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Forecasting utility of UK consumer sentiment indexes in real time : do consumer sentiment surveys improve consumption forecasts in real time?

Bradford M. Smith
University of Richmond

Forecasting Utility of UK Consumer Sentiment Indexes in Real Time: Do Consumer Sentiment Surveys Improve Consumption Forecasts in Real Time?

by

Bradford M. Smith

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Advisor: Dr. Dean Croushore

Abstract

This paper builds on recent research utilizing real time datasets in order to assess the forecasting utility of consumer sentiment indexes in the United Kingdom. Academic researchers have consistently found that consumer confidence indexes accurately predict consumer spending in the near term. Few of these examinations, however, have utilized out of sample forecasting and only one has incorporated real time data. In an effort to recreate the exact dataset that is available to economic forecasters in real time, this paper utilizes the recently published Gross Domestic Product Real-Time Database from the Bank of England in order to produce forecasts of consumer spending growth. The results of the root mean forecasting error analysis indicate that the inclusion of a consumer sentiment index in a VAR forecast does not improve the accuracy of the model.

Introduction

On July 31, 2008, Reuters UK reported that consumer sentiment had fallen to an all time low according to the GfK Martin Hamblin Index. The sheer magnitude of a five point drop in the index in one month indicates that consumers have lost confidence in the economy's ability to maintain current growth levels. Consumer sentiment surveys such as the GfK Index capture consumer perceptions and expectations of the economic environment they act in. Many policy makers, businesses and pundits closely monitor the information provided in these indexes in order to make forward looking predictions about consumer behavior. For example, the Federal Open Market Committee, the policy setting branch of the Federal Reserve System, regularly monitors the University of Michigan's Consumer Sentiment Index when weighing monetary policy decisions. The Monetary Policy Committee (MPC) of the Bank of England tracks the GfK Consumer Sentiment Surveys for insight into demand side prospects. The minutes from the August 2008 meeting of the MPC echoed the story by Reuters UK, stating that in July "survey indicators of retail sales had been uniformly weak and consumer confidence had reached a new low according to the GfK."[1]

Why is so much attention paid to these indexes? Basic intertemporal consumption theory states that consumer behavior is affected by forward looking assessments of future income. The cognitive nature of these assessments allow for a degree of uncertainty in the economy to affect estimations of future income. Consumer sentiment today, therefore, influences consumptive behavior tomorrow. Economic forecasters utilize these indexes to account for consumer cognition in forecasting models of near term consumer expenditure.

[1] "Minutes of the Monetary Policy Committee Meeting, 6 and 7 August, 2008" *Bank of England.* Published August 20, 2008.

A vast amount of academic research on consumer sentiment indexes has arrived at the conclusion that they do marginally aid in predicting consumer expenditure in the near term. Bram and Ludvigson (1998) for example find that both the Conference Board and the University of Michigan indexes provide statistically significant explanatory power of consumer spending two to four quarters ahead. Easaw et al. (2005) arrives at a similar conclusion in his analysis of consumer sentiment indexes in the United Kingdom. These studies however, have utilized data with the most up to date information available. While this data provides a more accurate gauge of the true economic condition at any given time, it has been revised over its lifetime and is therefore not the actual raw data that forecaster input into their models in real time. The issue of data revisions skewing retrospective out of sample forecasting analyses has led to the creation of real time databases. These datasets have recently been created for the United States, the United Kingdom and the Euro zone. Dean Croushore (2005) is the first to utilize real time data in an analysis of consumer expenditure forecasting. Contrary to previous research, he finds that that consumer sentiment is fundamentally a lagging indicator and has no beneficial role in forecasting consumer expenditure. In his groundbreaking work on the topic, Croushore's use of real time data allows him to input unrevised data into retrospective forecasting models in order to recreate the forecasts made in real time. While Croushore's article focused on American indexes such as the University of Michigan's Consumer Sentiment Index, the creation of the Bank of England's Gross Domestic Product Real Time Database has allowed this more accurate form of retrospective forecast analysis to be extended to UK indices.

This article aims to examine the effectiveness of consumer confidence indexes in forecasting consumer spending in the UK in real time. While other studies have looked at this topic (see Easaw et al. 2005), none have surmounted the fundamental problem of utilizing

conventional historical data, which is reported post-revision, rather than the real-time data that an economic forecaster faces when making a forecast. This study utilizes the Bank of England's Gross Domestic Product Real Time Database in order to account for the data revisions that make the available historical data more accurate but mask the true forecasting power of consumer confidence measures in real time.

Literature Review

John Maynard Keynes first suggested the link between consumer aspirations and macroeconomic activity in 1936 through his explanation of "animal spirits." Keynes states that

> "[T]here is the instability due to the characteristic of human nature that a large proportion of our positive activities depend on spontaneous optimism rather than mathematical expectations, whether moral or hedonistic or economic. Most, probably, of our decisions to do something positive, the full consequences of which will be drawn out over many days to come, can only be taken as the result of animal spirits - a spontaneous urge to action rather than inaction, and not as the outcome of a weighted average of quantitative benefits multiplied by quantitative probabilities."[2]

This idea of animal spirits indicates that the consumer acts in an irrational manner depending on moods. Consumption patterns are therefore influenced by "moral or hedonistic or economic" whims. The result is that consumers make consumption decisions that deviate from pure economic rationality. This deviation exposes the need to account for a consumer's "mood" in consumption forecasting as economic and financial indicators cannot account for the irrationality inherent in human nature.

Katona (1956) expands on Keynes' inquisition of human factors in economic phenomena by solidifying the link between consumer sentiment and consumer spending through the

[2] Keynes 1936, p.161-162.

breakdown of consumer spending into discretionary and necessary spending. Through the analysis of consumer outlook survey data, Katona found that optimistic outlooks about the economy amongst consumers fosters a willingness to spend and make large purchases while pessimistic outlooks cause consumers to postpone large purchases on non-discretionary goods (Curtain 341). Thus, when consumers anticipate a recession in the near term, they will curb consumption and choose to save more.

Future actions of consumers can be anticipated by surveying the consumer outlook on the economy in order to determine future consumption habits. The University of Michigan's Consumer Sentiment Index was devised in the 1940's by Katona in order to track consumer sentiment in the economy of the United States. Figures 1 illustrates the correlation between consumer sentiment and consumer spending growth. Katona, thus, shows that consumer sentiment is a useful tool in predicting macroeconomic activity.

The predicting utility of consumer sentiment indices was first assessed by Mueller in 1963, where she regresses 10 years of consumer attitude surveys along with an array of business and financial indicators against consumer spending. Mueller found that attitudes do play a significant role in accounting for fluctuations in consumer spending on durable goods when controlled for other financial variables. A number of studies have followed suit and found that Consumer Sentiment Indices are significant predictors of future consumption within sample. Carroll et al. (1994) uses lagged values of the University of Michigan's Consumer Sentiment Index (CSI) to find that CSI explains 3% of the variation in total personal consumption expenditure aside from the information contained in other available indicators.

Bram and Ludvigson (1997) utilize reduced form regression analysis to determine the ability of both lagged values of the Conference Board's Consumer Confidence Index and the University of Michigan's CSI. As the first to utilize out-of-sample testing, Bram and Ludvigson find that the Conference Board index reduces the root mean forecasting error compared to the baseline equation and therefore increases the forecasts' accuracy. Wilcox (2007) reaffirms previous research and qualifies it by stating that consumer sentiment significantly improves forecasts of consumption expenditure at the four-quarter-ahead horizon.

Easaw et al. (2005) is one of the first papers to look at the predictive ability of Consumer Sentiment Indices in the UK. Easaw utilizes the Martin Hamblin GfK Consumer Confidence Index and the Market and Opinion Research International (MORI) Political Monitor Report to predict growth in household expenditure on both durable and non-durable goods in the UK. Previously, Acemoglu and Scott (1994) had studied the relationship between consumer sentiment and household consumption of durable goods in the UK. Utilizing within sample testing, Easaw finds that when the MORI representation of consumer sentiment is used to estimate durable personal consumption behavior, a statistically significant correlation between lagged consumer sentiment and consumption of durable goods is found. The paper concludes that consumer confidence indexes do predict household consumption of durable goods and adds that UK indexes are better predictors than their equivalents in the United States.

As shown, academic studies have continually found consumer sentiment to be a useful predictor of household consumption. However, all the aforementioned studies of consumer confidence have faced a fundamental measurement flaw in their data sets: the use of latest available data rather than that which is available to forecasters in real time. Croushore and Stark (1999) shows the importance of utilizing vintage data, or real time data snapshots, when testing

the quality of forecasts made in the past with current vintage data. Croushore points out that the use of data that has been revised can skew empirical research on forecasting. Since significant data revisions are often released weeks or months after the initial release of consumer spending data, datasets become more accurate representations of the actual economic conditions but also stray from the information available to the forecaster at the time of the release of the report. Therefore, in order to truly assess the predictive ability of a consumer sentiment index, the real time data must be analyzed rather than post-revision data conventionally used.

Croushore (2005) addresses the issue of real time data in consumer spending forecasting by utilizing the Real-Time Data Set for Macroeconomists (RTDSM) which contains the vintage data that was issued before any revisions were made. The RTDSM allows the researcher to create the exact data set available to forecasters in real time and allows the forecasts generated from the dataset to align with the forecasts made at the time of the data's release. Croushore hypothesizes that the confidence index may actually prove a better forecasting tool once the real time data is applied because, while data revisions are based on information unknown to government collectors until later, consumer are nonetheless aware of their own income and intentions to spend or save in the near term when they complete the survey regardless of revisions. Croushore then tests a set of out of sample forecasts in order to determine if including consumer confidence index information reduces the root-mean-squared-forecast error significantly. After controlling for real personal income, the real interest rate and real stock prices, Croushore finds that, contrary to the conjecture made, the inclusion of a consumer confidence index into a forecast in real time plays no significant value in forecasting consumer spending and in some cases may actually make the prediction significantly worse. This seminal, yet controversial conclusion solicits further inquiry into the utility of consumer sentiment

surveys in forecasting consumer expenditure as it overturns the pre-existing academic consensus on the subject.

In order to see the importance of real time data, one must examine the magnitude and frequency of data revisions after its initial release. Castle and Ellis (2002) provide this assessment of UK data releases by utilizing the BoE's Gross Domestic Product Real Time Database. They calculate the mean absolute revision and mean revision of UK GDP growth as published in the ONS Blue Book in order to determine the uncertainty that surrounds the initial estimate and the bias of the initial estimates. Ellis and Castle find that the average revision to any given GDP growth release by the ONS is +0.2% on an average quarterly growth rate of 0.6%. The data, therefore, retains an underestimating bias and is generally increased by 33.3%. Clearly revisions of this magnitude indicate that initial releases are not the best or most accurate estimation of the true state of the economy. As Croushore (2005) points out, the fundamental problem of lack of information means that forecasters are forced to utilize this data in real time even though it will almost certainly be revised. Croushore and Stark (2002) showed that forecasts for a given date change significantly depending on the vintage year used.

As shown by Croushore (1999, 2005), the availability of a real time data set is crucial to analysis of consumer sentiment forecasts. In the United States the RTDSM has facilitated such research. Eggington et al. (2002) is the first to compile a real time data set for the United Kingdom. The study utilizes the data set to analyze the quality of initial measurements of demand-side macro variables on UK inflation forecasts in the late 1980's. The work of Eggington et al. has led to the creation of the Gross Domestic Product Real Time Database by the Bank of England. This study utilizes this database in order to modify the study of Easaw et al. (2005) on the analysis of the forecasting utility of UK consumer sentiment surveys on UK

household consumption and apply the appropriate real-time data set as Croushore (2005) has done for the United States. We will first establish the theoretical connection between sentiment and consumption. Then, the empirical model will be developed and the data presented. Careful attention will be paid to the importance of real time data. Results will be analyzed to determine the utility of sentiment indexes in real time forecasting and we will conclude whether or not the indexes should be included in the forecasting model.

Intertemporal Consumption Theory: *A Consumer Sentiment Modification*

How can a psychological factor influence real macroeconomic variables? This section is used to establish the link between consumer perceptions, or sentiment, and consumption. While numerous researchers have found that sentiment indexes can explain some of the variation in consumer spending, few have grounded the link between current perceptions and future consumption in a theoretical model. Ludvingston et. al. identifies two competing theories on the transmission mechanism between consumer sentiment and consumer spending. First is the Precautionary Saving Model where higher levels of consumer confidence indicate less uncertainty about future income and therefore diminishes the precautionary motive for saving. This theory suggests that the consumer will consume more today and less in the future when confidence rises, resulting in a decreasing rate of growth in consumption over time. Ludvingston notes, however, that empirical studies have found contradicting evidence of this occurrence depending on the level of data collection (i.e. at the macro level consumption growth increases while at the micro level consumption growth falls given a rise in consumer sentiment). The alternative theory is that consumer sentiment captures household expectations of future income or wealth. This theory suggests that consumers base their sentiment on accurate predictions of future wealth or income. Therefore when sentiment is positive, the economy will, on average,

improve in the future.[3] Sentiment has no causal link to consumption in this model. As the Carroll et. al. study shows, consumer sentiment provides up to 3% additional information on the future state of consumption over financial variables. The Expectations of Future Income Model is adopted as the basis of the mathematical model by separating perceived future income into a wage and a sentiment component within the context of an intertemporal consumption model. Consumer sentiment is interpreted as a shock to the expectation of future income in the future. We go beyond this theoretical framework of the mechanics of consumer sentiment on consumer spending in Appendix A in order to establish a theory of the determinants of consumer sentiment.

The Representative Consumer

Consider the Fisher Intertemporal Model. We assume an economy with two periods, t_1 and t_2 in which a representative consumer makes consumption decisions in the two periods as to maximize total lifetime utility. We therefore assume that the consumer makes forward looking assumptions about future income in order to make consumption decisions today. In each period the consumer earns an income, y_i and consumes c_i. The consumer saves a portion of period one income by purchasing bonds at a rate of r, the real interest rate. The savings function is given as:

$$s = y_1 - c_1 \tag{1}$$

The consumer's consumption in period two is constrained to their income in period two and the portion of income in period one that was saved plus the interest earned:

$$c_2 = y_2 + (1+r)s \tag{2}$$

[3] Hall (1978) argues that consumer spending is unforecastable because it follows a "random walk" and is not influenced by past information such as lagged sentiment or income. Formally, Hall's model holds that the expected value of the change in consumption patterns is 0: $E_t[\Delta c_{t+1}] = 0$. Therefore, information available to the consumer at time t has no influence on choices made at time t+1 according to Hall.

Substitute (1) into (2):

$$(1+r)\, c_1 + c_2 = y_2 + (1+r)\, y_1$$

Divide through by (1+r) and rewrite to arrive at the *Intertemporal Budget Constraint*:

$$c_1 + \frac{c_2}{(1+r)} = y_1 + \frac{y_2}{(1+r)} \quad (3)$$

This equation equates the net present value of lifetime consumption on the left to the net present value of lifetime income on the right. Since this is a two-period economy, consumers must exhaust all their income on consumption in periods 1 and 2. We see that the consumer faces a tradeoff between current and future consumption. For every unit consumed in period 1, the consumer forgoes 1+r, or the reward for saving, in period two. The tradeoff is therefore determined by the consumer's patience or time preference. The budget constraint is represented by the straight line on Figure 2. The BC line represents all possible combinations of c_1 and c_2 that the consumer can achieve given their lifetime income. Indifference curves, representing the tradeoff between current and future consumption, are drawn negatively sloped and convex to the origin due to the assumption of diminishing marginal returns under the Consumption Smoothing Hypothesis.

In Figure 2 the consumer determines a combination of C_1 and C_2 based on their time preference. Consumers who are impatient prefer consumption today over tomorrow, making $c_1 > y_1$. The consumer's indifference curve is skewed to the right and consumes at a point to the right of $c_1 = y_1$. The impatient consumer is therefore a net borrower. Patient consumers are rewarded with higher consumption in period 2 by a factor of (1+r). As a result, the patient consumer purchases $c_1<y_1$ and is a net lender in period 1, consuming at a point to the left of $c_1=y_1$, $c_2=y_2$. We can extend this idea of patience as a risk profile of the consumer. Risk adverse consumers

may desire a hedge against the uncertainty inherent in future income by saving in period one. The risk adverse consumer will therefore also be a net saver.

We now assume the representative consumer has separable utilities for consumption in periods 1 and 2:

$$U_{1,2} = u(c_1) + \beta u(c_2), \;\; u'>0, \; u"1<0 \qquad (4)$$

where β is the subjective discount factor measuring the consumer's respective time preference and the utility function $u_t(c_i)$ is strictly concave. β is limited by 0> β >1 and equal to $\frac{1}{1+\rho}$ where ρ is the consumer's discount factor.. Since the consumer's formation of β is based on expected income, it can be assumed that β also encompasses a measure of the consumer's appetite for risk as future income is uncertain. Assume the $\lim_{c\to 0} U'(c) = \infty$ as to ensure that the consumer always desires some consumption in every period, effectively avoiding a corner solution. The consumer now maximizes expected lifetime utility (4) subject to the budget constraint (3):

$$\max_{c_1,c_2} E(U_{1,2}) = u_1(c_1) + \beta u_2(c_2)$$

$$\text{s.t.} \;\; c_1 + \frac{c_2}{(1+r)} = y_1 + \frac{y_2}{(1+r)}$$

The first order condition or the Euler Equation:

$$U'(c_1) = \beta\,(1 + r)U'(c_2) \qquad (5)$$

The Euler equation determines maximized consumption over time based on the expected income in period two. The left hand side represents the marginal utility of consumption in period one or the value that a consumer receives from one unit of consumption. The right hand side represents the marginal utility of consumption in period 2 discounted by β. Thus, if the consumer saves one unit in period one he or she would receive 1+r units of consumption in period 2 and increase lifetime marginal utility of consumption discounted by β. By rewriting the equation, we

can see the relationship between the consumer indifference curve and the budget constraint represented in Figure 2:

$$\frac{\beta U\prime(c_2)}{U\prime(c_1)} = \frac{1}{(1+r)} \tag{6}$$

Here, the left hand side of the equation is the marginal rate of substitution (MRS) between c_1 and c_2. This is also the slope of the consumer's indifference curve. The right hand side of the equation is the relative price of consumption $\frac{1}{(1+r)}$, or the slope of the budget constraint, - (1+r). The utility maximizing point of consumption is seen on Figure 2 where the IC touches the BC. At this point the slopes of the two lines are tangent indicating that the MRS is equal to (1+r).

From equation (5) it is seen that the utility maximizing combination of c_1 and c_2 is determined by the time preference of consumption and the real interest rate. If $\beta(1 + r) > 1$ then consumption is greater in period 2 and the consumer is a net saver in period 1 ($c_1 < y_1$). If $\beta(1 + r) < 1$, the consumer consumes more than their income in period 1 and becomes a net borrower. When the interest rate is 0, the consumer does not save and income is equal to consumption in each period.

In order to understand the effect of consumer sentiment on intertemporal consumption, we must return to the budget constraint equation (3). The representative consumer's behavior in period one is based on a discount of perceived future income y_2. Since consumers have not yet received y_2, they base their actions on a predicted income that is a function of wage and salary contracts as well as a general sentiment about the economic conditions at t_2 [i.e. $y_2 = f(\underset{+}{w}, \underset{+}{\theta})$][4]

[4] Here, wage is considered a function of Y_1. The future wage is a function of the consumer's current wage, or $w = f(y_1)$, as well as contracts that establish the wage in the future. θ captures any exogenous shock to predicted income beyond the effects of Y_1. We therefore assume that sentiment is an exogenous variable in the model. An interesting extension of this model would be to endogenize θ through the introduction of the production function.

where w is the future wage and θ[5] represents consumer's perceptions of future income.] .] Under the Expectations of Future Income Model we assume that w represents a fixed expectation of income in period 2 that is some function of the wage in period one. θ represents an exogenous shock to those expectations of y_2 based on a consumers' perception of the economic climate in period two. If a consumer has a grim economic outlook, fears of pay cuts, inflation or job loss will cause the consumer to decrease their estimate of future income. Reductions in perceived income push consumers to cut back spending as they no longer believe that future income will no longer finance borrowing in the current period. From equation (3), we see that if a consumer reduces their perceived future income, ⇩ y_2 they then reduce their lifetime income and lifetime consumption must fall as a result.

$$⇩\left(c_1 + \frac{c_2}{(1+r)}\right) = y_1 + \frac{y_2⇩}{(1+r)}$$

Formally,

$$c_1 + \frac{c_2}{(1+r)} = y_1 + \frac{y_2(1+\theta)}{(1+r)}$$

$$c_1 = y_1 + \frac{y_2(1+\theta) - c_2}{(1+r)} \quad (7)$$

$$c_2 = y_2(1+\theta) - (1+r)(c_1 - y_1) \quad (8)$$

From 7, we see the effect a shock to future income perceptions [represented by $y_2(1+\theta)$] has on c_1. As a result, a consumer's personal economic outlook on future income has a direct effect on their current and future consumption by a factor of $\frac{y_2\theta}{(1+r)}$. We see that a positive shock to perceived future income, $y_2(1+\theta)$, will increase c_1 even if current income remains unchanged. This situation is represented in Figure 3 where the representative consumer perceives a future rise in his or her income. The increase in y_2 by $y_2\theta$ shifts out the budget constraint line to BC_2,

[5] See Appendix A for an analysis of the determinants of θ.

allowing the consumer to reach a higher indifference curve at IC_2. Both c_1 and c_2 rise respectively to c_1' and c_2'. Since $s = y_1 - c_1$ (1), and y_1 is assumed unchanged, any increase in c_1 must be financed through borrowing.[6]

From Figure 3 it is see here fluctuations in consumer sentiment change expectations of future income and result in modification of current and future term consumption behavior. θ, therefore, is a determinant of future consumption.

It is important to establish the difference between β and θ. β indicates a static assessment of the consumer's risk profile regarding the uncertain nature of future income regardless of conditions in period two. β is considered and endowment within the model. θ, on the other hand, captures the exogenous change to perceptions of future income and is not necessarily associated with the appetite for risk or time preference of consumption.

The Economy

We now assume that the economy as a whole is made up of consumers with identical preferences $U = u(C_1) + \beta u(C_2)$. Aggregate consumption becomes $C_1 + C_2$ and the economy faces the budget constraint:

$$C_1 + \frac{C2}{(1+r)} = Y_1 + \frac{Y2}{(1+r)}$$

The utility maximizing point of consumption occurs where:

$$C_1 = \beta(1 + r)\, C_2$$

Extrapolating equations (7) and (8) onto the economy as a whole:

$$C_1 = Y_1 + \frac{Y2(1 + \theta) - C2}{(1+r)} \quad (9)$$

$$C_2 = (1+r)\,(Y_1 - C_1) + Y_2\,(1+ \theta) \quad (10)$$

[6] Admittedly, we must assume here that consumer's perceptions of future income are at least partially met at t_2.

We see that aggregate expenditure in the economy fluctuates directly with consumer's perceptions of future income, Y_2. Consumer sentiment in t_1 therefore becomes an indicator of aggregate consumer expenditure at t_2. At any given time θ, which represents a shock to consumer's expectations on future income, is a determinant of both C1 and C2 or aggregate consumer expenditure.

The Empirical Forecasting Model

The intertemporal consumption theory above is developed to explain the mechanism through which current consumer sentiment determines future consumption behavior. Economic forecasters looking at consumer spending need to estimate θ in order to determine future aggregate consumption movement. Consumer sentiment surveys can be a useful tool to approximate θ. An economic forecaster can utilize data from indexes of consumer sentiment such as the University of Michigan's CSI or the GfK Martin Hamblin Index as a proxy for θ in an empirical forecasting model and predict how consumers will behave in a future term. In order to determine the effectiveness of real time consumer sentiment surveys as proxies for θ in economic forecasts of aggregate consumer expenditure we develop an empirical model. The baseline equation used is based on research by Caroll et al. and omits the sentiment index:

$$\Delta c_t = \alpha_0 + \sum_{i=1}^{4} \alpha_1^i \, \Delta c_{t-i} + \sum_{i=1}^{4} \alpha_2^i \, \Delta y_{t-i} + \sum_{i=1}^{4} \alpha_3^i \, \Delta r_{t-i} + \sum_{i=1}^{4} \alpha_4^i \, \Delta s_{t-i} + \varepsilon_t \qquad (11)$$

where c is real UK Household final consumption expenditure, y is real UK income (GDP), r is the real interest rate and s is real stock prices measured by the FTSE All-Share index. The change in each variable is utilized rather than nominal levels. Forecasts are made using real time data from the Bank of England's Real Time Data Set and the root mean forecasting errors will be compared to the test model, equation (12), which is nested in equation (11) and includes the

proxy for θ, C, the consumer sentiment index as measured by the GfK Martin Hamblin Consumer Sentiment Barometer (CCB). Equations are estimated in a Vector Autoregression (VAR) with four lags.[7]

$$\Delta c_t = \alpha_0 + \sum_{i=1}^{4} \alpha_1^i \, \Delta c_{t-1} + \sum_{i=1}^{4} \alpha_2^i \, \Delta y_{t-i} + \sum_{i=1}^{4} \alpha_3^i \, \Delta r_{t-1} + \sum_{i=1}^{4} \alpha_4^i \, \Delta s_{t-1} + \sum_{i=1}^{4} \beta \, \Delta C_{t-i} + \varepsilon_t \quad (12)$$

UK Consumer Sentiment Indexes

This study examines the forecasting utility of the GfK Martin Hamblin Consumer Sentiment Barometer. Figure 1 outlines the Gfk Consumer Confidence Barometer (CCB) since inception in 1974 and charts it against UK household consumption growth. The UK Consumer Confidence Survey from GfK NOP is released monthly and is conducted amongst a sample of 2,000 individuals aged 16 and up on behalf of the European Commission. Quotas are imposed on age, sex, region and social class to ensure the final sample is representative of the UK population. The survey underlying the index consists of a set of five questions regarding the current and future economic environment. The questions are as follows:

Personal financial Situation

Q1. How has the financial situation of your household changed over the last 12 months?

Q2. How do you expect the financial position of your household to change over the next 12 months?'

General Economic Situation

Q3. How do you think the general economic situation in this country has changed over the last 12 months?

[7] Four lags is commonly utilized in VAR estimates with quarterly. While not utilized in this study, an SIC minimization process can be utilized to find the optimal number of lags.

Q4. How do you expect the general economic situation in this country to develop over the next 12 months?

Climate for major purchases

Q5. In view of the general economic situation, do you think now is the right time for people to make major purchases such as furniture or electrical goods?

Responses to questions 1-4 are weighted as follows[8]:

a. a lot better (+1)
b. a little better (+0.5)
c. the same (0)
d. a lot worse (-1)

Question 5 is weighted:

a. yes, now is the right time (+1)
b. neither right nor wrong time (0)
c. no, wrong time, purchases should be postponed (-1)

The responses to these questions are weighted and the headline figure, the Consumer Sentiment Barometer, is simply an average of these weights. Over the course of this study, the index exhibited and average value of -6.51 and a standard deviation of 9.55. Figures 4 through 6 offer an overview of the GfK's performance over the past 30 years and analyze the correlation with major macroeconomic variables. From figure 4, a plot of the unemployment rate and the GfK, it can be seen that sentiment may actually lag movements in the unemployment rate. Figure 5 plots the UK fuel price index against the GfK. The commodity price bubble beginning in 2006 is marked by a concurrent fall in the sentiment index to all time lows. The comparison of the FTSE 100 equity index and the GfK provides the strongest concurrent movement. The seven year bull market that followed the floating of the Pound in 1992 is mirrored by the upward trend

[8] Easaw et. Al. 2005 p. 520

in consumer sentiment until 1999. We note the positive relationship apparent between equity performance an GfK while unemployment and fuel prices exhibit a negative relationship with sentiment. Appendix A provides an in-depth look at the determinants of consumer sentiment and analyzes the major economic and political factors that influence sentiment in the UK.

Figure 7 plots the GfK CCB against the European Commission's Economic Sentiment Index in order to elucidate that these indexes capture the same general fluctuations in sentiment over time. This study has chosen to utilize the GfK CCB due to the more extensive nature of the underlying survey as well as 10 years of additional data available for the GfK CCB. The recession bars included in the chart show that sentiment is generally a leading indicator and therefore may have some utility in forecasting consumption fluctuations. Note that the UK has not experienced a recession over the course of this study.

Real Time Data

As Croushore (1999, 2005) has shown, the recreation of the exact data available to forecasters in real time is integral to the analysis of forecasting utility. This new form of retrospective forecasting analysis in the UK is facilitated by the creation of the Bank of England's Gross Domestic Product Real Time Database, The database complies Office of National Statistics' Blue Book data for GDP and its components and reports a vintage of data for each quarter between January 1990 and July 2007. A vintage is defined as the latest available estimate of a given data set (encompassing revisions to previous data) at a given time. Ellis and Castle (2002) outline the construction of this dataset and provide insight into how researchers may utilize the database.

Household Consumption is extracted from this dataset and used as the dependent variable proxy for consumer spending in the VAR model. Nominal Gross Domestic Product is extracted as a measure of consumer income. A dataset of 107 monthly vintages is extracted from the BoE's dataset, each vintage starting with the most up to date revision of 1974Q2 data. The real time dataset begins with the September 1998 vintage and expires in July of 2007. Figures 8 and 9 indicate the importance of incorporating real time data when assessing forecasting utility. Figure 8 shows 107 different vintages of the estimate of 1997Q1 Household Consumption in. Figure 9 provides the same 107 vintages for UK GDP. It is easy to see the frequency and volatility with which the data is revised. As previously noted, GDP growth data is revised on average by 33.3% with an upward bias in the UK. Revisions, however, can push data in either direction as more survey data becomes available, more accurate forms of computation are adopted retrospectively or base years are changed. The most recent vintage of the UK GDP data in this study was revised an average of 2.31% after the initial release.[9] The preliminary vintage of household consumption exhibits a mean absolute revision of 1.132% over the course of study. Table 1 provides an overview of the mean revisions to the real time data utilized in the study. Figure 10 and 11 plot the total revision from initial release to most recent vintage of Consumer Spending and GDP respectively. The upward bias of GDP revisions, reaching upwards of 4.5%, is characteristic of UK GDP data and may indicate insufficiencies in the Office of National Statistics survey techniques. This phenomenon also presents the possibility that adjusting a given forecast for the upward bias may improve forecasting accuracy over time. The GDP deflator provided in the BoE's Gross Domestic Product Real Time Dataset is utilized to calculate to calculate real time real values for income, consumption and stock prices. Interest rates are not

[9] Note that the phenomenon of an upward bias to GDP revisions in the UK may be a result of the fact that the UK has not experienced negative year over year GDP growth since the 1991.

adjusted for price movements as previous research has shown that inflation expectations only affect long term interest rates, allowing for a negligible effect on one quarter ahead forecasts.

Table 2 outlines the remaining data that is utilized on the right hand side of the forecasting equations. Equity prices are captured by the FTSE All-Share index. The Official Bank Rate is used to capture interest rates as it is the only well documented interest rate that is available for the UK before 1980. Figure 11 outlines the performance of these variables in relation to the GfK CCB over the course of this study (1997Q1-2007Q2). We see that at there is some degree of correlation between these variables, most notably between the FTSE equity index and the GfK. The FTSE rose 20x its 1974 value over the course of the study while the interest rate remained relatively stable around ±3% about the mean of 8.83%.

Estimation

The initial test is performed in the following sequence:

1) Beginning with the September 1998 vintage of data, deflate consumption, GDP and the FTSE All-Share values by the respective real time GDP deflator.
2) Calibrate a VAR model from Eq. 11 utilizing four lags of each variable over the period of 1974Q1 to 1998Q2.
3) Forecast consumer spending growth out of sample one quarter ahead utilizing the baseline VAR equation, Eq. 11,.
4) Repeat steps 1 through 3 with the test equation, Eq. 12, which includes the GfK CCB.
5) Repeat steps 1 through 5 for each of the 106 vintages between October 1998 and May 2007.

In order to estimate the forecasting utility of the GfK CCB in real time, forecasts of one quarter ahead household consumption growth are calculated for both eq. (11) and eq. (12) for each of the 107 vintages. A VAR is a very powerful and common forecasting method utilized by professionals and is therefore an appropriate extension of Carrol et. al.'s original forecasting equation. The VAR is included with a four period lag as appropriate for quarterly data. The forecasts derived from the baseline equation and the equation including consumer confidence are outlined in Figure 13.

The Choice of Actual Values

The Root Mean Squared Error is calculated in the following manner:

$$\text{RMSFE} = \sqrt{\frac{\sum_{t=1}^{N} E_t^2}{N}}$$

where N is the number of forecasts made and E_t^2 is the squared difference between the actual value and the forecasted value. Due to the perpetually changing nature of real-time data, the choice of which actual value to use is an important one in this assessment. There are several considerations to keep in mind when making this choice. Clearly the goal of data revisions is to make the data more accurately represent the actual economic environment at any given point in time as new survey or census data becomes available or more accurate forms of calculation are developed. For this reason, the most recent vintage of data available is generally considered the "most accurate" representation of actual conditions. That said, it is important to take into account what forecasters are actually attempting to forecast in real time. Since forecasters do not attempt to predict methodological changes in data collection or calculation, it would be inappropriate to expect forecasters to account for benchmark revisions.

Forecast Assessment

As previously noted, the most recent vintage may be considered the most accurate representation of actual growth. The comparison of forecasts versus most recent vintage actual values can be found in Figure 15. Visually, it cannot be determined if the CCB aids the forecast as it seems to aid the forecasts from 1998 and 1999 but exacerbate forecast error in the 2000s. The results of the RMSFE comparison with different actual values are found in Table 3. Compared to the most recent values, the baseline model resulted in a RMSFE of 0.00693 while the model including the CCB resulted in an error .00006 lower. The relative RMSE is utilized to compare the nested models. With a Relative RMSFE of .991, the CCB does nominally improve the forecast. An important deficiency to note here is that an appropriate test of significance for nested forecasting models encompassing real time data does not currently exist. The Diebold-Mariano Test is commonly used to assess the out of sample predictive accuracy of a forecasting equation but it is not applicable to nested models. Croushore (2005) utilizes the Harvey-Leybourne-Newbold modification of the Diebold-Mariano procedure, noting, however, that this modification is also not appropriate for nested models.[10] Despite this fact, a difference of .00006 in forecasting error is a comparatively small value and would most likely not be found significantly different from the baseline error would the appropriate test be available. Continuing with Table 3, it can be seen that the inclusion of the CCB does not improve forecasts when utilizing the last benchmark revision actual. With a relative RMSFE of .988, the inclusion of the CCB does, however, improve forecasts when assessing forecast error against the initially released value. While it can be seen that overall the inclusion of consumer sentiment does not

[10] It may be suggested to utilize the Harvey-Leybourne-Newbold modification of the Diebold Mariano procedure with bootstrapped critical values in order to account for the use of real time data in the nested models. Additionally, Clark & West (2005) suggest alternative methods for approaching this problem.

improve forecasts made in real time, some utility may be gained from including the index should a forecaster desire to predict the initial release value rather than the actual value.

Alternative Forecasting Experiments

Alternative Time Horizon Forecast Assessment

Because the BoE Gross Domestic Product Real Time Database is organized into monthly vintages reporting a quarterly released variable, it is possible to assess the forecasting utility of consumer sentiment at alternate time horizons. Table 4 reports the results of the alternative time horizon assessment, assessing forecasts made two months, one month and the month of the initial release of a variable. Table 16 provides a visual representation of the one month ahead forecasts of consumer spending growth versus the most recent vintage of data. From the table, it is seen that as the forecast horizon shortens, the relative RMSFE of the test model falls from 1.0059 to 0.985. This result indicates that the consumer confidence index makes the forecasting model more accurate as the time horizon shortens with a prediction made the month of a data release being the most useful time to include the measure of confidence. Not surprisingly, as the time horizon shortens, both the baseline model and the test model become absolutely more accurate with the RMSFE falling.

Revision Bias Adjustment Test

As noted in the Real Time Data section of this paper, UK GDP data exhibits an interesting yet criticized phenomenon of upward biased data revisions. As seen in Figure 11, GDP data in the UK is consistently revised upward. A similar phenomenon is found with UK consumer spending data as seen in Figure 10. As a result, this experiment attempts to account for

the upward bias in data revisions by adjusting the initial forecast made from both the baseline and the test equation by the average revision over a past period. Table 5 presents the results of this experiment. The original forecasts are compared to forecasts adjusted with a 1 year and a 10 year moving average of revisions. The table shows that in no case was the forecast error improved by the inclusion of the moving average bias adjustment. As a result, it can be concluded that despite the drastic upward revision bias prolific amongst UK GDP aggregate data, revisions cannot be predicted in a useful manner.

Conclusion

The results of the initial forecasting experiment reveal that the inclusion of consumer sentiment indexes in forecasts of consumer spending growth does not significantly improve the forecast when accounting for the real time nature of data. This conclusion corroborates Croushore (2005) unprecedented findings with United States data. The implications of this finding suggest that forecasters in the United Kingdom and the United States do not gain additional utility from the inclusion of consumer confidence measures in their forecasts of consumer spending and should therefore omit the index from their model. Despite the fact that the majority of previous research has found that consumer sentiment indexes do provide some additional explanatory power about consumer spending, it seems that this power diminishes significantly when extrapolating that relationship out of sample. This phenomenon is likely a result of the high correlation between equity prices and consumer confidence. As a result, a more parsimonious forecasting model is preferred over on that includes consumer sentiment.

The alternative forecasting experiments performed in this paper do offer some insight into specific situations in which the inclusion of a consumer sentiment index may improve the

accuracy of the model. As shown in the Alternative Time Horizon Test, the CCB increasingly improves the accuracy of the model as the time horizon shortens. Additionally, it was found that the inclusion of consumer sentiment improves the prediction of initial release values of consumer spending growth. In the case that a forecaster is more concerned with predicting the nominal value of the initial release than the "actual" value of consumer spending growth then it may improve the accuracy of the forecasts to include the sentiment index. The last conclusion drawn from this paper does not apply to consumer sentiment index specifically, but rather the nature of real time data. In the Bias Adjustment test we attempted to account for the upward revision in UK GDP and consumer spending data by adjusting the forecast with a 1 and 10 year moving average of revisions. Because the inclusion of the adjustment actually raised the relative RMSFE, it can be concluded that revisions cannot be predicted in a manner that is beneficial to the accuracy of a forecast.

Suggestions for Further Research

A finding that goes against a majority of previous research on a topic certainly opens doors to further research and discussion. As noted in the results section, the lack of an appropriate extension of the Diebold-Mariano test of significance is a crucial drawback in the analysis of nested real-time models. Efforts should focus on further developing Clark & West (2005) extension of the Diebold-Mariano test.

Further research is still needed to solidify the transmission mechanism between consumer sentiment and consumer spending. Research still fluctuates between the Precautionary Saving Motive and the Expectations of Future Income Model. Appendix A offers some ideas about what influences consumer sentiment and may provide indications of the transmission mechanism.

From the forecasting models themselves, forecasters often consider parsimony as a key feature of quality forecasting models. While many factors can influence an aggregate such as household consumption, out of sample forecasts are generally improved when focusing on a few key variables. Therefore, it would be interesting to compare the difference in removing interest rates, equity prices and the consumer sentiment index from the VAR models. This process will touch on a key issue in the research which asks whether or not consumer sentiment simply repackages information already available in financial variables or if it offers additional explanatory out of sample?

The lack of a recession in the UK over the course of this study limits the amount of experiments that can be performed with the nested models. Clearly forecasting turning points is a key skill of a quality forecaster. In order to assess the ability of consumer sentiment to predict turning points, this study should be repeated in a country that has faced several business cycles over the course of recent history.

Lastly, it has become very prevalent in this study that the changing nature of data over time due to data revisions makes real time data an essential aspect of historical out of sample research. We have also seen that the UK experiences significant data revisions, upwards of 5%, with a tendency for an upward bias. This phenomenon makes it difficult for markets to efficiently understand the true nature of the underlying economy. As a result, it would be of use to the economy as a whole for the ONS to improve its data collection procedures so that data is more representative of the underlying economy upon initial release.

Appendix A: Determinants of θ

In order to better understand the effect of consumer sentiment on future consumption as well as the GfK CCB survey itself, we must look at the determinants of consumer sentiment. Unfortunately, little research has been conducted surrounding this topic. As developed in the modified Intertemporal Consumption Model, θ represents the exogenous change to consumer perceptions of future income. The theory indicates that a perceived increase in future income will increase consumption in both period one as well as period two. Many researchers (Bram and Ludvigson, Easaw et al. ect.) corroborate this theoretical underpinning by finding that consumer sentiment does empirically affect consumption. We utilize the GfK CCB as a proxy for θ in the empirical forecasting model in order test the real time utility of such indexes. What, however, influences sentiment? How do consumers forge their perceptions of future income? Cognitive perceptions cannot be measured in mathematical way and are therefore difficult to capture.

Based on collaborative research with Salmaan Ayaz, we have developed a theory of hedonistic perceptions. In this theory, consumer's perceptions are based on a perceived pleasure/pain from phenomena in their environment and are therefore influenced by those factors with which consumers have the most contact with or place the most value in. While trends in output and the labor market may offer much more insight into a consumer's actual future income, the consistent contact with equity and fuel prices in the media and in the community has a much greater impact on such perceptions. As a result, we look towards economic variables that are highly prevalent in a consumer's daily life to explain variation in sentiment indexes. While the inflation rate or the price of durable goods may have a larger impact on real income, for example, consumers place more significance on the prices they see every day, such as the price of fuel. The relative ubiquity of fuel prices compared to other prices is facilitated by roadside advertising and media attention. The consumer's dependency on their vehicle for transportation to work and leisure activities on a daily

basis reinforces this effect. The hedonistic theory of consumer perceptions also allows for political events to play a role in sentiment.

Table 6 presents the regression results of the GfK CCB against the FTSE 100 equity index, the unemployment rate, the earnings index, fuel prices as well as a number of major political events that affected the UK between 1990 and 2008. A lin-lin functional form is estimated and a trend and lagged variables are included (Lin-Log results are found in Table 4). The results confirm our theory that both real economic variables and political shocks play a role in consumer perceptions of the economy and the model explains about 70% of the variation in the index. A £1 per liter increase in the fuel price index results in a 1.63 point drop, ceterus paribus, in the GfK index while a much less ubiquitous number, the unemployment rate, has no real significant impact on the Gfk. Political events play a role as well. The 7/7 London Transport bombings in 2005 resulted in a 6.64 point drop in the GfK CCB one month out. The collapse of the Exchange Rate Mechanism after the speculative run on the pound in 1992 had an even more drastic effect on the consumer sentiment, deflating the index by 10.4 points. As a result, we can see that political events and ubiquitous variables can affect θ, and therefore affect both current and future consumption patterns.

These results provide the groundwork for future research on the role that cognitive perceptions play in consumption patterns as well as what variables affect those perceptions. Several variables have been suggested here, but there are many other potential influences according to our theory. Research should be careful to separate out wealth effects and income effects. It is important to note that empirically, consumer sentiment index variation depends on the questions asked in the survey. The nature of the survey questions has in instrumental effect on this measurement.

Figure 1

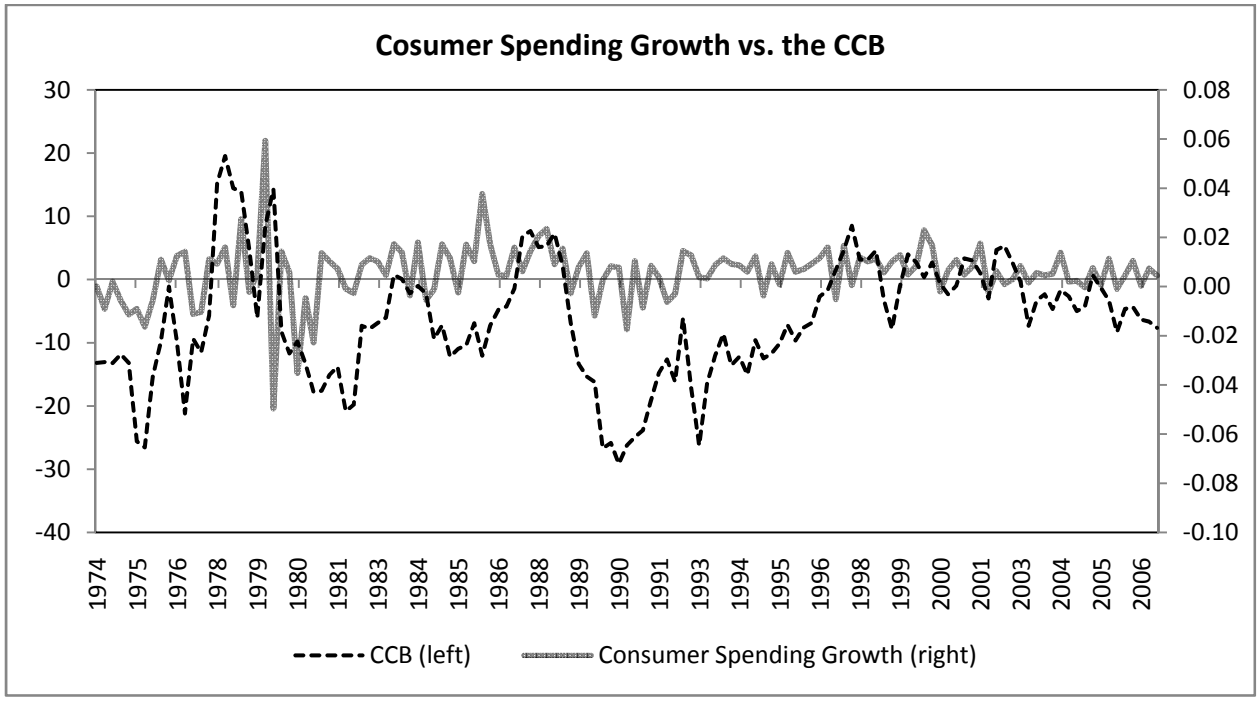

Figure 2

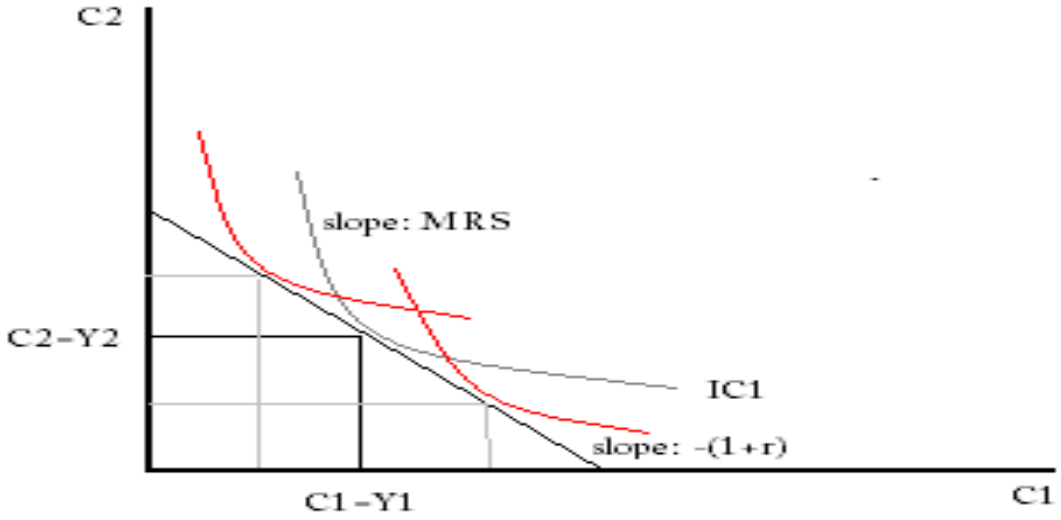

Figure 3

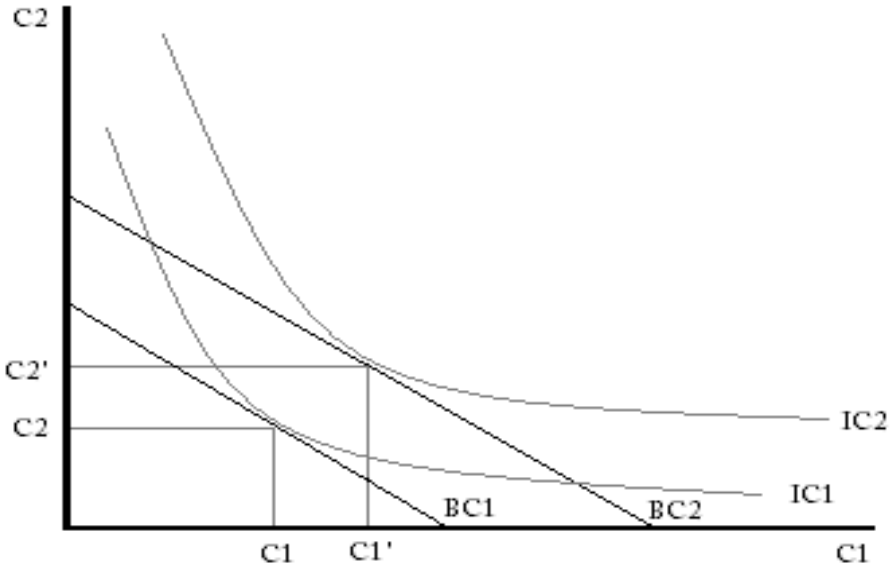

Figure 4

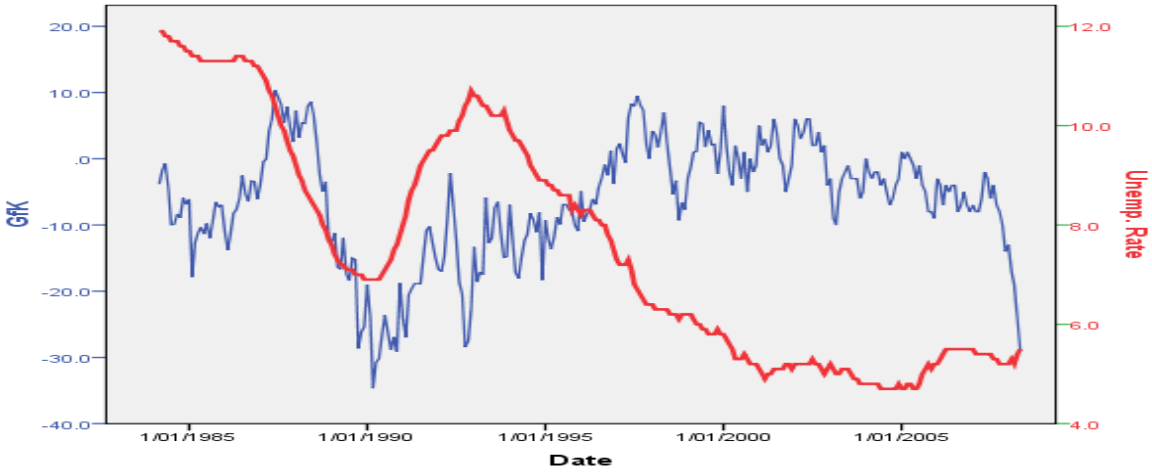

Figure 5

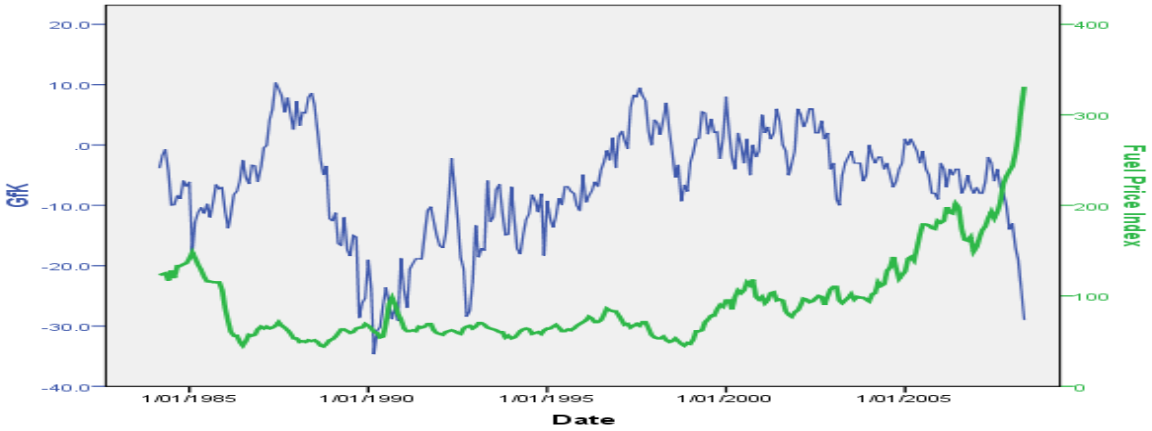

Figure 6

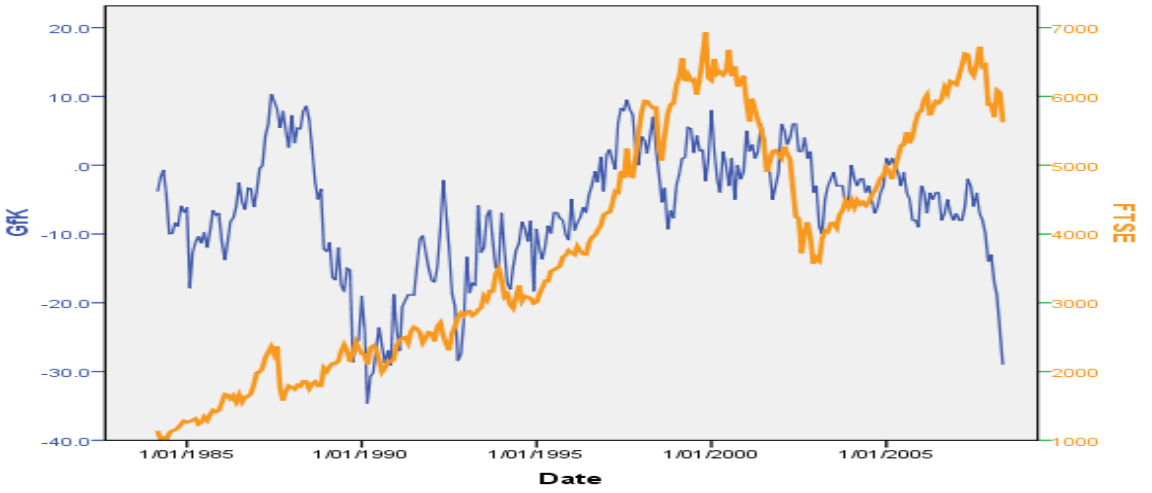

Figure 7

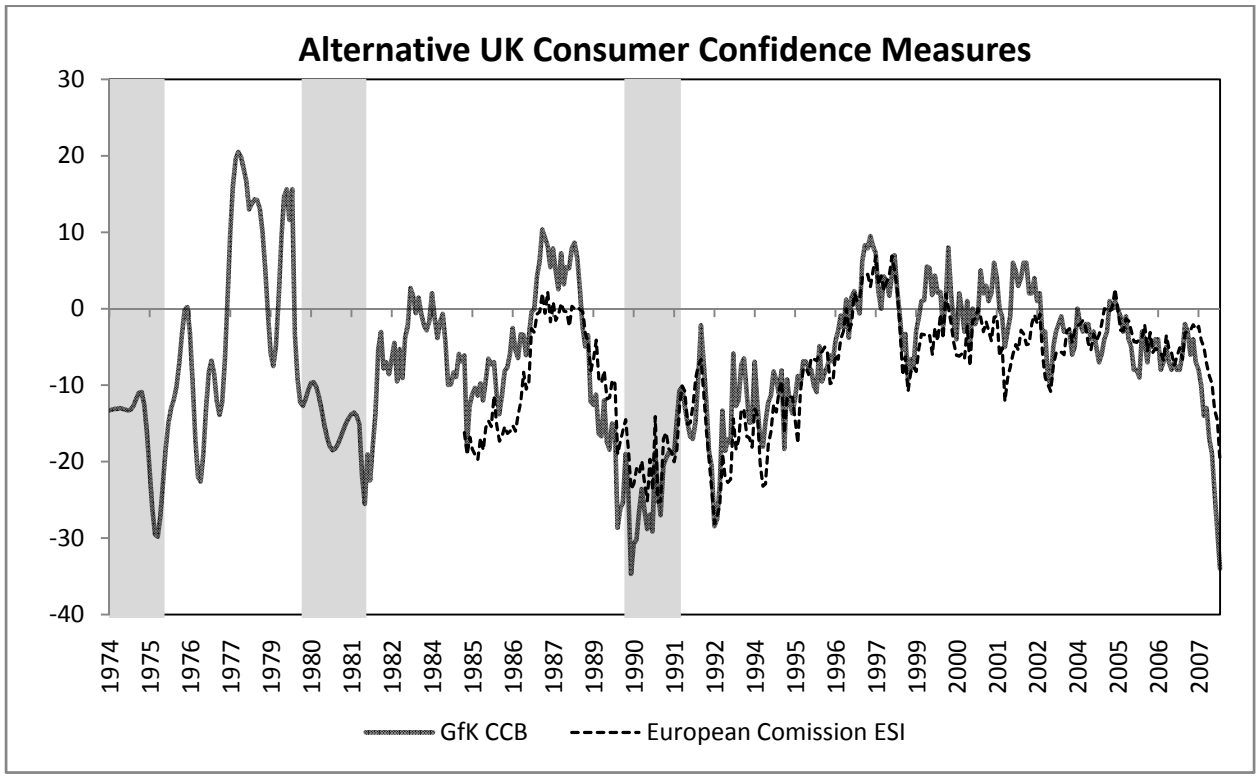
Alternative UK Consumer Confidence Measures
30
20
10
0
-10
-20
-30
-40
1974
1975
1976
1977
1979
1980
1981
1982
1984
1985
1986
1987
1989
1990
1991
1992
1994
1995
1996
1997
1999
2000
2001
2002
2004
2005
2006
2007
GfK CCB
European Comission ESI

Figure 8

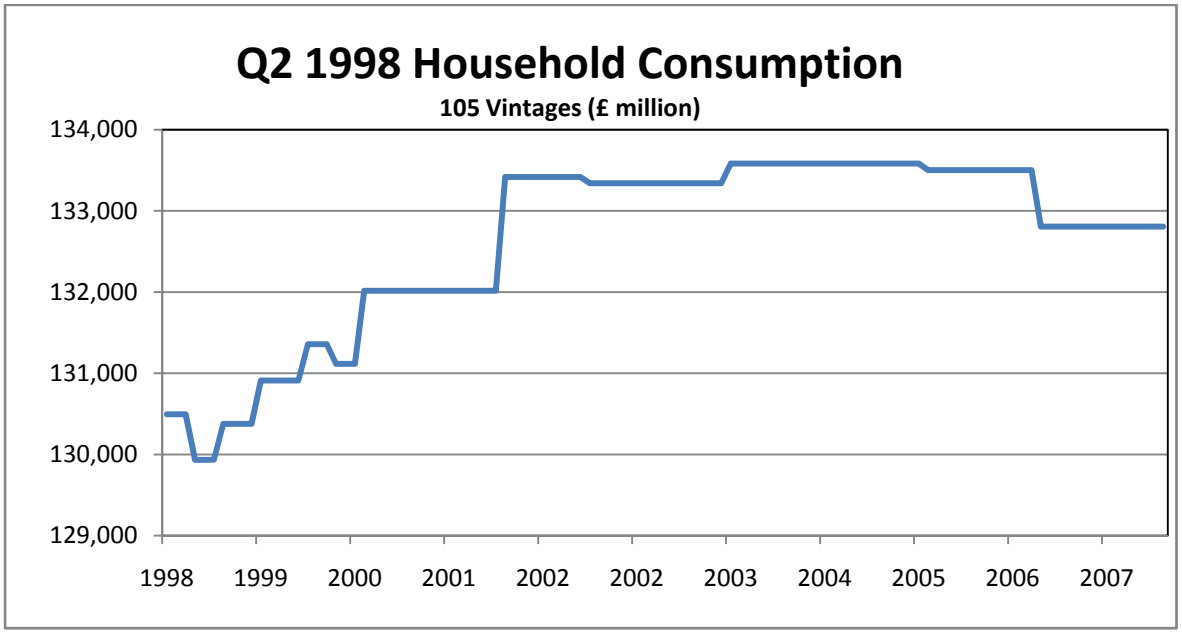

Figure 9

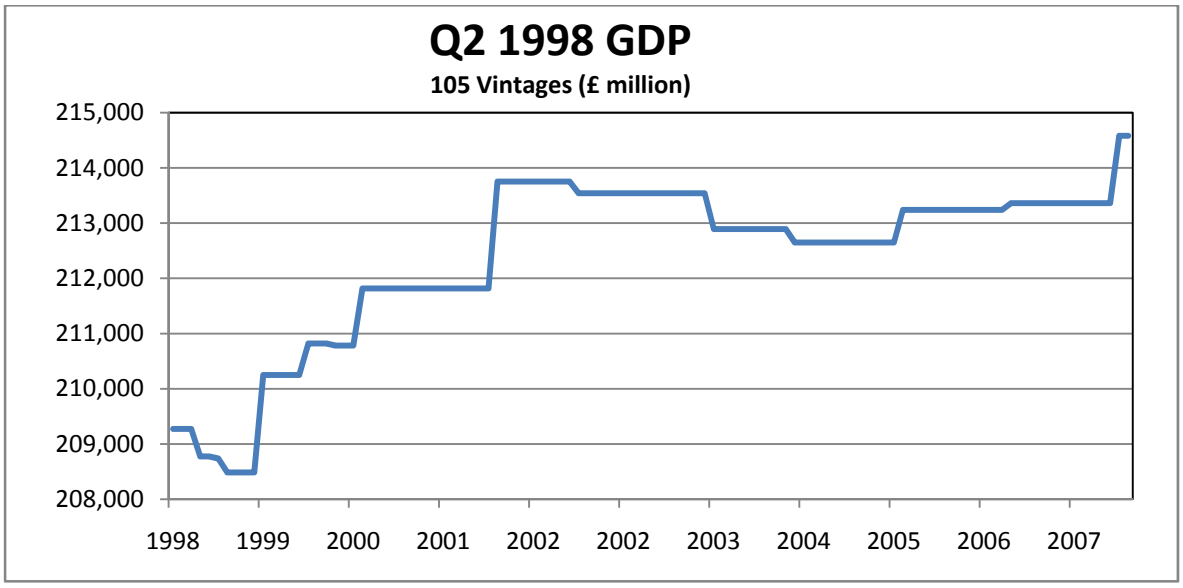

Figure 10

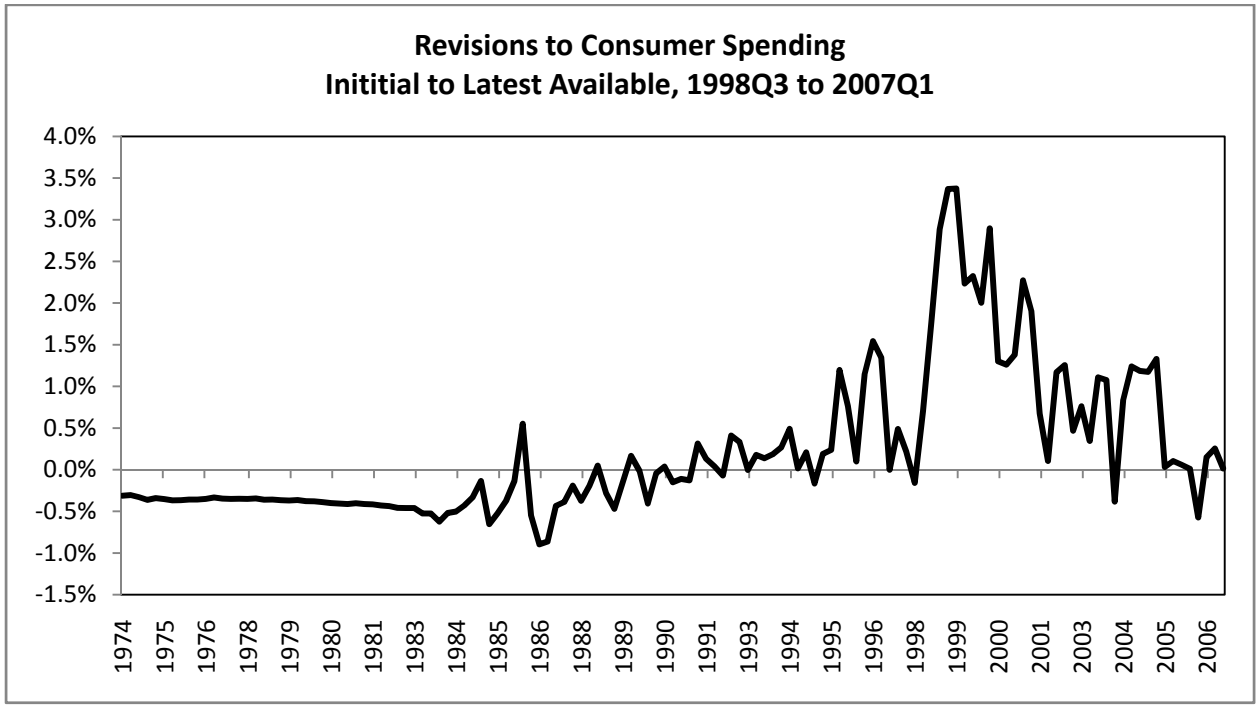

Figure 11

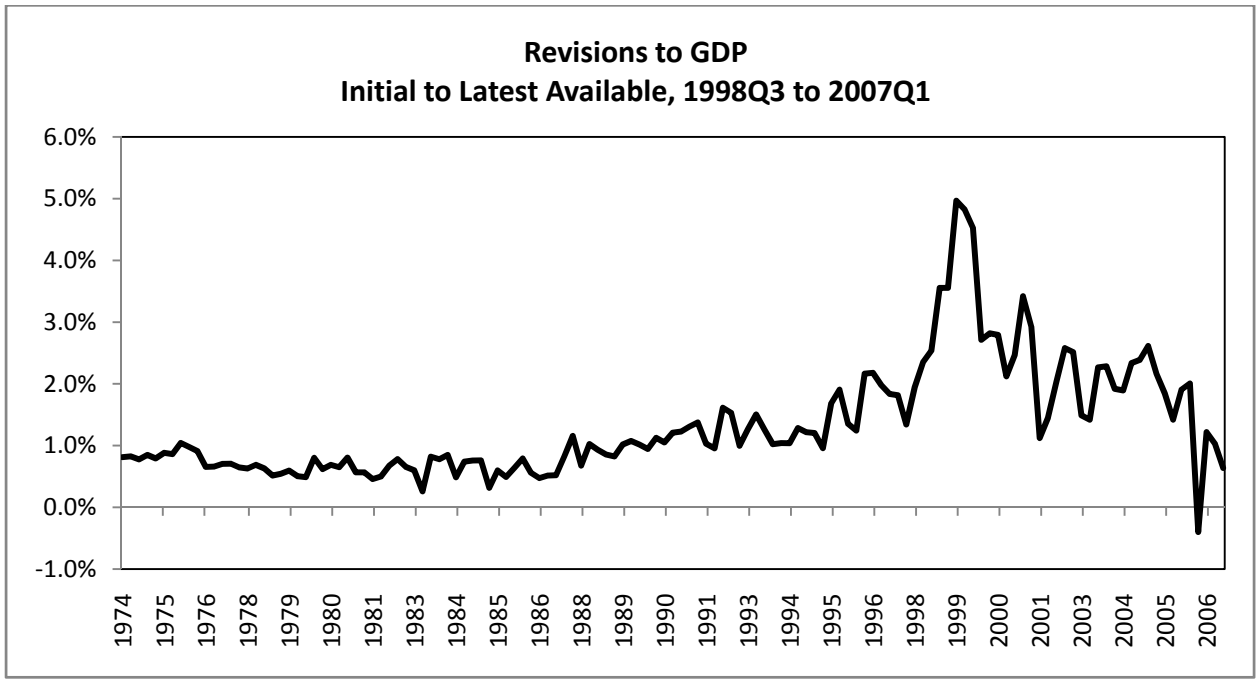

Figure 12

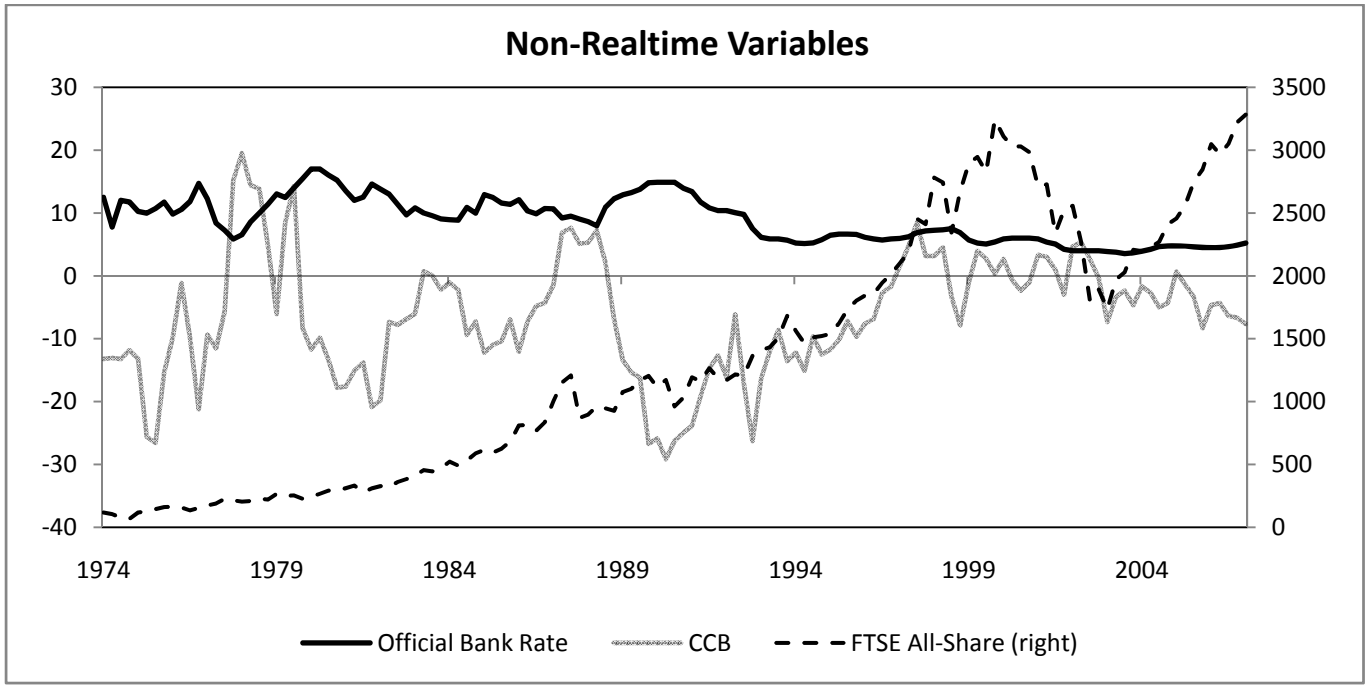
Non-Realtime Variables
30
20
10
0
-10
-20
-30
-40
3500
3000
2500
2000
1500
1000
500
0
1974
1979
1984
1989
1994
1999
2004
Official Bank Rate
CCB
FTSE All-Share (right)

Figure 13

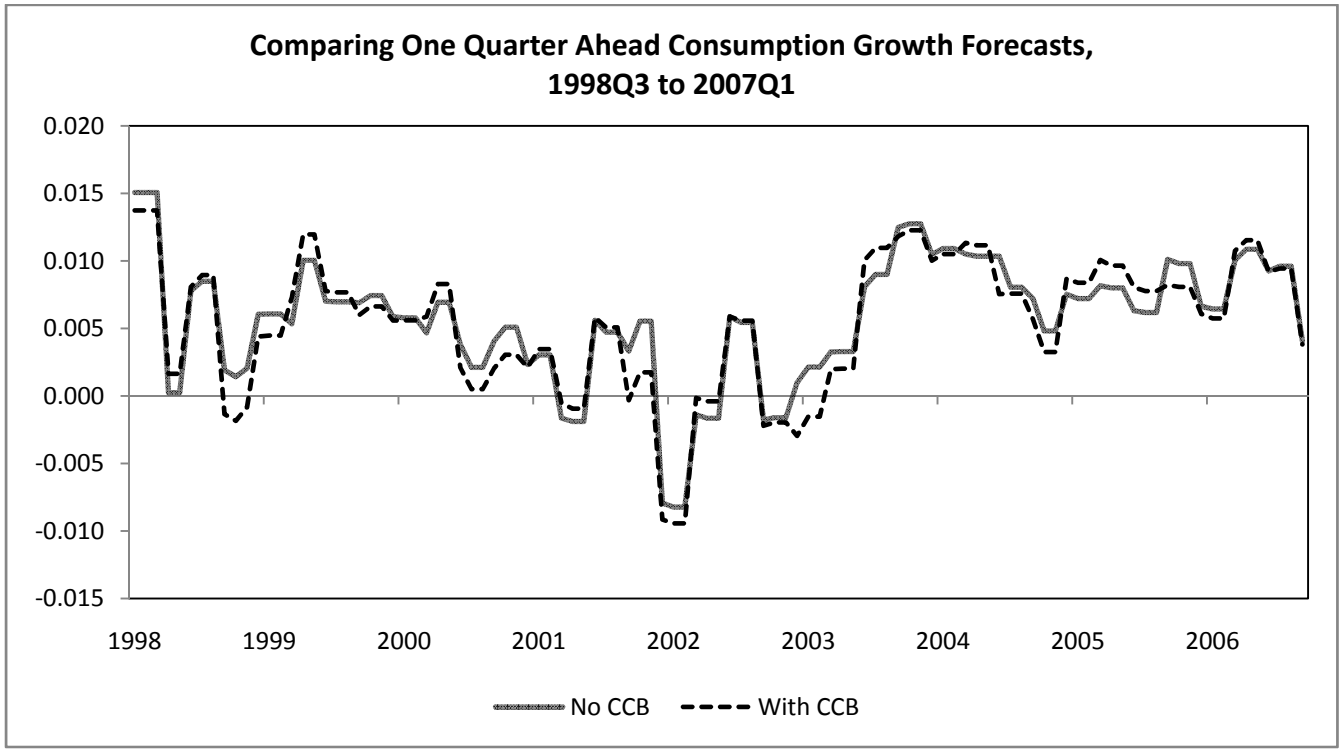

Figure 14

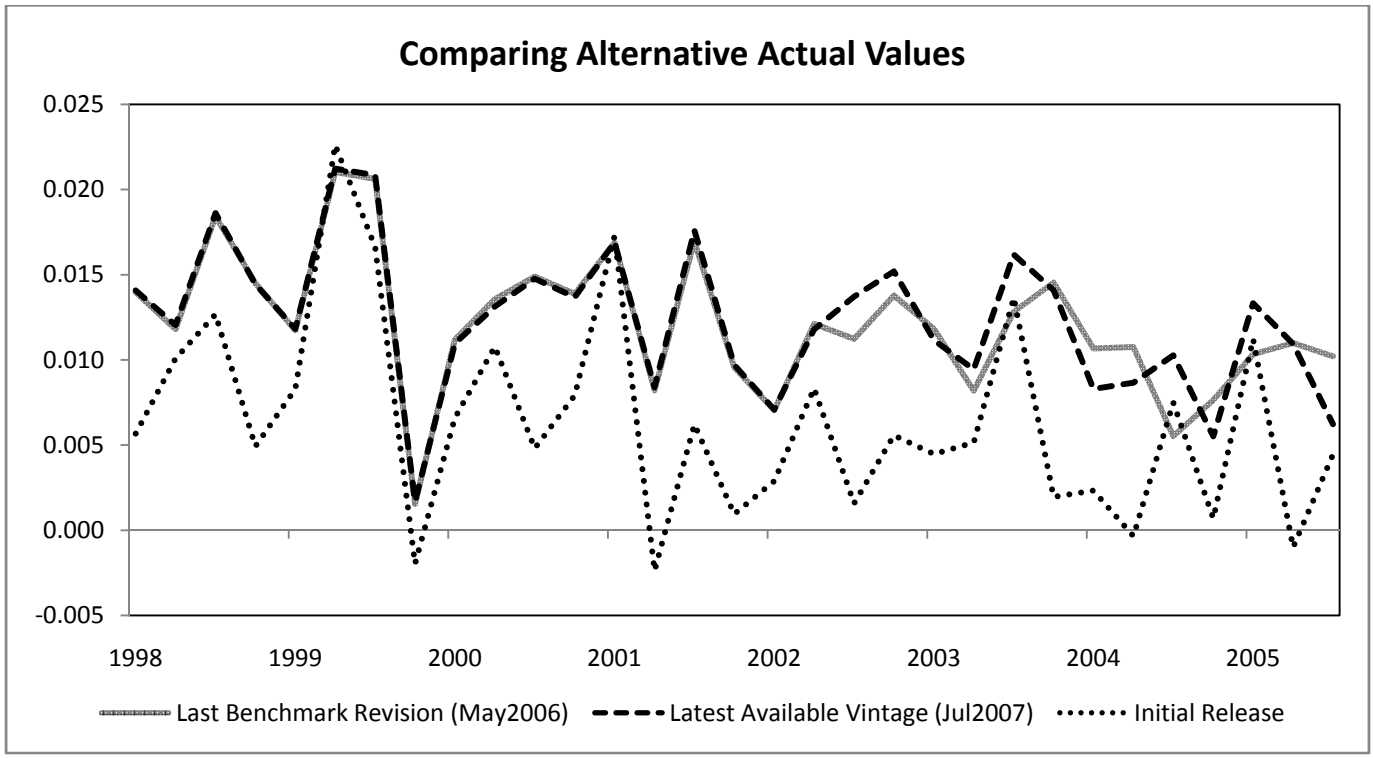

Figure 15

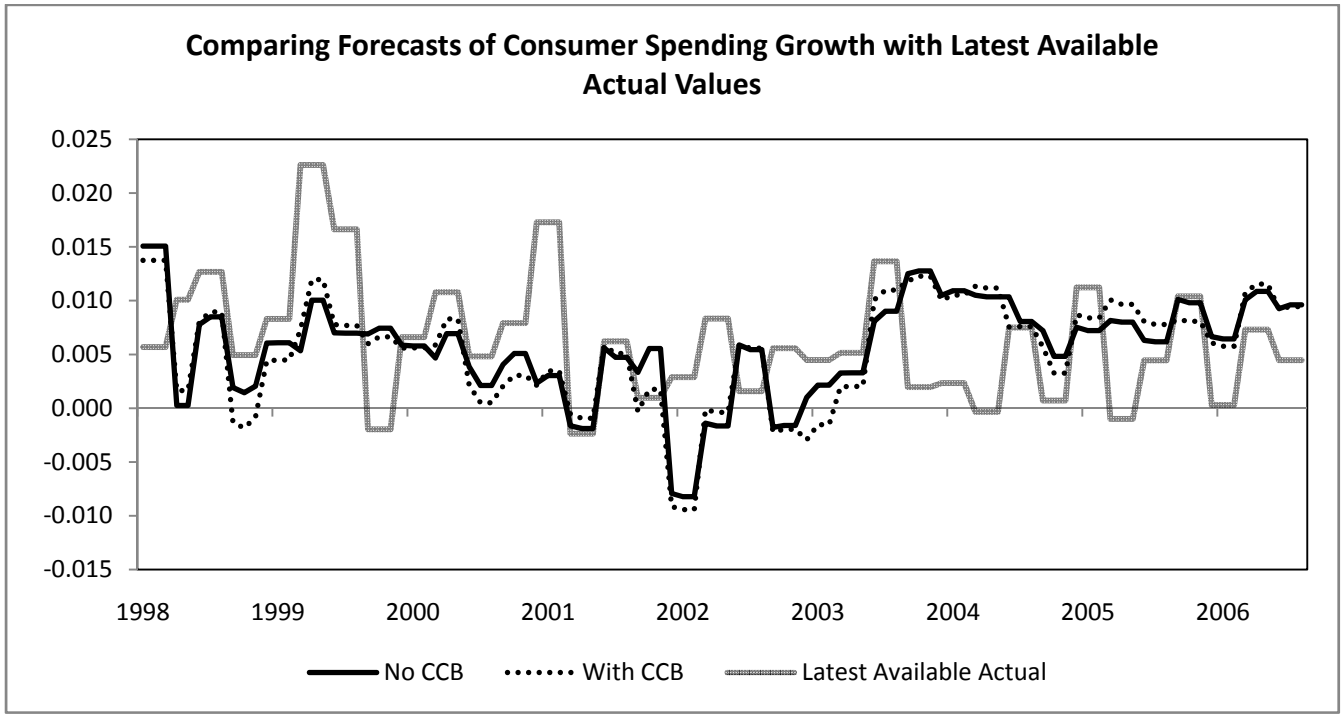

Figure 16

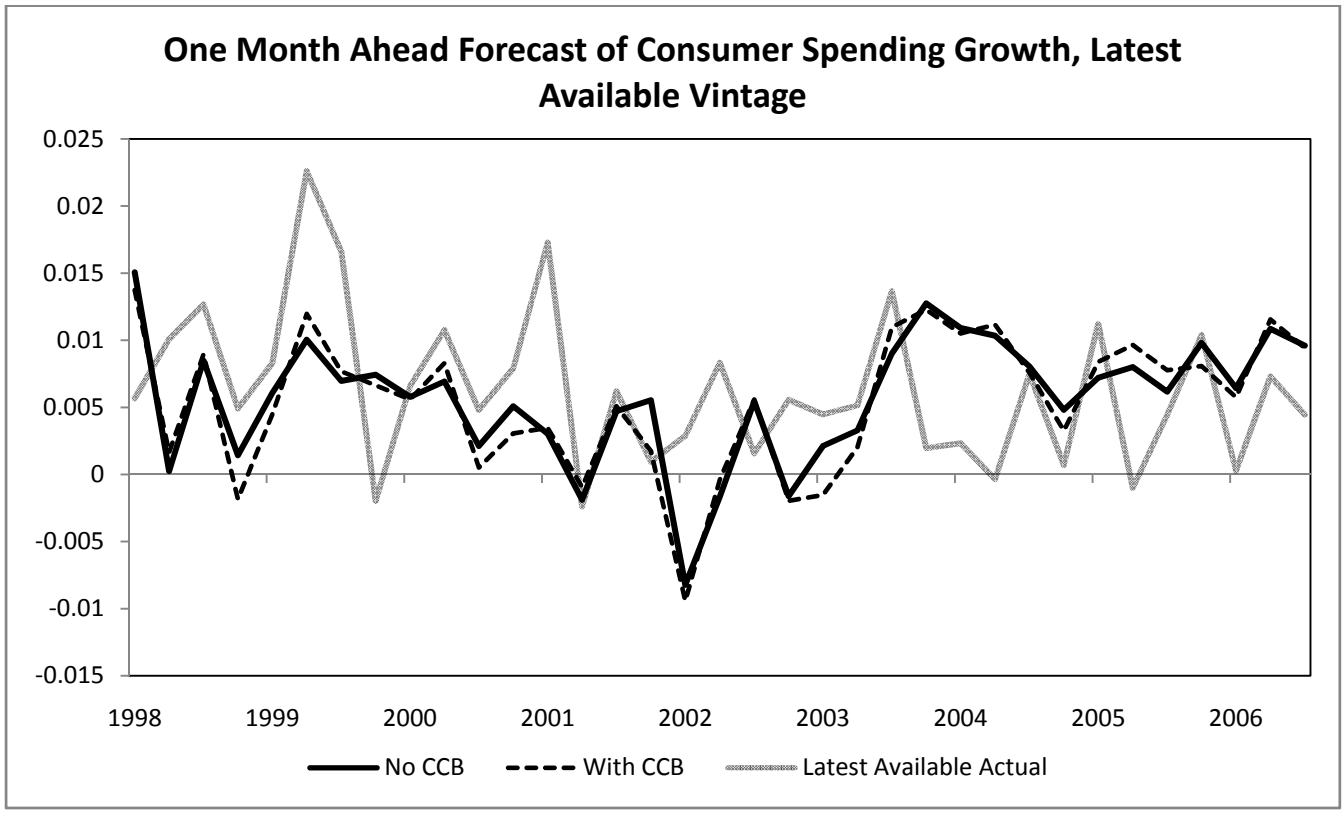

Table 1: Mean Revisions to Real Time Data

	Household Consumption		GDP		GDP Deflator	
	Mean Revision	*Mean Absolute Revision*	*Mean Revision*	*Mean Absolute Revision*	*Mean Revision*	*Mean Absolute Revision*
Most Recent Vintage						
First Annual Revision	0.008%	0.008%	0.355%	0.355%	0.005%	0.005%
Preliminary Vintage						
Revision after Most Recent Vintage	1.132%	1.186%	2.310%	2.333%	-12.874%	-12.886%

TABLE 2: Data Summery

Variable	*N*	*Range*	*Minimum*	*Maximum*	*Mean*	*Std. Dev*
GfK CCB	133	48.707	-29.173	19.533	-6.5077	9.5504
FTSE All-Share	133	3216.31	66.9	3283.21	1326.3	985.57
Official Bank Rate	133	13.47	3.53	17.00	8.839	3.586

Real Time Data

	N of Vintages	*Start Date*	*Oldest Vintage*	*Most Recent Vintage*	*Mean*
Household Consumption	107	Mar -1974	1998Q3	2007Q2	68,927
GDP	107	Mar -1974	1998Q3	2007Q2	240,545
GDP Deflator	107	Mar -1974	1998Q3	2007Q2	103.2

Table 3: Forecast Assessment with Alternative Actuals

	RMSFE	Relative RMSFE
Latest Available Vintage Actuals		
No Consumer Confidence Measure	0.00693	1.00000
Consumer Confidence Included	0.00687	0.99124
Last Benchmark Revision Actuals		
No Consumer Confidence Measure	0.00731	1.00000
Consumer Confidence Included	0.00924	1.03626
Initial Release Actuals		
No Consumer Confidence Measure	0.00684	1.00000
Consumer Confidence Included	0.00676	0.98848

Table 4: Alternative Time Horizon Forecast Assessment with Latest Available Actuals

Two Months before Release

	RMSFE	Relative RMSFE
No Confidence Measure	0.00705	1.00000
Consumer Confidence Included	0.00709	1.00595

One Month before Release

	RMSFE	Relative RMSFE
No Confidence Measure	0.00684	1.00000
Consumer Confidence Included	0.00676	0.98848

Month of Release

	RMSFE	Relative RMSFE
No Confidence Measure	0.00683	1.00000
Consumer Confidence Included	0.00673	0.98574

Table 5 : Revision Bias Adjustment Test

	Baseline	With CCB
No Adjustment	0.006931	0.006871
Relative RMSFE	1.000	0.991
One Year MA	0.006940	0.006875
Relative RMSFE	1.001	0.992
10 Year MA	0.006956	0.006897
Relative RMSFE	1.004	0.995

TABLE 6: Determinants of Consumer Sentiment Regression Results

Lin-Lin Model

Dependent Variable: GfK CCB

	Coefficients			
Variable	*No Trend*	*w/ Trend*	*Lagged$_{t-1}$*	*Lagged$_{t-2}$*
Constant	-38.304*** (6.950)	-19.158*** (3.161)	-41.6*** (7.679)	-41.594*** (7.591)
FTSE 100	0.003*** (7.208)	0.002*** (6.071)	0.003*** (7.844)	0.003*** (7.834)
Unemployment Rate	2.09E-05 (.000)	0.606* (1.764)	0.243 (.700)	0.299 (.854)
Earnings	0.354*** (7.326)	-0.328*** (2.643)	0.376*** (7.851)	0.377*** (7.639)
Fuel Prices	-0.163*** (12.307)	-0.154*** (12.405)	-0.178*** (12.777)	-0.185*** (12.328)
Collapse of ERM (1992)	-9.798** (2.591)	-9.483*** (2.701)	-10.407*** (2.808)	-10.736*** (2.869)
Death of Princess Diana	12.309** (2.338)	10.752** (2.197)	13.336** (2.588)	12.729** (2.444)
British Troops Enter Iraq	-6.777* (1.764)	-4.84 (1.351)	-3.435 (.917)	-2.941 (.778)
7/7 Bombings	6.205 (1.648)	4.428 (1.262)	6.356* (1.718)	5.056 (1.357)
September 11th	-6.1 (1.159)	-7.559 (1.546)	-4.776 (.925)	-2.208 (.424)
Nationalization of Northern Rock	-5.11 (.949)	1.698 (.331)	-4.586 (.871)	-2.908 (.546)
Trend	-	0.244*** (5.895)	-	-
R^2	0.679	0.725	0.69	0.679
Adj. R^2	0.664	0.71	0.675	0.664
Durbin Watson	0.676	0.684	0.616	0.571
# of Monthly Obs.	221	221	220	219

Notes:

Absolute values of t-statistics are in parentheses.

TABLE 7: Determinants of Consumer Sentiment Regression Results
Lin-Log Model
Dependent Variable: GfK CCB

	Coefficients			
Variable	*LN*	*LN with Trend*	*Lagged $_{t-1}$*	*Lagged $_{t-2}$*
Constant	-148.111***	-122.255*	-158.394***	-159.504***
	(7.251)	(1.845)	(7.800)	(7.772)
FTSE 100	12.744***	12.62***	13.688***	14.283***
	(5.994)	(5.865)	(6.527)	(6.702)
Unemployment Rate	-4.184	-3.795	-2.518	-1.825
	(1.572)	(1.340)	(.952)	(0.683)
Earnings	24.23***	17.855	24.147***	22.623***
	4.434	(1.084)	(4.497)	(4.162)
Fuel Prices	-14.979***	-15.24***	-15.06***	-14.656***
	(8.834)	(8.400)	(8.832)	(8.347)
Collapse of ERM (1992)	-8.916**	-8.859**	-9.638**	-9.686**
	(2.258)	(2.238)	(2.460)	(2.442)
Death of Princess Diana	11.444*	11.306**	12.516**	11.97**
	(2.073)	(2.040)	(2.293)	(2.172)
British Troops Enter Iraq	-5.267	-5.049	-2.31	-1.783
	(1.306)	(1.239)	(.582)	(0.446)
7/7 Bombings	4.519	4.447	4.412	3.718
	(1.146)	(1.124)	(1.127)	(0.944)
September 11th	-5.893	-6.014	-4.47	-1.962
	(1.070)	(1.088)	(.818)	(0.356)
Nationalization of Northern Rock	-9.437*	-9.017	-9.592*	-9.124
	(1.687)	(1.583)	(1.734)	(1.636)
Trend	-	0.025	-	-
		(.410)		
R^2	0.648	0.649	0.652	0.642
Adj. R^2	0.632	0.630	0.636	0.625
Durbin Watson	0.601	0.591	-	-
# of Monthly Obs.	221	221	220	219

Notes:

Absolute values of t-statistics are in parentheses.

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