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Would information on consumer confidence have helped to predict UK household expenditure during the recent economic crisis?

I. Introduction

Over the duration of the long run, the amount of expenditure which is undertaken by households is necessarily constrained by economic and financial considerations. However, over the course of the short run, it is conceivable that this form of spending is determined additionally by psychological factors. To the extent that a measure of consumer confidence at least partly reflects the prevailing mood of a representative sample of households, such a possibility has encouraged numerous researchers to investigate whether or not predictions of consumption expenditure can be improved upon by making use of consumer survey data. Indeed, in the review article by Curtin (2007),[1] reference is made to thirty-five studies which have sought to examine the forecasting capabilities of intentions data. The respective publication years range from 1955 to 2004, such that the collection includes the seminal contributions of Carroll et al. (1994) and Ludvigson (2004). Subsequently, empirical analysis has been conducted in this area by, inter alia, Cotsomitis and Kwan (2006), Jonsson and Linden (2009) and Al-Eyd et al. (2009). Emphasis is given to these

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[1] Specifically, within footnote 1, p. 9.

three papers for the reason that, in terms of the data that form the basis of the results, they show the closest relationship to the current inquiry.

The recent financial crisis which was endured by western economies could be regarded as having begun on 9th August 2007, when BNP Paribas became the first major bank to acknowledge exposure to sub-prime mortgage markets. Correspondingly, from August 2007 to January 2009, there occurred an unprecedented fall in consumer confidence in the UK of 32.8 percentage points.[2] While sentiment had more than fully rebounded by February 2010, there proceeded to take place another sizeable decrease of 23.4 percentage points by the end of 2011.[3] This considerable volatility which has been exhibited by consumer confidence would seem to render the period from 2008 as an ideal interval over which to assess whether or not recourse to data which purport to reflect the degree of optimism or pessimism within the household sector can serve to improve forecasts of the growth of consumption expenditure.

Hence, in this paper, the objective is to construct and estimate models of UK consumption expenditure, including and excluding indicators of consumer sentiment, in order to investigate whether or not predictive accuracy can be enhanced through the addition of a psychological component. The empirical analysis is founded upon quarterly, seasonally-adjusted data. Throughout, a common estimation period is employed, which stretches from 1986q2 to 2007q4. Correspondingly, forecasts are

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[2] The calculation is founded upon monthly, seasonally-adjusted data which have been compiled by the European Commission, Directorate-General for Economic and Financial Affairs. The previous largest decline was equal to 25.9 percentage points, between July 1988 and September 1990.
[3] While the initial steep fall in confidence appeared to be connected to the banking crisis which had its roots in the US, the subsequent decline corresponded to a recognition of debt problems within the Euro zone and the announcement of an extensive austerity programme by Chancellor of the Exchequer, George Osborne.

generated over the interval, 2008q1-2013q1, which thereby incorporates the recent economic crisis. As recommended by Curtin (2007), a disaggregated approach is adopted, in the sense that specifications are formed to explain the behaviour of not only total consumption expenditure but also its four constituent parts. Within this study, the extent of consumer confidence is represented by a harmonised measure which is assembled by the European Commission.[4] However, motivated by statistical and psychological theory, modifications are also applied to the headline variable in a quest to achieve more positive results.[5]

The potential findings of this paper have important implications for macroeconomic policy. For example, if it is discovered that movements in consumer confidence are of relevance for the future behaviour of aggregate consumption expenditure then a suitable monetary policy could be implemented at an earlier stage, which would help to achieve the objective of sustainable economic growth. Also, by virtue of performing analysis at a disaggregated level, it is possible to discern whether or not all categories of household spending are equally sensitive to changes in consumer sentiment. A popular view (e.g., Garner (1991)) is that the higher is the probability of future financial distress, the lower will be consumer confidence, and the greater will be the desire to hold assets in a liquid form. Consequently, there will be a reduced willingness to acquire durable goods when households perceive increased financial risks. Accepting this argument, expenditure

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[4] An advantage of choosing the harmonised measure is that the scope exists to repeat this study using corresponding data on several other European Union countries.

[5] Indeed, this would seem to be a distinctive aspect of this paper. Previous contributions (e.g., Easaw and Heravi (2004), Wilcox (2007)) have sometimes sought to evaluate the predictive performance of the respective parts of an aggregate measure of consumer sentiment but refrained from adapting these alternative headline indicators in an attempt to achieve greater accuracy.

on durable goods is the component of total consumption which would suffer to the greatest extent from a more apprehensive outlook.

The paper proceeds in the following way. In the second section, the principal data series which feature in this study are presented and their chief characteristics are highlighted. In the third section, a theoretical explanation is provided of the framework that is used for analysis. The empirical results are reported and discussed in the fourth section, with particular emphasis being given to the relative accuracy of out-of-sample predictions. Finally, the main findings are summarised and conclusions are reached.

II. Characteristics of the Data Series

Within this study, the aim is to compare the capabilities of different econometric models in respect of forecasting the quarterly growth of five different types of consumption in the UK. Consideration is given to not only total household expenditure but also the more specific categories of spending, on durable goods, semi-durable goods, non-durable goods, and services. Quarterly, seasonally-adjusted data in the form of constant prices have been obtained from the Office for National Statistics.[6] Line graphs of the respective time series, covering a period which extends from 1985q1 to 2013q1, are presented in Figure 1, below.

Figure 1

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[6] The codenames which are allocated by the Office for National Statistics to the respective series are 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).

Observation of the first line graph in Figure 1 shows that, for the most part, total consumption expenditure has been increasing. Indeed, between 1992q2 and 2007q4, there were only four quarters in which the growth rate was not positive. However, two distinct downward movements are visible. First, from 1990q2 to 1992q1, spending decreased by 3.78 per cent. Also, from 2007q4 to 2009q2, a decline was experienced of 5.70 per cent. Although, consumption expenditure has subsequently risen, by 2013q1, its value was still lower than in 2007q3.

It is evident from viewing the remaining graphs that the movements in the four components of total consumption expenditure can sometimes be markedly dissimilar from one another. The most striking difference appears to be between the behaviour of spending on non-durable and semi-durable goods. Expenditure on the latter seems to have risen in a largely uninterrupted fashion.[7] Even since the end of 2007, there have been only five occasions (out of twenty-one) of a decrease. Moreover, in 2013q1, spending on semi-durable goods represented the largest amount that had ever been recorded. In contrast, expenditure on non-durable goods has exhibited far greater volatility. In particular, between 2007q4 and 2011q4, demand declined by 10.79 per cent. Also, in 2013q1, consumption of non-durable goods was still below its level in 2002q2.

For the reason that spending on services constitutes the largest proportion of total household consumption expenditure in the UK, it is perhaps to be expected that the line graph at the foot of Figure 1 resembles quite closely the initial time plot.[8] Hence,

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[7] In fact, household consumption expenditure on semi-durable goods fell in 18 out of 112 quarters between 1985q1 and 2013q1.
[8] For the period as a whole, expenditure on services represented, on average, almost sixty-one per cent of total consumer spending.

in spite of predominantly rising, there have been two instances of declining consumption of services. Between 1990q3 and 1992q1, there occurred a 4.56 per cent reduction, while the period from 2007q4 to 2009q2 is associated with a fall of 7.02 per cent. As a consequence of the latter development, in 2013q1, household expenditure on services was still below its level in 2006q1.

Finally, personal consumption expenditure on durable goods was subject to a significant decrease from 1989q2 to 1992q1, which was equal to 15.49 per cent. Thereafter, from 1992q1 to 2008q1, the quarterly growth rate was largely positive.[9] A further observation is the somewhat lumpy behaviour of this form of spending towards the end of the data period. A contributing factor was the car scrappage scheme that was implemented by the most recent Labour Government, which provided a financial incentive to purchase a new car in 2009. Although demand fell through the first three quarters of 2010, it subsequently rebounded to the extent that, by 2013q1, household expenditure on durable goods had reached a maximum.

The Joint Harmonised EU Consumer Survey involves responses by two thousand individuals in the UK every month to twelve questions. These questions are presented in Table 1, below. For nine of the questions, the individual is provided with the choice of five possible answers (very favourable (++), favourable (+), neutral (=), unfavourable (-), very unfavourable (--)), as well as the opportunity to reply that he/she does not know (N). For questions 10 and 11, there is no potential to express neutrality. Finally, for question 8, in addition to an answer of do not know, there are only three options, very favourable, neutral and very unfavourable.

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[9] It should be added, though, that the rate of growth was not exactly even over this interval. From 1992q1 to 1998q2, the average quarterly percentage change in expenditure on durable goods equalled 1.49 per cent, which contrasts with a figure of 1.90 per cent for the period, 1998q2-2008q1.

Table 1

For each question, a percentage balance is produced in the following way. The answer that is provided by each member of the sample is allocated a value of 1, ½, -½ or -1, according to whether the response is ++, +, - or --, respectively. Also, a value of zero is assigned to an indication of neutrality. The scores of the participants in the survey are subsequently added together and the sum which is achieved is expressed as a percentage of the number of replies to the question. Therefore, it follows that, in each month, the balance that is attached to an individual question has the potential to range from -100 to 100. The European Commission constructs an overall measure of consumer confidence (CCI) by combining the balances corresponding to only four of the questions. More specifically, an arithmetic average is calculated of the percentages relating to questions 2, 4, 7 and 11. It may be noted that all four of the questions require an expectation to be formed of future developments concerning either the macroeconomic situation or the financial position of the household..

Through accessing the website of the European Commission (Economic and Financial Affairs),[10] it is possible to obtain monthly, seasonally-adjusted data on CCI for the UK, commencing in January 1985. A parallel quarterly time series is achieved by calculating the averages of the respective three monthly figures, and is shown in Figure 2, below.

Figure 2

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[10] http://ec.europa.eu/economy_finance/db_indicators/surveys/index_en.htm

From viewing the line graph, it is apparent that there is a lack of any trend in the time series. However, there have been occasions on which the value of CCI has been relatively high (e.g., 1987q2-1988q3 and 1995q3-2008q1). Also, there have been four instances of troughs, specifically, 1989q4-1991q3, 1992q3-1994q2, 2008q2-2009q2 and 2010q3-2013q1. Over the full data period, the average value of the indicator is -9.81, thus implying that households are generally pessimistic about future financial and economic conditions. On account of the manner of its construction, the series on CCI is anticipated as being stationary. Such a characteristic is confirmed following the application of a unit root test. In particular, the computed value of an augmented Dickey-Fuller test statistic is -3.1206, which is associated with a probability value of 0.0279.[11] Hence, for the purpose of entering subsequent regression models, there is no need to undertake a transformation of the confidence variable.[12]

III. Underlying Theory and Framework for Analysis

Models which have entered earlier empirical studies of the usefulness of an indicator of consumer sentiment for predicting the growth of household expenditure have tended to be quite similar in nature (e.g., Carroll et al. (1994), Bram and Ludvigson (1998), Ludvigson (2004), Cotsomitis and Kwan (2006), Wilcox (2007), and Al-Eyd et al. (2009)). More specifically, it is possible to regard their origins as lying within the Rational Expectations-Permanent Income Hypothesis (REPIH). The inclusion of

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[11] Using the Schwarz (Bayesian) Information Criterion, one lag on the dependent variable was deemed to be optimal in the test equation.

[12] The augmented Dickey-Fuller test still seems to be the most frequently conducted unit root test, even though its shortcomings have been well documented. However, the same broad conclusion is drawn when performing a Dickey-Fuller Generalised Least Squares test. The computed value of the test statistic is -2.0680, which compares with a five per cent critical value of -1.9437. In this context, the Schwarz criterion favours no lags on the dependent variable.

consumer confidence within the respective equations can be justified by accepting the presence of income uncertainty.

For simplicity, a two-period analysis is conducted which initially assumes an absence of money illusion and the formation of point expectations by households. The budget constraints which apply to time periods 1 and 2 are shown below.

$$c_1 \; + \; A_1 \; = \; y_1 \; + \; (1 + r_0)A_0 \tag{1}$$

$$c_2 \; + \; A_2 \; = \; y_2^e \; + \; (1 + r_1^e)A_1 \tag{2}$$

With respect to equations (1) and (2), all of the variables are contained in real terms. Furthermore:

c_j = Household consumption expenditure in period j (j = 1, 2);

A_j = Assets which have been accumulated by the end of period j (j = 0, 1, 2);

y_j = After-tax non-property income in period j (j = 1, 2);

r_j = Rate of interest which applies to the assets in period j (j = 0, 1);

e = A point (rational) expectation of the value of the associated variable.

The assumption is made that a household is seeking to maximise lifetime utility, U. On the basis of additive preferences:

$$U \; = \; u(c_1) + \; \frac{1}{1 + \delta} \; u(c_2) \tag{3}$$

With regard to equation (3), $u(c_j)$ $(j = 1, 2)$ denotes the utility that is derived from an individual period's consumption, where $u'(c_j) > 0$ and $u''(c_j) < 0$. Also, δ (≥ 0) signifies a subjective rate of time preference.

More specifically, if the single-period utility function is assumed to be associated with the property of a constant elasticity of substitution (σ) then:

$$u(c_j) = c_j^{-\rho}, \qquad (j = 1, 2), \qquad (4)$$

where $\sigma = (1 + \rho)^{-1}$. Consequently, the Euler equation, which is obtained by equating $\partial U/\partial A_1$ with zero, can be expressed as:

$$c_1^{-1/\sigma} = \frac{(1 + r_1^e)}{(1 + \delta)} c_2^{-1/\sigma} \qquad (5)$$

Upon application of a logarithmic transformation, there is achieved:

$$log.(c_2) - log.(c_1) = \sigma[log.(1 + r_1^e) - log.(1 + \delta)] \qquad (6)$$

Assuming that the subjective rate of time preference and the expected real rate of interest are constant, the introduction of a stochastic term, ε, enables the general equation, below, to be obtained:

$$\Delta log.(c_t) = constant + \varepsilon_t \qquad (7)$$

It should be respected that the constant would be zero were the expected rate of interest to be the same as the subjective rate of time preference. Within the context of the REPIH, ε_t is orthogonal to all information which is available in period t - 1, and reflects the impact of news on permanent income. On account of the implied properties of the disturbance term, a very straightforward approach is available for the purpose of testing the validity of the theory. The recommended practice is to add, as explanatory variables, lagged terms to the right-hand side of equation (7). Following the application of Ordinary Least Squares estimation, should the augmented regression model be found to be statistically significant at a conventional level then the REPIH is interpreted as being refuted by the data.[13]

There are several regards in which the analysis which gave rise to equation (7) may be considered to be unjustifiably restrictive. A suggested form of limitation is that it does not entertain the possibility of precautionary saving in the presence of income uncertainty. In order to accommodate this feature of household consumption behaviour, Muellbauer and Lattimore (1995) introduced the concept of certainty equivalent income. The latter can be derived from the point expectation of future income through the application of a weighting factor which is inversely dependent upon the variance of future income. In a situation, then, in which increased uncertainty becomes attached to a given set of projections of future income, consumption growth will fall below the prediction that is founded upon equation (7). Moreover, if shifts in consumer sentiment offer an insight into changes in the perception by households of the variance which is associated with future income

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[13] It must be recognised that this theoretical analysis is suitable for consumer goods and services which cease to yield utility after the period in which they were purchased. Mankiw (1982) has shown that, for durable goods, the disturbance term behaves in accordance with a first-order moving average process. However, he found this theoretical result to be soundly contradicted by US data.

then an explanatory role would be open to an indicator of consumer confidence in a model of consumption.

Consequently, the more general model of consumption which has tended to feature in earlier empirical studies is equation (8):

$$\Delta log.(Cons_t) \ = \ \alpha \ + \ \gamma \, Z_{t-j} \ + \ \varepsilon_t. \tag{8}$$

With regard to the above equation, *Cons* denotes household consumption expenditure (expressed in the form of constant prices) and Z_{t-j} constitutes a vector of predetermined variables. Every variable that enters Z_{t-j} corresponds to a past period of time; hence, the presence of this term allows for a departure of the behaviour of consumption from that which conforms to the REPIH. On the basis of the argument that was supplied in the previous paragraph, it would be appropriate for Z_{t-j} to accommodate one or more lags on consumer confidence. Additionally, though, in related studies (e.g., by Carroll et al. (1994), Ludvigson (2004) and Cotsomitis and Kwan (2006)), the vector has incorporated lags on the dependent variable, as well as factors that are considered to be relevant to the consumption decision (e.g., real income, real stock prices, a short-term rate of interest and the rate of unemployment).[14, 15]

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[14] Please respect that should any of the parameters which are contained within γ possess a value which is different from zero then the behaviour of consumption contradicts the REPIH.
[15] Given the focus of their papers, both Carroll et al. (1994) and Cotsomitis and Kwan (2006) present the corresponding equations such that consumer sentiment is separate from the other (control) variables.

IV. Empirical Methodology and Analysis

Empirical Methodology

Equation (9), below, which is a particular version of equation (8), serves as the general model of consumption in the forthcoming empirical analysis.

$$\Delta log.(Cons_t) = a + \sum_{j=1}^{n_1} b_j \, CCI_{t-j} + \sum_{j=1}^{n_2} c_j \, \Delta log.(Cons_{t-j}) + \varepsilon_t \qquad (9)$$

It can be seen that, in the above equation, the predetermined variables are limited to consisting of lagged values of consumer confidence and the dependent variable. Carroll et al. (1994) admit to the choice of control variables being somewhat arbitrary. Hence, initially, at least out of a desire to achieve parsimony, the specification is kept to a minimum.

With regard to equation (9), five different forms of household spending take turns at fulfilling the role of the consumption variable. More specifically, $Cons$ is represented by household expenditure in total, as well as that on each of durable goods, semi-durable goods, non-durable goods, and services. All of the equations are estimated over a sample period which extends from 1986q2 to 2007q4.

In connection with equation (9), a key decision concerns the number of lags to include on each of the two variables. A standard approach is to begin by imposing maximum values on n_1 and n_2, and then to assess whether or not smaller values are

preferable through utilising a recognised information criterion or undertaking sequential testing. For the confidence variable, it would seem to be appropriate to permit as many as four quarterly lags, given that each of the component questions of CCI requires the individual to contemplate developments over the course of the next year. On the grounds of symmetry, a maximum value of n_2 equal to four is justifiable. Additionally, this would seem to be the convention in earlier studies (e.g., Ludvigson (2004), Cotsomitis and Kwan (2006) and Wilcox (2007)).

For the purpose of establishing optimal values of n_1 and n_2, the implementation of a sequential testing procedure is favoured. On the basis that the most general model is acceptable, having applied the customary diagnostic tests,[16] an exclusion F test may be performed in order to assess whether or not a more specific representation accords with the data. Hence, in order for a more concise equation to be regarded as suitable, the computed value of the F statistic must not exceed the corresponding critical value. Furthermore, the probability value that emanates from the Breusch-Godfrey test must be at least as large as the chosen significance level. Finally, it should be added that the eventual regression model is compelled to retain at least two lags on CCI to ensure that two rival models are available which will permit an evaluation of the usefulness of consumer survey data for predicting the growth of consumption expenditure.[17]

It is apparent from the outline of the empirical methodology, above, that the potential issue of autocorrelation in the disturbance terms is dealt with via the dynamic specification of the regression function (equation (9)), rather than through

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[16] In this context, most notably, a Breusch-Godfrey test for autocorrelation in the disturbance terms.
[17] The incorporation of two lags on the CCI amounts to allowing for both the level and the change in consumer sentiment, one quarter in the past, to influence the dependent variable.

assuming that a particular statistical process underlies the value of ε_t. On the basis that application of the diagnostic tests reveals no econometric problems and that the regressors are comprised of merely past values of variables then Ordinary Least Squares constitutes a valid method of estimation.

Having established the optimal numbers of lags on the two variables, an F test is conducted of the null hypothesis, Ho: $b_j = 0$ (j = 1, 2, ……, n_1). A second approach towards quantifying the usefulness of CCI_{t-j} (j = 1, 2, ……, n_1) in terms of explaining the variation in $\Delta log.(Cons_t)$ is to estimate the preferred regression model with and without the confidence variable, and to proceed to undertake a comparison of corresponding values of the adjusted R-squared statistic. This follows the practice of, inter alia, Ludvigson (2004) and Cotsomitis and Kwan (2006).

The principal concern, though, is with the relative performance of an equation in producing out-of-sample predictions of the growth of consumption. Hence, for each of the five categories of household expenditure, the estimated form of the favoured model is employed to generate one-quarter-ahead forecasts of the dependent variable over the interval, 2008q1-2013q1. Predictions are similarly obtained, utilising the same specification but without the lags on CCI. Whether or not information on consumer confidence succeeds in improving the quality of forecasts can be gauged by contrasting values of the root mean square prediction error. Also, for a more formal assessment of whether or not there is a difference in predictive accuracy that is achieved by two rival models, there is available a statistical test that has been recommended by Harvey et al. (1997), which has previously been applied in a similar study by Easaw and Heravi (2004).

In the context of producing one-step-ahead forecasts, the application of the test that was proposed by Harvey et al. (1997) requires calculation of the value of a statistic, $S_1^* = S_1 \sqrt{(n-1)/n}$, where n denotes the number of predictions and S_1 is formed by dividing the mean of the difference in the corresponding squared forecast errors $(\bar{d})$ by the associated standard error $(s.e.(\bar{d}))$. Subsequently, the computed value of S_1^* is contrasted with a critical value that is extracted from the table of the t distribution, which is attached to v = n – 1 degrees of freedom.[18]

Empirical Results

Table 2, below, shows the results which are achieved from having applied Ordinary Least Squares estimation to the optimal form of equation (9) for each of the five consumption variables. The regression function is estimated both including and omitting the past values of CCI. The table indicates the change in the value of the adjusted R-squared statistic as a consequence of allowing lags on the sentiment measure to enter the model. Additionally, it reports the outcome of an exclusion F test which is performed in conjunction with CCI_{t-j} (j = 1, 2, ……, n_1). Finally, in order to confirm that the dynamics of each specification are acceptable, there are presented values of the Breusch-Godfrey statistic, along with the corresponding marginal levels of significance.

Table 2

The entries in the first two columns of Table 2 reveal that, for both total consumption expenditure and household spending on services, none of the four lags

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[18] The design of S_1 is such that a positive value signifies that, on average, the equation which includes the confidence indicator yields more accurate predictions.

on the two variables have been excluded from the general equation. In contrast, the specification for expenditure on semi-durable goods is the most concise that is admissible. Finally, the equations for spending on durable and non-durable goods require the presence of only one lag on the dependent variable, while accommodating two and three lags, respectively, on CCI.

Regarding the third column, it is apparent that, for each type of household expenditure, the value of the adjusted R-squared statistic is enhanced by the inclusion of lags on CCI in the respective equation. It is evident that the greatest gains are registered for consumer spending in aggregate and on durable goods, alone. Indeed, the probability values corresponding to the exclusion tests testify that it is only for these two types of consumption that the increase is significant at the five per cent level.

Thus, the conclusion that can be reached from the within-sample exercise that has been performed is that consumer confidence constitutes a contributing factor towards the short-run behaviour of at least some forms of household expenditure in the UK. However, a more worthwhile assessment of the relevance of consumer sentiment is derived from generating out-of-sample predictions of the five consumption variables. In particular, in this study, the objective is to examine whether or not information on recent movements in CCI is capable of increasing the accuracy of forecasts of the growth of different types of consumption over the period of economic downturn (2008q1-2013q1).

For each consumption variable, one-quarter-ahead predictions are produced using two different sample regression functions, namely, the estimated versions of equation (9), including and excluding the lags on CCI. For the purpose of obtaining the twenty-one forecasts, a preference is exhibited for relying upon models that have been estimated over a fixed interval, 1986q2-2007q4. The adoption of a recursive approach is rejected on account of concern over the possible distortion to estimates of parameters emanating from the Labour Government's attempt to bring expenditure on new cars forward (to before the beginning of 2010) through the implementation of a car scrappage incentive scheme.

For each of the five consumption variables and for each of the two forms of equation (9) (i.e., including and excluding the lags on CCI), the value of the root mean square prediction error statistic is calculated. Additionally, for each pair of rival models, the value of the S_1^* statistic is computed. These results are shown in Table 3.

Table 3

Upon comparing the figures which are presented in the first and second columns, it is apparent that the equation which accommodates CCI yields superior forecasts in three out of five cases. Regarding the final column, each of the computed values of the S_1^* statistic should be contrasted with a critical value corresponding to a $t_{v = 20}$ distribution. On the basis that $t_{\alpha/2 = 0.05, v = 20} = 1.725$, two significant results are achieved. For both expenditure on semi-durable goods and (especially) consumption

of non-durable goods, the evidence suggests that, by consulting data on consumer sentiment, decidedly improved predictions can be obtained.[19]

Finally, within this sub-section, it should be mentioned that, as a means of checking on the robustness of the results, the statistical analysis is repeated in conjunction with an augmented version of equation (9). More specifically, the regression function is extended to include as explanatory variables four quarterly lags on each of the first-difference of the logarithm of real household disposable income, the change in the percentage rate of unemployment, and the change in the three-month Treasury bill yield. It should be emphasised that, in implementing the empirical methodology that was outlined in the previous sub-section, the four lags on the additional variables remain ever present in the model. The broad findings to emerge are the same as earlier, i.e., reference to data on CCI significantly improves the accuracy of the forecasts only for expenditure on semi-durable and non-durable goods. Interestingly, for each of the five types of household spending, the value of the root mean square prediction error increases when permitting a greater number of control variables to accompany lags on sentiment, which could be construed as support for adopting the principle of parsimony.[20]

Alternative Measures of Consumer Confidence

The results which were produced and subsequently displayed in Table 3 indicate that allowing data on CCI to enter the analysis enables the accuracy of forecasts of the growth of certain types of consumption expenditure to be enhanced. As has been

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[19] It would seem, then, that, in general, the findings from the within-sample analysis are not a reliable guide to post-sample predictive performance.
[20] Detailed results can be obtained on request from the corresponding author.

mentioned earlier in this paper, a monthly value of the aggregate measure of consumer confidence is based upon answers to four forward-looking questions. For two reasons, there may be a preference for excluding Question 11 from the calculation. First, from the application of unit root tests which are performed at a conventional level of significance, it is possible to infer that the time series relating to Question 11 is non-stationary.[21] Second, in contrast to the other three questions, a common answer may have different implications for the subsequent behaviour of household spending. For example, the intention to save money over the following twelve months may be derived from a precautionary motive, i.e., the accumulation of funds in order to offset (anticipated) future falls in income. In such a case, a commitment towards savings would be combined with a contraction of expenditure. Alternatively, a positive approach towards savings may originate from an optimistic outlook with respect to income growth, which permits simultaneously an increase in consumption.

Consequently, the decision is taken to proceed by conducting analysis in conjunction with a modified measure of consumer confidence. More specifically, CCI^* is achieved by calculating an arithmetic mean of the percentage balances corresponding to merely questions 2, 4 and 7. The same empirical methodology is implemented as was outlined in the first sub-section, but with CCI^* replacing CCI in equation (9). For the reason of brevity, only the post-sample results are presented in this paper (in Table 4). Corresponding to Table 2, values of relevant statistics and associated probability values are available on request from the nominated author.

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[21] Both augmented Dickey-Fuller and Dickey-Fuller Generalised Least Squares tests are undertaken. The computed values of the test statistics are -1.3831 and -1.0478, respectively, which are considerably greater than the corresponding ten per cent critical values. For each of the other three questions, the evidence is sufficiently strong to be able to refute the notion that the associated series is non-stationary.

Table 4

A study of Table 4 reveals that, as a consequence of CCI* replacing CCI, the dynamic specification of equation (9) alters for both expenditure in total and spending on non-durable goods. Coincidentally, the figures in the final column indicate that only for these two forms of consumption is the computed value of S_1^* significant at a conventional level. However, perhaps the most interesting finding is that, for every one of the five forms of household expenditure, with the exception of spending on durable goods, recourse to the data on CCI* helps to produce a smaller value of the root mean square prediction error than when making use of CCI.[22]

An attempt is now made to achieve further advancements in predicting the growth of different types of household expenditure by virtue of involving data that are derived from a question which features within the EU Consumer Survey but does not contribute towards the aggregate measure (CCI). From two perspectives, it is appealing to exploit the information that is gathered from responses to Question 3. First, typically, the forecasts which have been produced over the interval, 2008q1-2013q1, fail to capture the full extent of the volatility that is displayed by the respective consumption variable. Hence, there is a desire to include in the analysis the question which is associated with the largest standard deviation.[23] Second, within the field of cognitive psychology, it has been argued that respondents to surveys exhibit a tendency to be overoptimistic about future economic developments, especially concerning their own personal circumstances. In an award-winning article,

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[22] This conclusion is based upon a comparison of the figures in the second columns of Table 3 and Table 4.
[23] Table 5 contains descriptive statistics pertaining to the twelve questions that contribute towards the EU consumer survey.

Bovi (2009) explains that households produce forecasts by identifying familiar patterns and assuming that these will be repeated in the future, sometimes without sufficient justification.[24] Also, it is maintained that individuals have an illusion of control, resulting in the personal success probability being higher than the corresponding objective probability. The combination of these two factors offers encouragement to rely upon information that is garnered from a backward-looking question relating to the general economic situation.[25]

Table 5

Consequently, a new confidence variable (CCI^+) is created by calculating the arithmetic average of the balances corresponding to questions 2, 4, 7 and 3, which feature in the EU survey. The same methodology is applied as was outlined in the first sub-section to establish an acceptable parsimonious specification for describing each form of consumption expenditure. The results of the within-sample analysis can be obtained from the corresponding author, while Table 6 enables a comparison of the predictive accuracy of the respective sample regression functions, including and excluding CCI^+.

Table 6

Consideration of Table 6 reveals that, in relation to total consumption expenditure, with CCI^+ fulfilling the role of the sentiment measure, the dynamics of

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[24] The term which Bovi deems to be apt is "irrational exuberance".
[25] However, it should be respected that, in the aforementioned paper by Bovi, it is also contended that lay-people are systematically over-critical in assessing past economic events, which stems from the media attaching a greater weight to negative news.

equation (9) have altered yet again. In particular, there is now no requirement for lags on the dependent variable to enter the model. A study of the final column indicates that as many as three values of S_1^* are significant at a conventional level. Additionally, upon comparing the values of the root mean square prediction error statistic which are contained in the second columns of Table 3 and Table 6, it is apparent that, in four cases out of five, CCI^+ succeeds in generating more accurate forecasts than CCI. However, when contrasting the values which are presented in the second columns of Table 4 and Table 6, it is evident that CCI^+ does not enjoy such dominance over CCI^*.

Excluding Purchases of Vehicles

On the basis of the post-sample results which have been reported earlier in this section, it is possible to conclude that, over the period of economic crisis in the UK, 2008-2013, one-period-ahead predictions of the quarterly growth of household expenditure on semi-durable goods and non-durable goods would have been significantly enhanced by utilising data on the headline measure of consumer confidence (CCI). Moreover, by ignoring information pertaining to Question 11, a further general improvement could have been recorded in the quality of forecasts. Finally, although a psychological argument exists for permitting the balances corresponding to Question 3 to contribute towards an indicator of consumer sentiment, a comparative study of values of root mean square error statistics suggested that this form of an extension would not have proved to be especially fruitful.

Consequently, governed by the earlier statistical findings, the recommendation is made that a measure of consumer confidence be permitted at least partial responsibility for producing forecasts of the growth of different types of household expenditure. Moreover, there is a preference for relying upon CCI^*, rather than CCI or CCI^+. However, from consideration of the results of the preceding empirical analysis, it would appear that there are still some key issues which remain to be resolved. For example, it is possible to observe that, irrespective of whether CCI, CCI^* or CCI^+ has operated as the indicator of consumer confidence, in the context of predicting the growth of spending on durable goods, a simple first-order autoregressive model has always achieved superiority. Evidence will be presented below to demonstrate that the failure of a consumer confidence variable to be seen to be of benefit for the purpose of forecasting this category of expenditure growth is attributable to the temporal reallocation of purchases of vehicles over 2009-2010 which was stimulated by the Labour Government's car scrappage initiative.

In order to be able to undertake a fairer assessment of the usefulness of EU survey data for prediction, a new consumption variable is formed by subtracting purchases of vehicles from expenditure on durable goods.[26] With each of CCI, CCI^* and CCI^+, in turn, operating as the indicator of consumer confidence, the familiar within-sample analysis is conducted for the purpose of obtaining a parsimonious equation to characterise the growth of this more specific type of spending. The subsequent findings are not explicitly shown in this paper, yet are available on request. In contrast to the results which were obtained for expenditure on all types of durable

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[26] Quarterly, seasonally-adjusted, constant-price data on the purchases of vehicles were downloaded from the website of the Office for National Statistics in December 2013. The codename that is given to the series is TMMI. For the period under consideration (1985q1-2013q1), on average, the acquisition of vehicles constitutes 53.75 per cent of expenditure on durable goods.

goods, in all three instances, the computed value of the Wald F statistic lacks significance at the ten per cent level. Also, for each form of confidence measure, the implementation of the general-to-specific methodology delivers a regression function which includes two lags on each of the dependent and sentiment variables.

Table 7, below, allows a comparison to be performed of the post-sample capabilities of the three measures of consumer confidence in respect of the growth of consumption expenditure on durable goods less vehicles. It can be seen that, at the five per cent level, each of the regression equations which accommodates a sentiment variable yields significantly more accurate forecasts than a second-order autoregressive model. The smallest root mean square prediction error is associated with the function which incorporates lagged values of CCI^+. However, it is apparent that the specification which features CCI^* also outscores the equation including CCI.

Table 7

Review of Results

Table 8, which is presented below, enables a comparison to be undertaken of the predictive accuracy of the regression models which have been constructed and estimated in this section of the paper.

Table 8

The results show that, following the replacement in the analysis of aggregate spending on durable goods by the refined consumption variable, for each category of household expenditure, a benefit is received from the inclusion of lags on a measure of consumer sentiment in the econometric function. In absolute terms, the greatest gain is for spending on durable goods less purchases of vehicles, while, for the consumption of services, any reduction in the root mean square error appears negligible. An equation which contains CCI^* or CCI^+ always improves upon the model which incorporates CCI. Although, for total consumption expenditure, the optimal specification features lags on CCI^*, for each of the more specific aspects of consumption, past information on CCI^+ is at least as useful.

It would seem, then, that the question which is raised in the title of this paper can be answered in the affirmative. However, in order to assess whether or not the results which have been obtained are period specific, the empirical analysis is now repeated, adopting as an estimation period, 1986q2-2002q3, and a forecast interval, 2002q4-2007q4. In comparison to 2008q1-2013q1, there is limited variation in CCI over the new prediction period. In spite of reaching as low as -9.87 in 2003q1, over the subsequent nineteen quarters, the value of the headline confidence indicator ranges merely from -6.00 to 1.00.

For the reason of brevity, not all of the findings are reported that are derived from the sensitivity analysis which is conducted. Indeed, only the summary table which corresponds to Table 8 is shown below (Table 9). However, all of the detailed results are available upon request from the corresponding author.

Table 9

The values of the root mean square prediction error statistics which are contained in Table 9 indicate that for none of the types of household expenditure is the overall accuracy of the twenty-one forecasts enhanced by accommodating within a regression function a measure of consumer confidence. Indeed, for both spending in total and on semi-durable goods, alone, the optimal model for the purpose of prediction is an equation which accords with the REPIH, i.e., does not incorporate lags on the dependent variable on its right-hand side. With regard to the three sentiment indices, the most favourable comparative results relate to expenditure on each of non-durable goods and services. However, for these two categories of consumption, it is merely the case that recourse to historical data on consumer confidence does not succeed in reducing the general quality of the forecasts.

V. Summary and Conclusions

This paper can be regarded as addressing three main issues. First, with reference to the recent period of economic crisis in the UK, it investigates whether or not the additional reliance upon data on the European Commission's aggregate measure of consumer confidence serves to increase the overall accuracy of predictions of the quarterly growth of different types of household expenditure. Second, an analysis is undertaken for the purpose of assessing whether or not refinements which are applied to CCI succeed in delivering forecasts which are of a superior quality. Finally, consideration is given to whether or not the empirical findings have

extension to an earlier prediction period of the same length, which did not feature a substantial downturn in economic activity.

On the basis of the results that have been presented in the previous section of the paper, it is possible to conclude that access to data on the EU's aggregate measure of consumer confidence would generally have improved predictions of the growth of UK household expenditure over the interval, 2008-2013. Moreover, refined versions of CCI would have enabled even greater accuracy to have been achieved. However, the usefulness of consumer survey data is possibly restricted to an episode of turbulence, granted that each of CCI, CCI* and CCI$^+$ was discovered to be of no virtue when forecasting over a relatively stable period for the UK economy, i.e., 2002-2007.

In terms of the chosen form of confidence measure, the investigation which has been conducted in this paper is most closely related to the analyses of Cotsomitis and Kwan (2006), Al-Eyd et al. (2009) and Jonsson and Linden (2009). Each of these earlier studies involved a consideration of data on several countries, one of which was the UK. However, in contrast to the current paper, no disaggregation was attempted of total household expenditure. In general, the findings were seen to be largely negative. Both Cotsomitis and Kwan and Jonsson and Linden generated post-sample predictions, which encouraged the conclusion that consumer survey data contained no useful information about the future path of household spending.[27] Conversely, Al-Eyd et al. produced merely within-sample results, which were founded upon quarterly data extending from 1973 to 2005. Within the context of a

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[27] The forecast intervals were 1999q1-2002q3 (Cotsomitis and Kwan) and 2003q4-2008q2 (Jonsson and Linden).

multivariate autoregressive-moving average specification, exclusion tests were performed in conjunction with the lags on CCI. Following estimation over equal-length sub-periods, though, a significant outcome was not forthcoming.

Hence, in terms of the usefulness of sentiment data, the results that have been reported in the current paper appear to be relatively positive. However, if it is accepted that consumer confidence possesses some, but only modest, incremental predictive power then it would seem to be possible to reconcile these with the findings of the earlier studies. First, it will be the case that a significant within-sample relationship fails to deliver a marked improvement in forecast accuracy when the survey data exhibit only limited variability over the post-sample period. Second, when estimation occurs over a short interval, both the number of degrees of freedom and the extent of the fluctuation in the survey variable may be insufficient to enable the inference of Granger-causality to be drawn.

In conclusion, then, the empirical analysis that has been undertaken in the current paper suggests that developments in consumer sentiment do possess independent predictive content. As such, the recommendation of Al-Eyd et al. (2009), that negligible attention be paid to movements in consumer sentiment in deciding upon monetary policy, would not be supported. Moreover, this study has shown that a modest refinement of the headline CCI can produce a general improvement in forecasting performance. Also, it is apparent that for forecasting some categories of household spending, recourse to information on consumer confidence is more beneficial than for others.

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Figure 1. Quarterly Data on UK Household Consumption Expenditure (£million, constant (2010) prices, seasonally adjusted)
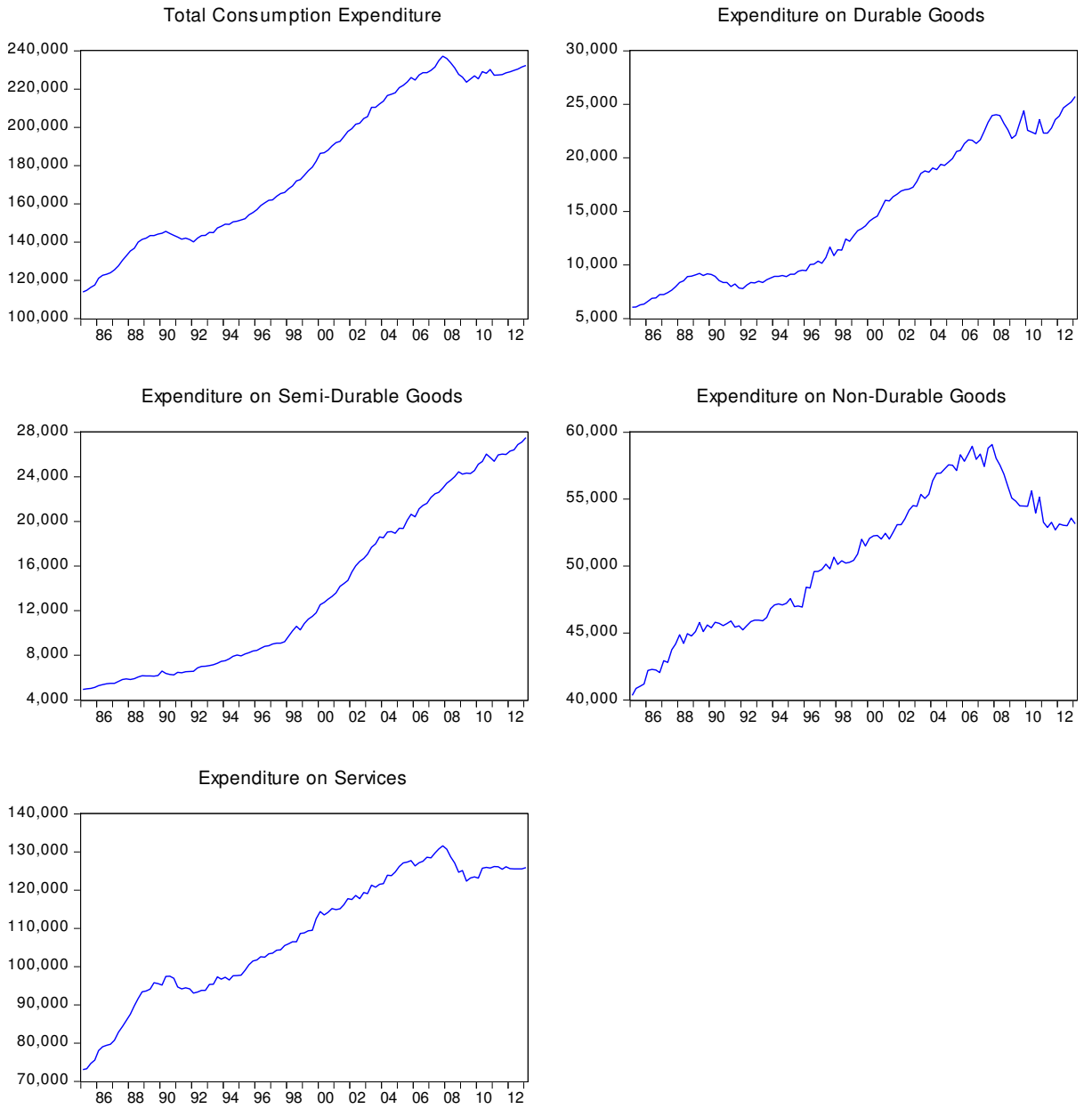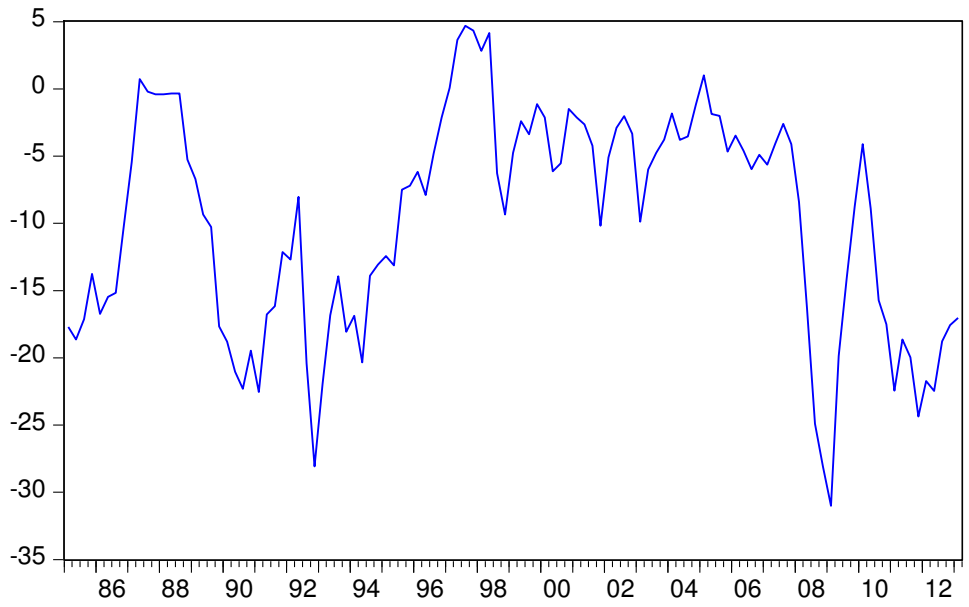
Figure 2: The European Commission Consumer Confidence Indicator (CCI)

Table 1. 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 2. Results Obtained following Estimation of Equation (9)

Consumption Variable	Number of Lags on the Variables		Increment to $\bar{R}^2$ (Prob. Value)	BG(4) (Prob. Value)
	n_1	n_2		
Total	4	4	0.0966 (0.0094)	6.0977 (0.1920)
Durable Goods	2	1	0.1449 (0.0005)	4.0001 (0.4060)
Semi-Durable Goods	2	0	0.0296 (0.1054)	4.1059 (0.3919)
Non-Durable Goods	3	1	0.0353 (0.0911)	5.5911 (0.2318)
Services	4	4	0.0286 (0.1562)	0.6202 (0.9608)

For all models, the estimation period extends from 1986q2 to 2007q4. Thus, estimates are founded upon a sample size of 87.

In the third column, the initial figure signifies the change in the value of the adjusted R-squared statistic which is achieved by virtue of admitting the lags on CCI to the equation. The figure which is shown in brackets is the probability value corresponding to a Wald F test of the null hypothesis, Ho: $b_1 = b_2 = \ldots\ldots = b_{n1} = 0$.

In the final column, the initial figure is the value of a Breusch-Godfrey chi-square statistic that has been computed to test for fourth-order autocorrelation in the disturbance terms. The figure which is presented in brackets is the associated probability value.

Table 3. Out-of-Sample Performance of Estimated Versions of Equation (9)

Consumption Variable	Root Mean Square Prediction Error		S_1^* Statistic
	Excluding Confidence Variable	Including Confidence Variable	
Total	0.0097	0.0090	0.9415
Durable Goods	0.0363	0.0376	-0.3704
Semi-Durable Goods	0.0138	0.0110	2.0091*
Non-Durable Goods	0.0174	0.0153	2.2997**
Services	0.0118	0.0120	-0.3066

Forecast interval extends from 2008q1 to 2013q1.
The predictions are founded upon versions of equation (9), which have been estimated over the common data period, 1986q2-2007q4.
Significance at the five per cent level is denoted by [**]. Significance at the ten per cent level is denoted by [*].

Table 4. Out-of-Sample Performance of Estimated Versions of Equation (9) with CCI* replacing CCI

Consumption Variable (n_1, n_2)	Root Mean Square Prediction Error		
	Excluding Confidence Variable	Including Confidence Variable	S_1^* Statistic
Total (2, 2)	0.0093	0.0076	2.4990**
Durable Goods (2, 1)	0.0363	0.0391	-0.5771
Semi-Durable Goods (2, 0)	0.0138	0.0106	1.6833
Non-Durable Goods (2, 1)	0.0174	0.0144	3.6404**
Services (4, 4)	0.0118	0.0115	0.3984

Forecast interval extends from 2008q1 to 2013q1.

The predictions are founded upon versions of equation (9), which have been estimated over the common data period, 1986q2-2007q4.

Significance at the five per cent level is denoted by **. Significance at the ten per cent level is denoted by *.

Table 5. Descriptive Statistics Corresponding to the Questions Comprising the EU Consumer Survey (1985q1-2013q1)

Variable	Mean	Standard Deviation
Question 1	-9.6322	9.9627
Question 2	0.7086	8.1835
Question 3	-30.335	19.709
Question 4	-12.236	11.010
Question 5	16.530	16.432
Question 6	26.705	12.457
Question 7	24.671	16.631
Question 8	2.9136	16.337
Question 9	-15.573	8.9930
Question 10	12.128	15.507
Question 11	-3.0608	11.472
Question 12	15.207	5.9916

Table 6. Out-of-Sample Performance of Estimated Versions of Equation (9) with CCI^+ replacing CCI

Consumption Variable (n_1, n_2)	Root Mean Square Prediction Error		
	Excluding Confidence Variable	Including Confidence Variable	S_1^* Statistic
Total (2, 0)	0.0119	0.0083	2.6270**
Durable Goods (2, 1)	0.0363	0.0394	-0.5374
Semi-Durable Goods (2, 0)	0.0138	0.0105	1.8664*
Non-Durable Goods (3, 1)	0.0174	0.0144	2.9940**
Services (4, 4)	0.0118	0.0115	0.3649

Forecast interval extends from 2008q1 to 2013q1.

The predictions are founded upon versions of equation (9), which have been estimated over a fixed period, 1986q2-2007q4.

Significance at the five per cent level is denoted by [**]. Significance at the ten per cent level is denoted by [*].

Table 7. Out-of-Sample Performance of Estimated Versions of Equation (9) with Expenditure on Durable Goods Less Purchases of Vehicles as the Consumption Variable

Confidence Variable (n_1, n_2)	Root Mean Square Prediction Error		
	Excluding Confidence Variable	Including Confidence Variable	S_1^* Statistic
CCI (2, 2)	0.0378	0.0309	2.5724**
CCI^* (2, 2)	0.0378	0.0283	2.8985**
CCI^+ (2, 2)	0.0378	0.0276	2.9234**

Forecast interval extends from 2008q1 to 2013q1.

The predictions are founded upon versions of equation (9), which have been estimated over a fixed period, 1986q2-2007q4.

Significance at the five per cent level is denoted by **. Significance at the ten per cent level is denoted by *.

Table 8. Summary of the Predictive Performances of the Different Regression Models (2008q1-2013q1)

Expenditure Variable	Root Mean Square Prediction Error Corresponding to the Model			
	Excluding Confidence	Including CCI	Including CCI*	Including CCI$^+$
Total	0.0093	0.0090	0.0076	0.0083
Durable Goods Less Vehicles	0.0378	0.0309	0.0283	0.0276
Semi-Durable Goods	0.0138	0.0110	0.0106	0.0105
Non-Durable Goods	0.0174	0.0153	0.0144	0.0144
Services	0.0118	0.0120	0.0115	0.0115

For all of the models, the estimation period is 1986q2-2007q4 and the forecast interval is 2008q1-2013q1.
The column with the heading, "Excluding Confidence", indicates, for each type of expenditure variable, the lowest root mean square prediction error corresponding to a model which does not include a measure of consumer confidence.

Table 9. Summary of the Predictive Performances of the Different Regression Models (2002q4-2007q4)

Expenditure Variable	Root Mean Square Prediction Error Corresponding to the Model			
	Excluding Confidence	Including CCI	Including CCI*	Including CCI+
Total	0.0059	0.0065	0.0063	0.0060
Durable Goods	0.0164	0.0199	0.0182	0.0185
Semi-Durable Goods	0.0144	0.0153	0.0163	0.0164
Non-Durable Goods	0.0095	0.0095	0.0095	0.0095
Services	0.0063	0.0064	0.0063	0.0063

For all of the models, the estimation period is 1986q2-2002q3 (such that the sample size is 66) and the forecast interval is 2002q4-2007q4.

The column with the heading, "Excluding Confidence", indicates, for each type of expenditure variable, the lowest root mean square prediction error corresponding to a model which does not include a measure of consumer confidence.