Excess sensitivity of consumption using micro data in the UK

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2005

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1 INTRODUCTION

The arguments over the Permanent Income Hypothesis (PIH) and the rational expectations extension of it (REPIH), concerning suggestions of excess sensitivity of consumption, have been continued for decades without an explicit solution. This is because there have been no conclusive findings in empirical studies. Most empirical results show confidence in supporting one or rejecting the other. This vagueness has significant and negative consequences for understanding the consumption/savings processes of households and for improving our knowledge of economic trends and stabilization from a policy perspective.

In the literature, many researchers have carried out investigations to test the validity of assumptions such as hyperbolic discount rates[1], binge augmented consumption, habit persistence, and the excess sensitivity of consumption to income. However, only a few empirical papers have investigated the impact of individual subjective information on economic outcomes.

The methodology developed by Souleles (2001) to test for excess sensitivity with respect to household data has a deep intuitive appeal. Rather than testing excess sensitivity using aggregate data, Souleles used US household-level data from the Michigan Index of Consumer Sentiment. He found that consumer sentiments were useful in forecasting future consumption, even after controlling for lagged consumption and macro variables such as stock prices. Furthermore, the systematic demographic components in forecast errors were used to reject of the PIH. Melvin (2003) also examined the link between

[1] People value present more than the future, as in Laibson(1997).

subjective job loss expectations and the subsequent impact on household consumption behavior behind the intuition suggested by Flavin (1981) and Campbell and Deaton (1989).

In this paper, I follow Souleles (2001) and Melvin (2003) by using data derived from the BHPS. This contains questions on the expected level and changes in a number of relevant economic variables and British respondents' uncertainty in making these predictions covering the years 1991 until 2002. One of the main novelties of this thesis is that it uses the financial situation validate in the BHPS to value the respondents' well being instead of the term 'income' popularly used in most papers. This is particularly interesting due to the potential relationship between macro-economic shocks and individual psychological well-being. Thus, while a narrow interpretation of financial situation is income, a broader interpretation would take into account the values of any assets agents hold and the incomes they currently received or expect to receive in the future. Most interesting, some who experience an increase in current income may feel themselves worse off financially. This is similar to the results in paper 5 in which respondents' expectations decrease with increasing real income. In other words, the idea of an agent's financial situation or satisfaction can potentially include many factors that are difficult to identify or value but can significantly affect agents' decision making behaviour in the real world. Furthermore, Das and Van Soest (1996) argue that subjective answers reflect real rather than nominal changes. Although the questions in the BHPS are not very well specified, it seems reasonable to assume that respondents have the same broad concepts in mind when answering questions on their financial outcomes and future expectations. In each wave of the BHPS, agents answer questions on whether their actual financial situation has changed in the past twelve months, and on whether they expect it to change over the next twelve months. Both questions are answered on a three points scale[2]. In addition, the following analysis breaks down the whole sample into various sub-samples to test for

[2] 1 = worse off; 2 = about the same; 3 = better off

excess sensitivity among each of these groups. It is hoped that these results can provide a deeply insight into the divergence of sensitivity of each individual component to consumption fluctuations.

2 RELATED STUDIES

Hall's random walk hypothesis of consumption argues that if agents have rational expectations (that is, if they are forward-looking) then current consumption should only depend on consumption in the most recent period, and that not other variables will feature. The implication of the REPIH is that if all past and predictable information is incorporated in current consumption, no lagged information can provide additional explanatory power in accounting for variations in future consumption. Thus, one way to test the predictions of the REPIH is to examine whether consumption is sensitive to anticipated changes in interested explanatory variables such as income. This approach has been taken by Hall and Mishkin (1982), Altonji and Siow (1987), Attanasio and Browning (1995) and Lusardi (1996) among others. As a means of testing the impact of lagged variables on consumption, regression equations of the following from have been introduced:

$$\Delta c_{t+1} = \beta E_t(y_{t+1}) + \varepsilon_{t+1} \quad \text{or} \quad \Delta c_{t+1} = \beta E_t(y_{t+1} - y_t) + \varepsilon_{t+1} \tag{1}$$

Where y is household real income. If theoretical predictions of the permanent income model and rational expectations are valid then $H_0 : \beta = 0$. In many studies (eg. Hall, 1978; Zeldes, 1989; Jappelli et al., 1998) the (log) level of income is used. Attanasio and Weber (1993) used the growth in income. It is noted that the income term can be considered as predictable income or income growth in t or $t+1$, using instruments dated $t-1$ or earlier. The Euler equation is a period-to-period arbitrage condition and therefore does not take into account the effects of future constraints on current behavior. As such, the Euler equation is only a minimal test of the REPIH. In addition, problems can arise when estimating Euler equations using panel data. Chamberlain (1984) states that "a time average of forecast errors over T periods should converge to zero as $N \to \infty$. But an average of forecast errors across N individuals surely need not converge to zero as $N \to \infty$; there may be common components in those errors, due to economy-wide innovations." As a result, a set of time dummies are also included in equation (6.1) to guard against this problem in many empirical studies[3]. Altug and Miller (1990) claim that these dummies can be interpreted as the undiversified aggregate risk facing intertemporal decisions under a complete market setting. Although the panel data (1991-2002) employed in this thesis is longer than that used in some earlier studies, the time dimension may still not be long enough. As a result, time dummies are included in the regressors.

Flavin (1981) used the excess sensitivity tests to mount a powerful rejection of the REPIH. Two ideas are developed in her work. One is that a stronger test for consumption than the reduced-form consumption equation is provided. In addition, she attempts to identify consumer's reaction to both anticipated and unanticipated income shocks. Flavin's model mainly focuses on the role played by current income in providing new information about future income. Under the permanent income hypothesis a rational agent can use such information to upgrade his/her permanent income expectations. A drawback of Flavin's test is that both income and consumption processes need to be modeled and the results which emerge from this are sensitive to the modeling specifications that are used[4].

Thus, a trended ARMA representation was used to model the time-series properties of the income process and to specify agent's expectations about their future levels of income. Under assumption of an ARMA process for income, actual revisions in permanent income can possibly be acquired from the contemporaneous observation of current

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[3] Zeldes (1989), Altongji and Siow (1987), and Runkle (1991)
[4] See Deaton (1992)

income. This revision is given by the forecast error in the ARMA specification and such an error represents unanticipated news associated with current observations of income[5]. The magnitude of the revision would then depend on the parameters of the ARMA representation of the income process. Together with this argument, one can 'specify a structural equation relating the change in consumption to the contemporaneous revision in permanent income (modeled using the income innovation) and the change in current income'. [pp.976]. As a result, it is possible to use Flavin's model to explore the determinants of change in consumption for inferring agents' expectations.

Since the path of future income is uncertain, an individual must make his consumption plans on the basis of some set of expectations about future income. Given the expectations about future income held in period *t*, the individual's permanent income can be expressed as

$$y_t^p = r\left[A_t + \sum_{k=0}^{\infty}(\frac{1}{1+r})^{k+1} E_t y_{t+k}\right] \tag{2}$$

where y_t^p is permanent income at time *t*; A_t is their stock of assets at time *t*; *r* is the constant real rate of interest; y_t is their labor income at time *t*; and E_t is the expectations operator for expectations at time *t*.

Allowing for a stochastic, or transitory, component of consumption, the consumption function for the representative individual becomes $c_t = y_t^p + u_t$, or

$$c_t = r\left[A_t + \sum_{k=0}^{\infty}(\frac{1}{1+r})^{k+1} E_t y_{t+k}\right] + u_t \tag{3}$$

[5] Flavin also suggests that the error in the ARMA representation for income can represent, for econometricians attempting to model consumption, not just the 'true innovation' in income, but also the predictive 'value of all the lagged values of variables observed by the individual, but not explicitly incorporated in the regression.' [pp. 991]. This is an issue related to Campbell's (1987) and West's (1988) superior information.

where the error term u_t denotes the transitory component of consumption.

Solving for c_{t+1} in terms of c_t, subject to $A_{t+1} = (1+r)A_t + y_t - c_t$, gives:

$$c_{t+1} = c_t + r\sum_{k=0}^{\infty}(\frac{1}{1+r})^{k+1}(E_{t+1} - E_t)y_{t+k+1} - (1+r)u_t + u_{t+1} \tag{4}$$

Consumption will evolve as random walks only if the transitory consumption term is identically zero, $u_t \equiv 0$. So I can re-write

$$\begin{aligned}\Delta c_{t+1} &= r\sum_{k=1}^{\infty}(1+r)^{-k}(E_{t+1} - E_t)y_{t+k} \\ &= r\left[\left(\frac{1}{1+r}\right)(y_{t+1} - E_t y_{t+1}) + \sum_{k=2}^{\infty}\left(\frac{1}{1+r}\right)^{-k}(E_{t+1} - E_t)y_{t+k}\right]\end{aligned} \tag{5}$$

Consequently I use the above equation to understand how changes in expectations of future income relate to consumption changes. Because the first term represents the household's expectations errors concerning current income, y_{t+1}, while the second term corresponds to the influence of changing expectations regarding future income y_{t+k}, $k \geq 2$, changes in consumption between the two periods can be decomposed into these two terms. A basic empirical implication of this model is that, even if the behavioral marginal propensity to consume out of current income is zero, consumption should respond to changes in current income because these innovations provide new information about future income and therefore induce revisions in expected permanent income. In other words, one alternative hypothesis is that expectations errors might not be classical but rather contain systematic components correlated with the excess sensitivity regressor. Chamberlain (1984) states that systematic expectations errors can be a potential problem in estimating any rational expectations (or forward-looking) model in a short panel. For instance, female respondents might, on average, have been optimistic about future over the sample period, so that they increase their consumption due to their over-optimism or a positive correlation between consumption and expectations would not be inconsistent with the REPIH. The availability of the direct measures of respondents' expectations errors in the BHPS makes it possible to test this point directly.

The null hypothesis in Flavin's paper is the permanent income hypothesis associated with an autoregressive specification for the process governing labor income. In general, it also can be specified as followed:

$$\Delta c_t = \varepsilon_t = \alpha\eta_t = \alpha\sum_{k=0}^{T-t}(1+r)^{-k}(E_t - E_{t-1})(w_{t+k} + y^{\tau}_{t+k}) \tag{6}$$

$$\phi(L)y_t = \varepsilon_t \tag{7}$$

where $y_{t+k} = w_{t+k} + y^{\tau}_{t+k}$. Flavin also introduces the possibility of unanticipated capital gains in the model, so surprises in non-labor income, y^{τ}, are allowed to be different from zero. Strictly speaking, Flavin's excess sensitivity hypothesis allows consumption to respond to current and lagged changes in income by more or less than is required by the permanent income theory. The extended version of Flavin's model is as followed:

$$\xi(L)y_t = \mu + \varepsilon_t \tag{8}$$

$$\Delta c_t = \gamma + \theta\varepsilon_t + \beta(L)\Delta y_t + u_t$$

where $\xi(L) = \sum_{i=0}^{p}\xi_i L^i, \xi_0 = 1$ and $\beta(L) = \sum_{i=0}^{p}\beta_i L^i; \beta_0 \neq 1$. It should be noted that Flavin rearranges the *AR(p)* income process equation and substitutes the error term ε_t into the consumption equation for income variable. Hence, the first difference of consumption responds both to current and lagged changes in income as well as the innovation in the income process in the unrestricted version of the model. The measures of excess sensitivity of consumption to current income, β, provide an estimate of the amount of additional response of consumption to the new information contained in current income. In sum, according to the REPIH, consumption changes should not be related to other variables except of the amount to income innovation provided by the error term ε. Hence all the β coefficients, which represent the extend to which consumption responds to previously predictable changes in income, should be zero.

In Flavin's paper, she runs an eight-order auto-regression (*p=8*) for the labor income process. The restriction $\beta_0 = \beta_1 = ... = \beta_7 = 0$ is imposed on the system to obtain a constrained system that can be estimated. She then used data on non-durable goods consumption from 1949(3) to 1979(1) and found that the likelihood ratio statistic for the hypothesis $\beta_0 = \beta_1 = ... = \beta_7 = 0$ was 27.02 for $\chi^2(8) = 21.96$. Hence the random walk specification of Hall was rejected by Flavin. [pp. 999]. The estimates for the first three sensitivity parameters are .335, .071 and .049. These results indicate a strong excess sensitivity response of consumption to changes in current income. [pp. 1002]

However Mankiw and Shapiro (1985) and Deaton (1992) began to question the validity of the stationary income process assumption, one of the main econometric techniques used by Flavin, and discussed the actual form that modeling the income process should take when such a process appears to be non-stationary. They also criticized the method used by Flavin to account for the upward trending behaviour of income which dealt with the non-stationary nature of the income process by fitting exponential time-trends to both consumption and income, and by replacing consumption and income in the regressions by their residuals. In particular, Mankiw and Shapiro argued that excess sensitivity is induced by this detrending procedure, even if excess sensitivity is not present in the data. Basically, y is a non-stationary variable while Δc is stationary so running a system like

(8) cannot provide much information for both sides of the consumption equation as each are of a different order of integration[6]. The problems about making inferences about the coefficients on lagged income using standard t and F-tests are essentially the same as the problems that occur in discerning the existence of a unit root in a univariate time series, and the use of standard normal tables at usual significance levels results in over-rejection. Deaton (1992) ran a Monte Carlo experiment[7] to test this point and found that the t-statistics for excess sensitivity on each of the income variables, and the test for excess sensitivity as a whole (an *F-test*), rejected more than the customary 5%[8].

However Stock and West (1988) challenged Mankiw and Shapiro's suggestion that excess sensitivity was the result of bad econometric practice by using the concepts of cointegration and error correction to provide a means of testing excess sensitivity:

$$c_t = b_0 + b_1 c_{t-1} + b_2 y^d_{t-1} + b_3 y^d_{t-2} + u_t$$

where y^d is the same income measure used by Flavin. Now, if savings is defined as

$$c_t = b_0 + (b_1 + b_3) c_{t-1} + (b_2 - b_3) y^d_{t-1} + b_3 s_{t-1} + u_t \tag{9}$$

We would see that the savings variable plays the error correction role in this model if we expect the coefficient of the lagged consumption variable $(b_1 + b_3)$ to be close to one. Sims, Stock and Watson (1990) show that in a regression of integrated variables of the same order, standard asymptotic theory can be applied to parameters that can be written as the coefficients of stationary variables. If consumption and disposable income are cointegrated, then the last two variables of equation (9) are stationary. Hence, it is

[6] To see this note that in (21) the income equation is already in reduced form, and to obtain the reduced form for consumption I only need to substitute the income equation into the consumption equation (see Deaton (1992) pp. 89).

[7] Deaton himself recognizes that 'the Monte Carlo results, although tailored to reflect the actual data, do not generate results that look like Flavin's'. [pp. 94]

[8] The overall *F-test* rejects 43% of the time, and the *t-test* for β_0 and β_1 rejects 14% and 21% of the time respectively rather than the correct 5% [pp. 93].

possible to make inferences about the excess sensitivity parameters b_2 and b_3. Stock and West also used Monte Carlo experiments to show that their technique worked and found evidence in favor of excess sensitivity. Thus, according to Stock and West, the problem with Flavin's test procedure is that the imposition of a unit coefficient upon the lagged consumption variable alters the asymptotic distributions of the estimates. However once we correct for this problem, evidence for excess sensitivity still appears to exist.

3 DATA

4 METHODOLOGY

In life cycle models of individual behaviour, future expectations play an important role. As a result, it is believed that they may help in making forecast of individual behaviour in consumption or saving. This has lead to an increasing interest in data on, and the modelling of, expectations. The preceding discussion has clearly indicated that standard theoretical predictions are prone to dismissals primarily depending on the information sets the household faces. Any assumption on the homogeneity of preferences and information sets the households face might lead to inefficient evaluations. To deal with this shortcoming, Souleles (2001) came up with a simple but novel way of estimating consumption patterns by exploring the response of different types of households over time. In this paper, following on from Souleles (2001) and from Melvin (2003), direct information on respondents' future financial change expectations, which are different from the standard approach[9] of inferring expectations from panel data on outcomes that leads to the assumption of rational expectations are used, to test for excess sensitivity.

[9] See the discussion in Guiso et al. (1992, 1996), Lusardi (1993), and Alessie & Lusardi(1996).

In this analysis, the individual's financial variables are used as a proxy of income to explore the relationship between financial well-being and household consumption. To the extend, the current income shock $y_{t+1} - E_t y_{t+1}$ is taken the place of the financial expectations errors. Financial expectations change is related to future income expectations change, $(E_{t+1} - E_t) y_{t+k}$. The first part of this paper follows Souleles' (2001) method to test for the excess sensitivity of consumption to changes in financial expectations. To do this Souleles added the lagged expectations variable *Fisitx* to a standard linearized Euler equation for consumption. Thus, for household *i* the change in consumption between period *t+1* and *t* is specified as

$$\Delta c_{i,t+1} = \alpha time_{t+1} + \beta Fisitx_{i,t} + \gamma W_{i,t+1} + \varepsilon_{i,t+1} \quad (t = 1,...,10) \tag{10}$$

Where Δc refers to changes in household nondurable consumption[10]; *time* includes a full set of year dummies (1992~2002), which controls for all aggregate (uniform) effects, including seasonality, aggregate interest rates, and other macro variables which allow for changes in the households financial situation from year to year; *Fisitx* denotes the expectations of financial situation change; while *W* controls for demographic characteristics such as changes in the number of adults and children[11] in the household.

There are many possible sources of excess sensitivity, such as myopia and the existence of liquidity constraints. As a result, the second stage of the analysis is to explore the possible sources of excess sensitivity associated with the whole sample and with some sub-samples of it. The analysis also distinguishes between anticipated changes in financial situation that are negative (deteriorated financial situation changes) from those that are positive (improved financial situation changes). This asymmetry between

[10] Since many studies examine the change in log consumption, the results of the analysis using this alternative dependent variable are presented as well.

[11] Following Zeldes (1989), Dynan (1993), Lusardi (1996), and Souleles (1999), these variables help control for the most basic changes in household preferences over time. Expanding the variables in *W* would be possible to eliminate most any excess sensitivity. Therefore *W* is restricted to the commonly used set of controls.

negative and positive resource changes is first discussed in Altonji and Siow (1987) and recently analyzed by Shea (1995b;1995a). A simple extension of equation (6.10), following Shea (1995b), provides a deeper insight into the evolution of the consumption process given the following:

$$\Delta c_{i,t+1} = \alpha time_{t+1} + \beta_1 Fisitx_{i,t}^{-} + \beta_2 Fisitx_{i,t}^{+} + \gamma W_{i,t+1} + \varepsilon_{i,t+1} \quad (t = 1,...,10) \qquad (11)$$

where β_1 and β_2 are dummy variables indicating $Fisitx_{i,t}^{-}$ and $Fisitx_{i,t}^{+}$ respectively. This form allows us to test whether excess sensitivity can be explained by the following reasons.

1. *Rule-of-Thumb Consumers.* There are consumers who are myopic. They are assumed to have a constant marginal propensity to consume out of current wealth or income and therefore do not behave as predicted by the REPIH. As a result, such consumers will be excessively sensitive to variables known in the information set. However, rule-of-thumb consumers will respond to changes in their financial resources regardless of whether these are expected to be an improvement (a positive change) or a deterioration (a negative change). In other words, if consumers are myopic, β_1 and β_2 should both be significantly positive and of similar magnitudes.

2. *Liquidity Constraints.* Consumption models based on the presence of liquidity constraints predict a stronger (positive) response in consumption growth to positive predicted financial resource growth than to negative financial resource growth because liquidity constraints only preclude borrowing against future expected financial source growth but do not inhibit saving ahead of future expected financial resource reductions. Hence consumers can save and smooth their consumption when their financial resources are expected to fall. This

outcome would also be expected if forecast errors represent a transitory financial situation shock as in buffer-stock saving models, such behaviour reflects 'self-imposed' liquidity constraints. Thus, if liquidity constraints were the main cause for rejections of the REPIH, we should observe excess sensitivity only when consumers expect increases in financial resource but are prohibited from borrowing. In such a case β_2 should be significant if a household head is genuinely liquidity constrained, but β_1 should be insignificant.

3. *Asymmetric Preferences.* Another plausible explanation for the excess sensitivity to predicted changes in financial resource is that households do not have time-separable preferences as assumed. If there is inertia in preferences, perhaps due to the role of habit formation, households will only adjust their behavior slowly. In the case of asymmetric preferences, β_1 should be significant while β_2 should be insignificant. Carroll (1995) applied two dummy variables to test the existence of an asymmetric response of consumption to positive and negative shocks to permanent income by using information on union contracts to construct a measure of expected income growth for each household. He found that the response of consumption to negative income shocks were much higher than those associated with positive income shocks. Likewise, Bowman *et al*. (1998) used a database derived from five countries (Canada, France, West Germany, Japan, and the United Kingdom) to estimate the expected income growth and found empirical support for an asymmetry in consumption behaviour. Bowman *et al*'s method for estimating the expected income growth was to regress actual income growth at time *t* against the second through fourth lags of consumption growth, income growth, *ex post* real interest rates, and an error correction term formed from the second lag of the difference between consumption and income.

In most cases, economists who assume that individuals do not make systematic errors under the REPIH find that it works well using aggregate data. Because the BHPS involves information on individuals' financial well-being, this paper tests to see whether individuals' subjective financial well-being influences their consumption behaviour (non-durable consumption). Next, this paper examines the overall distribution of individual financial well-being and consumption with respect to various categorizations of household types.

To carry out a further investigation of the failure of Hall's random walk hypothesis, this paper then returns to the residual, ε, which determines changes in consumption and potentially includes many factors, such as measurement error or unobserved heterogeneity in discount rates. According to Flavin (1981), Campbell and Deaton (1989), and Melvin (2003), equation (6) can help to decompose ε into two components: the change in consumption resulting from unexpected current financial changes; and any revisions in expected future financial situations. Empirically, the following equation (12) is used, which shows a direct relationship between financial expectations errors and household consumption, to assess whether systematic heterogeneity in expectations errors can lead to spurious inference more generally in forward-looking models.

$$\Delta c_{i,t+1} = \alpha time_{t+1} + \beta Fisitx_t + \varphi Fisite_{i,t+1} + \phi \Delta Fisitx_{i,t+1} + \gamma W_{i,t+1} + \varepsilon_{i,t+1} \quad (t = 1,\ldots,10) \quad (12)$$

Where $Fisite$ denotes financial expectations errors and $\Delta Fisitx$ denotes changes in respondents' financial expectations. For consistent estimates of β, the forecast errors need to be uncorrelated with the excess sensitivity regressor *Fisitx*. With direct measures of expectations errors, we can test the implications of systematic heterogeneity in the errors. Also, shocks to financial situation are considered to be among the most important sources of the overall changes in consumption in ε. Under the alternative hypothesis that excess sensitivity is generated by demographic components in expectations errors, we would expect to find $\beta = 0$ and $\varphi > 0$, since the REPIH allows for consumption to respond to the current financial shocks represented by *Fisite*. $\varepsilon_{i,t} = \mu_i + v_{i,t}$, where μ_i captures the unobserved, time-invariant characteristics of the individual. It means that, for all observations relating to a given individual, μ_i will have the same value, reflecting their unchanging unobserved characteristics. For μ_i to be properly specified, it must be orthogonal to the individual effects. v_{it} are random errors. In this case $\mu_i \sim IID(0, \sigma_\mu^2)$, $v_{it} \sim IID(0, \sigma_v^2)$ and the μ_i are independent of the v_{it}. In other words, the cross-sectional specific error term μ_i must be uncorrelated with the errors of the variables if this is to be modeled with other explained variables. However the later assumption is unrealistic in the present context, as W includes demographical variables that are correlated with, for example, any unobserved ability captured in μ_i. Furthermore, if this unobserved individual specific effect is also correlated with the expectations errors, then the main coefficient of interest, β, will be biased. Panel data allow us to overcome these potential problems of endogeneity by treating the unobserved effect μ_i as random, and I estimate equations (11) and (12) using random effect models.

In the process of developing detailed simulation models we need to identify a proxy for non-durable consumption while food and grocery expenditures are considered to be fairly unresponsive to changes in purchasing power in aggregate data, that is, the consumption of food is relatively inelastic to income, at the level of individual or household. We might expect to observe significant changes in food and grocery expenditure when there are noticeable changes in their financial circumstances and a reasonably strong relationship between food expenditures and their financial well-being. All specifications have the same instrument sets for comparability. As a result, with the help of the micro data derived from the BHPS, I exploit cross-sectional variation by controlling for time effects and investigate the source of any excess sensitivity by using a random effects model.

5 RESULTS AND ANALYSIS

5.1 Evaluating Excess Sensitivity

In terms of the excess sensitivity tests, there are two main findings. First, Table 1 in Appendix provides robust estimates of the model parameters for the estimating equation (10). If the REPIH holds, one would expect to find that the coefficient of financial well being growth (β) would not be statistically different from zero. Instead the test reports a significant β with a coefficient estimate of -0.1148 for nondurable consumption in the whole sample. This clearly indicates that consumption fluctuated with anticipated changes in financial well being and this amounts to a decisive rejection of the REPIH: consumption is excessively sensitive to current financial well being changes, or, in other words, it suggests that individuals fail to peg their consumption to expectation of their permanent wealth.

Carroll (2001) explains the correlation between future expected resource growth and the probability of excess sensitivity by arguing that such households are more likely to want to borrow or because expected resource growth effectively raises the degree of impatience. In addition, the information on financial expectations appears to help predict consumption. The signs on β are negative in most sub-samples. Thus, in all cases, better financial states are associated with less steep consumption profiles; that is, higher expectations are associated with less saving. This outcome is both consistent with precautionary motives for saving (Deaton, 1992; Carroll, 1992; Lusardi, 1998) as well as with increases in expected future resources. While adding demographic variables into the consumption regression reduced the significance of the financial variable considerably, these variables act as important control variables. Thus age is employed as a significant variable in the regressions. Age decreased consumption up to 41.5 and thereafter increased it (because quadratic $ax^2 + bx + c$ turns over at $x = -b/_{2a}$, which for *age* and *age2* coefficient is $(-(-0.0733)/_{2 \times 0.0883}) \times 100 \approx 41.50$). Other demographic terms also showed plausible signs. For example, there was a positive relationship between consumption growth and family size or changes in the number of children.

Second, the evidence for excess sensitivity is statistically significant in only some sub-samples. For example, with respect to household heads with highly educated level, β(-0.1605) was statistically significant at the 5% level; however it was insignificant for other groups in the education sub-sample. This suggests that high-educated agents fail to smooth their consumption, but agents with comparatively lower education level smooth consumption very effectively in the sense that they do not display excess sensitivity. In the same vein, I can refer the employee, the self-employed, or higher degree holders as the excess sensitivity groups. Among the other groups, agents' expectations did not affect their nondurable consumption. In other words, the REPIH could not be rejected for results in these sub-groups.

5.2 Tests for Myopia and Liquidity Constraints

As was indicated earlier, deeper insights into the relationships between the excess sensitivity of consumption and the dependence of consumption to financial situation change can be obtained by extending equation (10) to equation (11). In addition, changes in financial situation are divided into negative and positive parts to investigate whether consumption changes are more sensitive to stochastic financial deteriorations or improvements. The estimated equation and results are presented in Table 2 in Appendix. A similar set of instruments as in the previous case were used for these estimations. These find that β_1 in equation (11) is strongly significant only when consumers expect a deterioration in their future financial situation. Conversely the coefficient of positive financial well being growth is insignificant and ambiguous. The above exercise proves an important point in that we can formally reject $\beta_1 = \beta_2 = 0$ in favor of $\beta_1 > \beta_2$, a result strikingly similar to that found by Shea (1995b).

Under predictable or expected financial well being changes, myopia would imply that consumption fluctuates equally in response to both positive and negative financial situation variations. Thus, if households are indeed myopic, they would be incapable of pegging their consumption to their permanent income, in which case, consumption should increase whenever their financial situation improves and decrease whenever their financial situation deteriorates. Hence changes in consumption should be uniformly related to changes in financial well being. This analysis finds that consumption is affected only by negative financial well being growth. This does not conform to the situation of myopic consumption behavior. One the other hand, if liquidity constraints exist, predicted financial situation deterioration should make forward-looking individuals save more, and thereby avoid a decline in their consumption. Therefore, consumption should be more sensitive to predicted financial situation improvement than to financial situation deterioration, due to existence of anticipatory savings. However, if financial well being fluctuations are predictable, the above results are not indicative of either myopia or liquidity constraints. And, the effect of anticipated financial well being fluctuations might be quite different. Individuals, then, would be incapable of forecasting financial situation deterioration. Thus it is plausible that an inability to borrow pulls consumption down with deteriorated financial situation. Nevertheless, the failure of the REPIH is apparent from the empirical results. However, the cause for this breakdown remains unclear in the present analysis.

Consequently, asymmetric preferences appear to be the most important source of the excess sensitivity found in this study. There are many ways to model time nonseparabilities in preferences, and I would focus on those that induce asymmetric responses to positive and negative predicted financial resource changes. Such behavior could arise if individuals weigh outcomes that are above and below a certainty equivalent, or treat gains and losses differently.[12] For example, if consumers with asymmetric preferences (i.e., they are averse to negative changes) expect a negative income change in *t+1*, they would gamble that the negative shock will not occur rather than revise c_t downward in expectation of the negative shock. A small reduction in c_t and a large negative change in c_{t+1} can therefore translate into a large negative Δc_{t+1} for a given expected change in financial resources. In contrast, when consumers anticipate a future but positive income change in period *t*, they will revise c_t upward immediately just as any expected utility maximizer would. This implies that Δc_{t+1} will be small in response to the anticipated positive change in financial resources. In summary, I used equation (11) to test three hypotheses and found that *Asymmetric Preferences* appears to be the most important source of excess sensitivity.

Turning to the results from sub-samples, the coefficients of anticipated financial well being deterioration are significant in male, employee, and the highly educated groups in line with the explanation of asymmetric preferences in the whole sample. However, the coefficient of financial well being improvement is significant in self-employed group. This result implies that liquidity constraints can be the source of excess sensitivity for the self-employed respondents.

5.3 Detecting Excess Sensitivity in Systematic Heterogeneity

Another possibility, but one that has not previously received much scrutiny in the

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[12] Examples include "loss aversion" proposed by Tversky and Kahneman (1991) and extended by Bowman, Minehart, and Rabin (1993) into a saving model; "disappointment aversion" axiomatized by Gul (1991) and used to explain the so-called Allais paradox.

literature, is systematic heterogeneity in *expectations errors*. This is especially likely to be a problem since both the financial situation variables and expectations errors were found to be correlated with household's demographic characteristics in paper five. These findings suggest that even a long sample period and a full set of time dummies might not be enough to ensure the orthogonality of the expectations errors with the financial situation variables[13]. Furthermore, Flavin (1981) derives a model to identify the consumers' reaction to expectations errors and changes in expectations of their future resources. The direct measures of households' expectations errors found in the BHPS make it possible to explore whether expectations errors play an important role in the rejection of the REPIH. As a result the expectations errors were added into equation (10) and equation (12) was used to consider whether systematic heterogeneity in expectations errors was another source of excess sensitivity.

There is likely to be a multicollinearity problem if financial expectations changes are correlated with expectations errors. In other words, even a long sample period and a full set of time dummies might not be enough to ensure orthogonality of the expectations errors with the financial expectations regressors. To test for multicollinearity each x was regressed on all of the other x variables. The $1-R^2$ from this regression was then used to see what fraction of the first x variable's variance was independent of the other x variables. The results from VIF (Variance Inflation Factor) Table 3 in Appendix give a quick and straightforward check for multicollinearity. The 1/VIF column at right in a VIF table gives the values equal to $1-R^2$. It shows that 65.8% of the variance in *expectations errors*' was independent of *age, age2, financial expectations, expectations change, change in number of adults, and change in number of children*. Similarly, about 63.9% of the *expectations change's* variance was independent of the other variables.

[13] Souleles (2001) tests this hypothesis and argues that expectations errors might not be classical, but rather contain systematic component correlated with the excess sensitivity regressor.

The VIF column in the center of the VIF table reflects the degree to which other coefficients' variances (and standard errors) are increased due to the inclusion of that predictor. This shows that both *expectations errors* and *expectations change* have virtually no impact on the other variances. In sum, there is not substantial multicollinearity in the regressions.

Table 4 in Appendix shows that the coefficients of φ on the expectations errors, *Fisite,* are significant in the whole sample and nearly all of the sub-samples despite the inclusion of the time dummies in the equation. It notes that the excess sensitivity regressor β becomes insignificant in all groups, except for the self-employed and the respondents with the secondary education level, when expectations errors and expectations changes are controlled for. This means that some excess sensitivity persists among self-employed and the secondary-educated respondents and is not due to heterogeneity in expectations errors alone. However, for most respondents, some of the excess sensitivity appears to be due to systematic heterogeneity in expectations errors. This suggests the possibility that previous excess sensitivity tests might have made spurious inferences. Also, the resulting coefficients of expectations errors in Table 4 are positive and marginally significant. In other words, the more positive the expectations errors, the more pessimistic the household is in regards to their financial situations and the larger is the magnitude by which they would change their consumption. The coefficients ϕ of the changes in expectations of future financial resources are not significant except for the unmarried and the self-employed groups. The insignificance of the ϕ coefficients is consistent with the assumption that changes in expectations of future financial resources are incorporated into current consumption.

For more details about the response of consumption to expectations errors, I distinguished between expectations errors that were positive (under-estimated/

over-pessimistic) from those that were negative (over-estimated/over-optimistic), and denoted them by $Fisite^{+}_{i,t+1}$ and $Fisite^{-}_{i,t+1}$, respectively. The equation now took the form:

$$\Delta c_{i,t+1} = \alpha time_{t+1} + \beta Fisitx_{t} + \varphi_1 Fisite^{-}_{i,t+1} + \varphi_2 Fisite^{+}_{i,t+1} + \phi \Delta Fisitx_{i,t+1} + \gamma W_{i,t+1} + \varepsilon_{i,t+1} \quad (t = 1,...,10)$$

The results (Table 5) of splitting the expectations error term were again consistent with the predicted result: positive expectations errors were positively correlated with consumption but the relationship was insignificant except for higher-educated agents. In addition, there was no significant differences in the consumption growth changes between over-pessimistic agents and "smart" agents. This implies that agents refuse to decrease their consumption level in c_t when they are pessimistic about their future financial source. Δc_{t+1} will be small when their pessimistic expectations are proved to wrong. In contrast, the coefficient for negative expectations errors (over-estimation) are also of the correct sign and highly significant in most of the sub-groups. Thus consumers who tend to be over-optimistic increase their consumption more than those that have correct expectations of their future financial resources. It means that agents increase their consumption as soon as they feel optimistic about their future financial resources. But, if they are over optimistic, there would be a large increase in c_t and a relatively less increase or even a reduction in c_{t+1}. This would lead to a negative consumption growth. So, the results of splitting the expectations errors provide more evidence to support the finding that asymmetric preferences are an important cause of excess sensitivity.

6 CONCLUSION

This paper has presented a comprehensive discussion on the implications of the REPIH and has evaluated the model empirically with a household micro panel data set which includes exhaustive information on consumption. The theoretical formulation presented here is that of a benchmark consumption model following the main assumptions of the REPIH. The primary focus of the discussion was to re-evaluate the excess sensitivity puzzle of consumption behavior. Simple investigations on the BHPS data set, used for empirical aspects of this thesis, revealed some interesting facts. What follows from this empirical work is that consumption may be associated with other variables other than financial wealth. In the introductory sections, I reviewed the work by Souleles (2001) and Flavin (1981) which used US data sets. Their studies appear to be an excellent benchmarks for formulating the analysis strategy: this empirically revisit the random walk hypothesis of consumption using Souleles's method; used the extensions presented in Shea (1995b) to evaluate myopic consumption behavior and the existence of liquidity constraints; and finally, a follow-up of the Flavin test of excess sensitivity was carried out to investigate the role of expectations errors in explaining the excess sensitivity. While this previous work used aggregate data to test the REPIH hypothesis, the present study employed their methodology to investigate patterns from the BHPS data set.

The results clearly refute the predictions of the rational expectation extensions of the PILCH. In the first regression (Table 1), the results indicate an excess sensitivity of current consumption to one-period lagged financial well being.

In the next regressions, financial wealth growth was divided into positive and negative parts. The results (Table 2) indicate that consumption fluctuations are significantly related to financial wealth declines, but not related to financial wealth increases. However, although the failure of the REPIH is substantiated from these results, they do not shed light on whether it is myopia or liquidity constraints that are the main cause for this failure. Ambiguity arises because if myopia exists, then consumption should fluctuate with both financial wealth improvements and deteriorations. If liquidity constraints exist, and financial situation changes are predictable, individuals should be able to smooth their consumption in cases of declines in financial wealth by saving beforehand, in forecast of the future financial deterioration. If financial deterioration cannot be forecasted, anticipatory saving is not plausible. In the presence of strict borrowing constraints, households might face a fall in their consumption in such circumstances.

The third step tried to remove the ambiguity in understanding the cause for the breakdown of the REPIH by turning whether the systematic heterogeneity in forecast errors explains this breakdown. Previous studies, which lacked explicit measures of these errors, have not been able to consider this hypothesis directly. Demographic components of forecast errors were found to explain some of the excess sensitivity. Generally speaking, since forecast errors are correlated with household demographic characteristics, they will be correlated with many regressors of interest in forward-looking models, suggesting that non-classical forecast errors are in practice a general and potentially serious problem. In addition, these results are consistent with another alternative model of behavior: that of individuals exhibiting loss aversion over future consumption changes.

In sum, excess sensitivity is a critical finding of the present study. For the first time in the literature, to my knowledge, an attempt has been made to understand the divergence in the patterns of expenditure using subjective data from British household. Many studies in the past have discussed consumption behavior using aggregated data. What I proposed, in this study, was a way of exploring the cross-sectional variation in financial wealth expectations, which contained information not included in with the other macro variables used in forecasting. Of the BHPS survey questions, those asking specifically about the household, rather than the aggregate economy, were found to contain the most useful cross-sectional information.

APPENDIX

Table 1 Financial Expectations and Consumption Changes

$$\Delta c_{i,t+1} = \alpha time_{t+1} + \beta Fisitx_{i,t} + \gamma W_{i,t+1} + \varepsilon_{i,t+1} \quad (t = 1,...,10)$$

Dependent Variable = Change in Nondurable Consumption (BHPS: 1991~2002)

	Whole Sample		*Male*		*Female*		*Married*		*Unmarried*	
Ind. Variable	Coef	*T-Stat.*	*Coef.*	*T-Stat.*	*Coef.*	*T-Stat.*	*Coef.*	*T-Stat.*	*Coef.*	*T-Stat.*
Change Expectations	-0.1148**	-1.96	-0.0847	-1.33	-0.0446	-0.94	-0.0584	-0.70	-0.0585	-0.98
Age	-0.0733**	-4.48	-0.1247**	-7.39	-0.0259**	-2.55	-0.1475**	-4.61	0.0030	0.20
AgeAge/100	0.0883**	5.94	0.1289**	8.28	0.0300**	3.26	0.1613**	5.46	0.0084	0.64
Adult No. Change	1.3579**	10.97	1.2662**	9.56	1.0883**	11.20	0.9668**	5.44	1.9162**	15.85
Children No. Change	0.6440**	4.06	0.6762**	4.32	0.5879**	4.47	0.7103**	3.46	1.5401**	8.18
Constant	1.3644**	2.96	-36.4337**	-77.09	0.6872**	2.23	-40.5018**	-47.20	-0.3528	-0.86
Wald chi2(15)	106752.9		103831.3		41442.8		89434.74		45883.84	
R2	0.7427		0.7830		0.6946		0.8279		0.7118	
Number of Obs.	35495		27769		18026		17646		17849	

	Employee		Self-employed		Higher		Secondary		Others	
Ind. Variable	*Coef*	*T-Stat.*	*Coef.*	*T-Stat.*	*Coef.*	*T-Stat.*	*Coef.*	*T-Stat.*	*Coef.*	*T-Stat.*
Change Expectations	-0.1096*	-1.79	-0.1441*	-1.86	-0.1605**	-2.16	0.0522	0.52	0.0339	0.10
Age	-0.0643**	-3.86	0.0233	1.07	-0.0032	-0.15	-0.1808**	-6.65	-0.0848	-0.93
AgeAge/100	0.0790**	5.23	0.0082	0.43	0.0307	1.59	0.1779**	6.65	0.0973	1.14
Adult No. Change	1.3412**	10.22	1.4836**	8.97	1.1939**	7.95	1.5559**	7.24	1.2357	1.47
Children No. Change	0.6946**	4.07	0.8849**	3.37	0.9221**	4.38	0.3875	1.59	1.1247	1.14
Constant	1.1867**	2.51	-1.3904**	-2.13	-0.5752	-0.90	4.0056**	5.63	1.5711	0.60
Wald chi2(15)	94818.27		50805.26		71613.4		35960.68		2551.19	
R2	0.7379		0.7135		0.7396		0.7667		0.7461	
Number of Obs.	32308		19577		23974		10637		884	

Note: Every equation contains full year dummies. Instruments are same for all estimated equations. The dependent variable is the change in weekly food consumption. ** = significant at 5%, *=significant at 10%.

Table 2 Financial Expectations and Consumption Changes

$$\Delta c_{i,t+1} = \alpha time_{t+1} + \beta_1 Fisitx^{-}_{i,t} + \beta_2 Fisitx^{+}_{i,t} + \gamma W_{i,t+1} + \varepsilon_{i,t+1} \quad (t = 1,...,10)$$

Dependent Variable = Change in Nondurable Consumption (BHPS: 1991~2002)

	Whole Sample		*Male*		*Female*		*Married*		*Unmarried*	
Ind. Variable	*Coef*	*T-Stat.*	*Coef.*	*T-Stat.*	*Coef.*	*T-Stat.*	*Coef.*	*T-Stat.*	*Coef.*	*T-Stat.*
Deteriorated	0.2395**	2.42	0.2572**	2.34	0.0540	0.68	0.1793	1.27	0.0999	1.03
Improved	-0.0124	-0.14	0.0446	0.48	-0.0372	-0.54	0.0376	0.31	-0.0229	-0.26
Age	-0.0725**	-4.43	-0.1236**	-7.32	-0.0258**	-2.54	-0.1468**	-4.59	0.0033	0.23
AgeAge/100	0.0882**	5.94	0.1287**	8.26	0.0300**	3.25	0.1611**	5.45	0.0083	0.63
Adult No. Change	1.3594**	10.98	1.2680**	9.57	1.0884**	11.20	0.9688**	5.45	1.9162**	15.85
Children No. Change	0.6402**	4.03	0.6706**	4.28	0.5877**	4.46	0.7037**	3.43	1.5404**	8.18
Constant	1.1265**	2.60	-36.7163**	-83.21	0.5911**	2.09	-40.6955**	-49.34	-23.9266**	-62.47
Wald chi2(16)	106758.8		103841.1		41440.7		89436.58		45882.09	
R2	0.7427		0.7830		0.6946		0.8279		0.7118	
Number of Obs.	35495		27769		18026		17646		17849	

	Employee		*Self-employed*		*Higher*		*Secondary*		*Others*	
Ind. Variable	*Coef*	*T-Stat.*	*Coef.*	*T-Stat.*	*Coef.*	*T-Stat.*	*Coef.*	*T-Stat.*	*Coef.*	*T-Stat.*
Deteriorated	0.2665**	2.66	0.0332	0.29	0.1867*	1.64	0.1716	0.90	-0.4017	-0.56
Improved	0.0260	0.28	-0.2830**	-2.20	-0.1348	-1.19	0.1884	1.35	-0.1693	-0.34
Age	-0.0630**	-3.78	0.0221	1.01	-0.0030	-0.13	-0.1792**	-6.59	-0.0858	-0.94
AgeAge/100	0.0786**	5.21	0.0084	0.44	0.0306	1.58	0.1772**	6.62	0.0969	1.14
Adult No. Change	1.3438**	10.24	1.4839**	8.97	1.1943**	7.95	1.5564**	7.24	1.2270	1.46
Children No. Change	0.6892**	4.04	0.8862**	3.38	0.9213**	4.37	0.3807	1.56	1.2056	1.21
Constant	-33.1035**	-75.42	-1.5727**	-2.54	-0.9157	-1.53	3.9791**	5.91	-43.8725**	-17.51
Wald chi2(16)	94829.95		50809.74		71610.9		35965.68		2549.62	
R2	0.7379		0.7136		0.7396		0.7667		0.7462	
Number of Obs.	32308		19577		23974		10637		884	

Note: Every equation contains full year dummies. Instruments are same for all estimated equations. The dependent variable is the change in weekly food consumption. ** = significant at 5%, *=significant at 10%. Data: 1991 to 2002 yearly BHPS samples.

Table 3 Variance Inflation Factor (VIF)

Variable	*VIF*	*1/VIF*
Age	46.16	0.021665
Age2	45.27	0.022089
Financial Expectations	2	0.499809
Expectation errors	1.41	0.707325
Expectations Change	1.6	0.626314
Children No. Change	1.03	0.973695
Adult No. Change	1	0.99537
Mean VIF	14.07	

Table 4 Financial Expectations and Consumption Changes

$$\Delta c_{i,t+1} = \alpha time_{t+1} + \beta Fisitx_t + \varphi Fisite_{i,t+1} + \phi \Delta Fisitx_{i,t+1} + \gamma W_{i,t+1} + \varepsilon_{i,t+1} \quad (t = 1,...,10)$$

Dependent Variable = Change in Nondurable Consumption (BHPS: 1991~2002)

	Whole Sample		*Male*		*Female*		*Married*		*Unmarried*	
Ind. Variable	*Coef*	*T-Stat.*	*Coef.*	*T-Stat.*	*Coef.*	*T-Stat.*	*Coef.*	*T-Stat.*	*Coef.*	*T-Stat.*
Expectations	0.0916	1.06	0.0734	0.81	0.0340	0.52	0.0528	0.42	-0.0473	-0.54
Expectation errors	0.2712**	5.37	0.2008**	3.68	0.2098**	5.33	0.2292**	3.17	0.2319**	4.71
Expectations Change	0.0094	0.15	-0.0066	-0.10	-0.0787	-1.58	-0.0875	-1.01	-0.1799**	-2.88
Age	-0.0688**	-4.32	-0.1175**	-7.14	-0.0257**	-2.70	-0.1381**	-4.39	0.0055	0.38
AgeAge/100	0.0833**	5.77	0.1219**	8.04	0.0292**	3.39	0.1502**	5.17	0.0043	0.33
Adult No. Change	1.4008**	11.11	1.3121**	9.72	1.0882**	11.17	1.0018**	5.55	1.9183**	15.64
Children No. Change	0.7338**	4.57	0.7849**	4.96	0.6148**	4.67	0.8679**	4.19	1.5349**	8.07
Constant	-34.0602**	-71.05	-36.8576**	-74.61	-22.962**	-71.00	2.6456**	2.94	-0.3036	-0.68
Wald chi2(17)	101508.8		99034.24		39406.5		85128.34		44158.11	
R2	0.7431		0.7836		0.6954		0.8278		0.7155	
Number of Obs.	33842		26519		17159		16878		16964	

	Employee		*Self-employed*		*Higher*		*Secondary*		*Others*	
Ind. Variable	*Coef*	*T-Stat.*	*Coef.*	*T-Stat.*	*Coef.*	*T-Stat.*	*Coef.*	*T-Stat.*	*Coef.*	*T-Stat.*
Expectations	0.0274	0.30	0.2884**	2.51	0.0772	0.70	0.3247**	2.31	-0.3071	-0.61
Expectation errors	0.1973**	3.79	0.2801**	4.07	0.2559**	4.04	0.3063**	3.65	0.0423	0.14
Expectations Change	-0.0103	-0.16	0.2538**	3.01	0.0593	0.76	0.0585	0.57	-0.6300*	-1.72
Age	-0.0560**	-3.35	0.0332	1.55	-0.0014	-0.07	-0.1785**	-6.59	-0.0793	-0.86
AgeAge/100	0.0704**	4.65	-0.0013	-0.07	0.0274	1.48	0.1767**	6.63	0.0872	1.01
Adult No. Change	1.3433**	10.06	1.6320**	9.58	1.2940**	8.50	1.5325**	6.95	1.1838	1.40
Children No. Change	0.7061**	4.10	1.1414**	4.29	1.0624**	5.04	0.4047	1.62	1.4404	1.40
Constant	-33.1386**	65.96	-2.4334**	-3.55	-0.9631	-1.46	-36.362**	-48.38	2.3245	0.82
Wald chi2(17)	90390.05		48296.51		67982.0		34669.7		2559.19	
R2	0.7380		0.7157		0.7419		0.7659		0.7502	
Number of Obs.	30827		18515		22649		10323		870	

Note: Every equation contains full year dummies. Instruments are same for all estimated equations. The dependent variable is the change in weekly food consumption. ** = significant at 5%, *=significant at 10%.

Table 5 Financial Expectations and Consumption Changes

$$\Delta c_{i,t+1} = \alpha time_{t+1} + \beta Fisitx_t + \varphi_1 Fisite^-_{i,t+1} + \varphi_2 Fisite^+_{i,t+1} + \phi \Delta Fisitx_{i,t+1} + \gamma W_{i,t+1} + \varepsilon_{i,t+1} \quad (t = 1,...,10)$$

Dependent Variable = Change in Nondurable Consumption (BHPS: 1991~2002)

	Whole Sample		*Male*		*Female*		*Married*		*Unmarried*	
Ind. Variable	*Coef*	*T-Stat.*	*Coef.*	*T-Stat.*	*Coef.*	*T-Stat.*	*Coef.*	*T-Stat.*	*Coef.*	*T-Stat.*
Expectations	0.0490	0.58	0.0385	0.43	0.0081	0.13	0.0180	0.15	-0.0727	-0.85
Over-estimated	-0.4081**	-4.87	-0.3243**	-3.58	-0.2862**	-4.38	-0.4059**	-3.41	-0.4083**	-4.99
Under-estimated	0.1088	1.17	0.0384	0.38	0.1571**	2.19	0.0079	0.06	0.0881	0.99
Expectations Change	0.0196	0.31	0.0028	0.04	-0.0768	-1.54	-0.0764	-0.88	-0.1743**	-2.78
Age	-0.0694**	-4.36	-0.1178**	-7.16	-0.0259**	-2.72	-0.1386**	-4.40	0.0053	0.37
AgeAge/100	0.0833**	5.77	0.1216**	8.01	0.0291**	3.38	0.1498**	5.15	0.0039	0.30
Adult No. Change	1.4039**	11.14	1.3132**	9.73	1.0935**	11.23	1.0049**	5.56	1.9179**	15.64
Children No. Change	0.7322**	4.56	0.7836**	4.96	0.6162**	4.68	0.8642**	4.17	1.5370**	8.08
Constant	1.0745**	2.21	-36.7064**	-74.23	-22.872**	-70.55	2.8337**	3.15	-23.5913**	-53.00
Wald chi2(18)	101498.2		99029.68		39400.4		85136.12		44176.01	
R2	0.7431		0.7836		0.6954		0.8278		0.7155	
Number of Obs.	33842		26519		17159		16878		16964	

	Employee		*Self-unemployed*		*Higher*		*Secondary*		*Others*	
Ind. Variable	*Coef*	*T-Stat.*	*Coef.*	*T-Stat.*	*Coef.*	*T-Stat.*	*Coef.*	*T-Stat.*	*Coef.*	*T-Stat.*
Expectations	-0.0035	-0.04	0.2462**	2.18	0.0421	0.39	0.2701**	1.96	-0.2683	-0.54
Over-estimated	-0.3178**	-3.68	-0.4010**	-3.66	-0.3588**	-3.49	-0.5398**	-3.76	-0.0316	-0.06
Under-estimated	0.0544	0.58	0.0794	0.68	0.1205	1.09	0.0748	0.44	0.2042	0.33
Expectations Change	-0.0019	-0.03	0.2707**	3.20	0.0719	0.92	0.0634	0.61	-0.6364*	-1.74
Age	-0.0566**	-3.38	0.0329	1.53	-0.0020	-0.10	-0.1781**	-6.57	-0.0800	-0.86
AgeAge/100	0.0704**	4.65	-0.0012	-0.07	0.0275	1.49	0.1753**	6.57	0.0887	1.02
Adult No. Change	1.3439**	10.06	1.6354**	9.60	1.2956**	8.51	1.5380**	6.97	1.1840	1.40
Children No. Change	0.7045**	4.09	1.1504**	4.33	1.0608**	5.03	0.4004	1.60	1.4624	1.42
Constant	0.9124*	1.80	-32.6397**	-47.91	-33.678**	-52.17	-36.132**	-47.95	2.3397	0.82
Wald chi2(18)	90387.81		48285.78		67970.9		34675.5		2556.6	
R2	0.7380		0.7156		0.7419		0.7659		0.7503	
Number of Obs.	30827		18515		22649		10323		870	

Note: Every equation contains full year dummies. Instruments are same for all estimated equations. The dependent variable is the change in weekly food consumption. ** = significant at 5%, *=significant at 10%.

Reference List

1. Altonji, Joseph G, Aloysius Siow. "Testing the Response of Consumption to Income Changes with (Noisy) Panel Data." *Quarterly Journal of Economics*, 1987, *102* 293-328.

2. Altug, Sumru, Robert A.Miller. "Household Choices in Equilibrium." *Econometrica*, 1990, *58* 543-571.

3. Attanasio, O. P., Weber, G. "Consumption Growth, the Interest Rate and Aggregation." *Review of Economic Studies*, 1993, *60* 631-649.

4. Attanasio, Orazio P., Martin J.Browning. "Consumption over the Life Cycle and over the Business Cycle." *Review of Economic Studies*, 1995, *60* 631-649.

5. Campbell, John, Angus Deaton. "Why is Consumption So Smooth?" *The Review of Economic Studies*, 1989, *56* (3), 357-373.

6. Carroll, Christopher D. "A Theory of the Consumption Function, with and without liquidity constraints." *Journal of Economic Perspectives*, 2001, *15* (3), 23-46.

7. Chamberlain, Gary. "Panel Data," Zvi Griliches, Michael D.Intriligator, *Handbook of Economietrics*. Amsterdam: North-Holland, 1984.

8. Das, M., van Soest, A. "A Panel Data Model for Subjective Information on Household Income Growth." *CentER Discussion Paper*, 1996, *9675*.

9. David Bowman, Deborah Minehart, Matthew Rabin. "Loss Aversion in A Consumption-Saving Model." *Journal of Economic Behavior & Organization*, 1998, *38* 155-178.

10. Deaton, Angus. *Understanding Consumption*. Oxford: Oxford University Press, 1992.

11. Flavin, M. A. "The Adjustment of Consumption to Changing Expectations about Future Income." *Journal of Political Economy*, 1981, *51* 974-1009.

12. Hall, Robert E., Frederic S.Mishkin. "The Sensitivity of Consumption to Transitory Income: Estimates from Panel Data on Households." *Econometrica*, 1982, *50* (2), 461-481.

13. Laibson, D. "Golden Eggs and Hyperbolic Discounting." *Quarterly Journal of Economics*, 1997, *100* (4), 1083-1113.

14. Lusardi, Annamaria. "Permanent Income, Current Income and Consumption: Evidence from Two Panel Data Sets." *Journal of Business and Economics Statistics*, 1996, *14* 81-90.

15. Mankiw, N. Gregory, Shapiro, Matthew D. "Trends, Random Walks, and Tests of the Permanent Income Hypothesis." *Journal of Monetary Economics*, 1985, *16* 165-174.

16. Melvin Stephens Jr. "Job Loss Expectations, Realizations, and Household Consumption Behavior." *NBER Working Paper*, 2003.

17. Shea, John. "Union Contracts and the Life Cycle-Permanent Income Hypothesis." *American Economic Review*, 1995a, *85* 186-200.

18. Shea, John. "Myopia, Liquidity Constraints, and Aggregate Consumption: A Simple Test." *Journal of Money, Credit, and Banking*, 1995b, *27* 798-805.

19. Sims, C. A., Stock, J. H., Watson, M. W. "Inference in Linear Time Series Models with Some Unit Roots." *Econometrica*, 1990, *58* 113-114.

20. Souleles, Nicholas S. "Consumer Sentiment: Its Rationality and Usefulness in Forecasting Expenditure - Evidence from the Michigan Micro Data." *NBER Working Papers*, 2001, *8410*.

21. Stock, James H., West, Kenneth D. "Integrated Regressor and Tests of the Permanent Income Hypothesis." *Journal of Monetary Economics*, 1988, *21* 85-95.