, on average, less (more) accurate forecasts than its rival.
The five (ten) per cent critical value of the t_{20} statistic is 2.086 (1.725).
Significance at the ten per cent level is denoted by *.
Significance at the five per cent level is denoted by **.

Table 9. Results Obtained from Estimating Equations (3.2) and (3.3) with Additional Control Variables (1986q2-2007q4)[+]

Consumption Variable	Adjusted R-squared					
	Additional Variable					
	ΔU		Δln(RHDI)		ΔTB	
	(3.2)	(3.3)	(3.2)	(3.3)	(3.2)	(3.3)
Total	0.2412	0.3198	0.1306	0.2323	0.1511	0.2611
Durable Goods	0.1332	0.2273	0.0751	0.2411	-0.0328	0.1578
Semi-Durable Goods	-0.0189	0.0168	0.0122	0.0373	-0.0062	0.0458
Non-Durable Goods	0.1567	0.1552	0.1549	0.1772	0.1329	0.1558
Services	0.2046	0.2264	0.1507	0.1755	0.1215	0.1533
Total less Vehicles	0.1962	0.2403	0.1176	0.1929	0.0946	0.1876
Durable Goods less Vehicles	0.0558	0.0615	0.1002	0.1215	0.0820	0.1546

[+] The original specifications were augmented to include four lags on each of the three variables.

Table 10. Results Obtained from Estimating Equation (3.3) with PC1 and PC2 replacing CCI (1986q2 - 2007q4)

Consumption Variable		n	Adjusted R-squared		
			CCI	PC1	PC2
Total		4	0.2412	0.2057	**0.2604**
Durable Goods		1	0.1622	0.0506	**0.2129**
Semi-Durable Goods		0	0.0137	0.0109	**0.0310**
Non-Durable Goods		1	0.1827	0.1341	**0.1969**
Services		4	0.1736	**0.2244**	0.1909
Total less Vehicles		2	0.1856	0.1500	**0.2231**
Durable Goods less Vehicles		2	**0.1013**	0.0595	0.1005

Maximum values of statistics are indicated in bold.

Table 11. Predictive Performances of Different Regression Models with PC1 and PC2 replacing CCI

		Root Mean Square Prediction Error			
		Original		With Replacements	
Consumption Variable		Equation (3.2)	Equation (3.3)	Equation (3.3) including PC1	Equation (3.3) including PC2
Total		0.0097 (0.0097)	**0.0089** (**0.0090**)	0.0104 (0.0114)	**0.0089** (0.0091)
Durable Goods		**0.0362** (**0.0363**)	0.0399 (0.0394)	0.0399 (0.0416)	0.0403 (0.0416)
Semi-Durable Goods		0.0133 (0.0138)	0.0116 (0.0117)	0.0148 (0.0159)	**0.0111** (**0.0109**)
Non-Durable Goods		0.0167 (0.0174)	0.0142 (0.0150)	0.0162 (0.0179)	**0.0133** (**0.0140**)
Services		0.0115 (**0.0118**)	**0.0114** (0.0120)	0.0134 (0.0143)	**0.0114** (0.0119)
Total less Vehicles		0.0083 (0.0087)	**0.0070** (**0.0073**)	0.0091 (0.0104)	0.0071 (**0.0073**)
Durable Goods less Vehicles		0.0349 (0.0378)	0.0302 (0.0334)	0.0366 (0.0408)	**0.0269** (**0.0289**)

The figures which are not contained in brackets are derived from recursive estimation of the respective equations. In contrast, the figures in parentheses are founded upon fixed-period estimation.
Values of statistics relate to the forecast interval, 2008q1-2013q1.
Minimum figures have been highlighted in bold.

Table A1. Questions relating to the Joint Harmonised EU Consumer Survey

Question Number	Question
1.	How has the financial situation of your household changed over the last twelve months?
2	How do you expect the financial position of your household to change over the next twelve months?
3.	How do you think the general economic situation in the country has changed over the past twelve months?
4.	How do you expect the general economic situation in this country to develop over the next twelve months?
5.	How do you think that consumer prices have developed over the last twelve months?
6.	By comparison with the past twelve months, how do you expect that consumer prices will develop in the next twelve months?
7.	How do you expect the number of people unemployed in this country to change over the next twelve months?
8.	In view of the general economic situation, do you think that now it is the right moment for people to make major purchases such as furniture, electrical/electronic devices, etc.?
9.	Compared to the past twelve months, do you expect to spend more or less money on major purchases (furniture, electrical/electronic devices, etc.) over the next twelve months?
10.	In view of the general economic situation, do you think that now is …… ?: a very good moment to save; a fairly good moment to save; not a good moment to save; a very bad moment to save; don’t know.
11.	Over the next twelve months, how likely is it that you save any money?
12.	Which of these statements best describes the current financial situation of your household?: we are saving a lot; we are saving a little; we are just managing to make ends meet on our income; we are having to draw on our savings; we are running into debt; don’t know.

Table A2. Descriptive statistics relating to the balances arising from responses to questions entering the EU Consumer Survey (1985q1-2013q1)

Variable	Mean	Standard Deviation	Correlation Coefficient*
Question 1	-9.6322	9.9627	0.8444
Question 2	0.7086	8.1835	0.8110
Question 3	-30.335	19.709	0.8697
Question 4	-12.236	11.010	0.7038
Question 5	16.530	16.432	-0.7233
Question 6	26.705	12.457	-0.1685
Question 7	24.671	16.631	-0.7868
Question 8	2.9136	16.337	0.6082
Question 9	-15.573	8.9930	0.6856
Question 10	12.128	15.507	0.3516
Question 11	-3.0608	11.472	0.4849
Question 12	15.207	5.9916	0.6290

* indicates the sample correlation coefficient relating to the CCI and the specified balance.

Figure 1. Quarterly Data on UK Household Consumption Expenditure (£million, constant (2010) prices, seasonally adjusted)

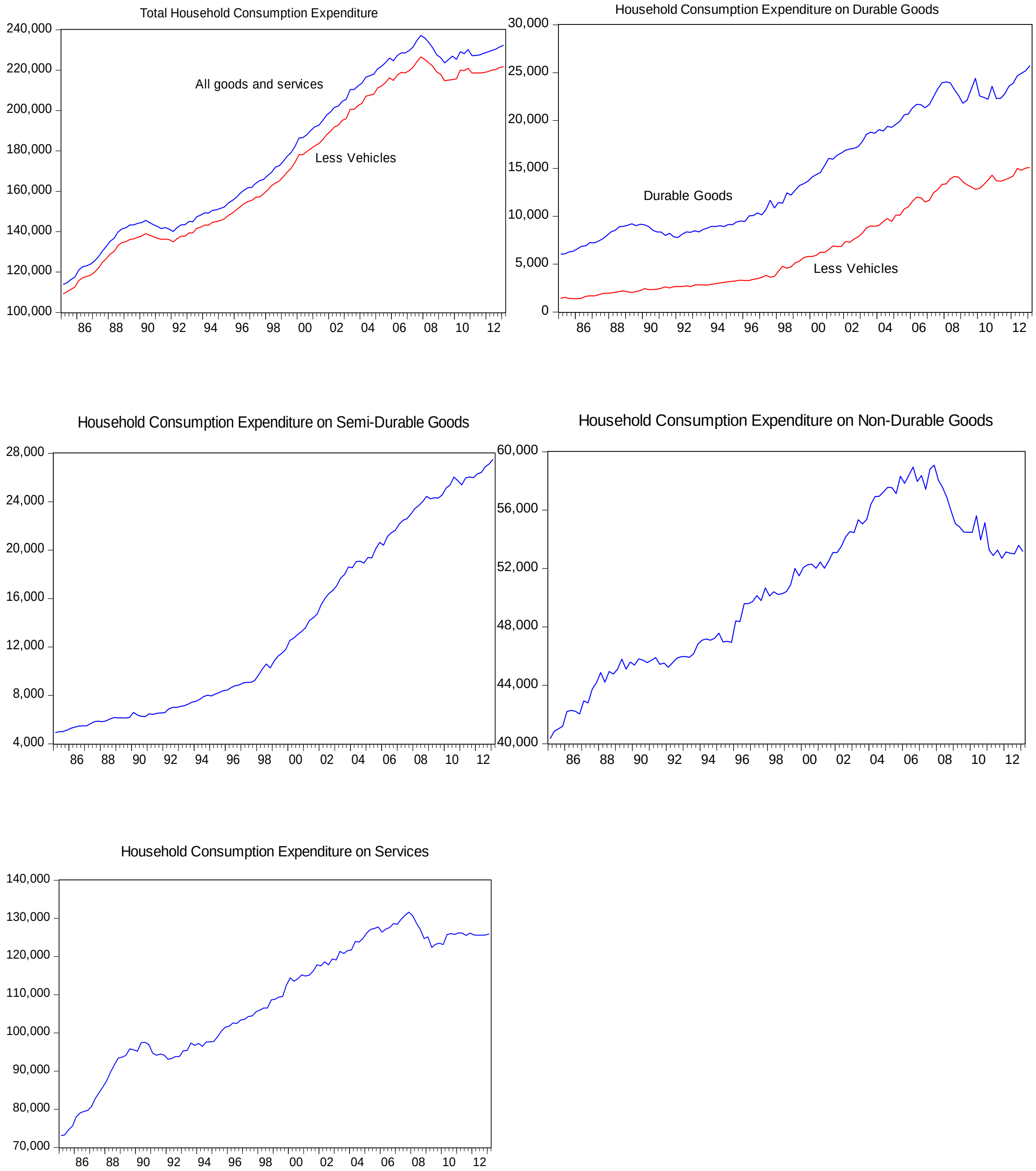

Figure 2. The European Commission Consumer Confidence Indicator (CCI)