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## The Misperception of Inflation by Irish Consumers

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*Abstract:* Perceptions and forecasts of inflation have the potential to impact on a range of economic outcomes. We reveal large, systematic overestimation of inflation by Irish consumers, which varies by social group. In contrast to previous work in this area, our models suggest the upward bias and the variation by social group should be considered substantially separate phenomena. We also offer evidence that inflation misperceptions are linked to attitudes and intentions with respect to consumption and saving and, hence, are likely to affect household decision-making. The findings therefore raise issues regarding the relationship between financial literacy and consumer behaviour.

### I INTRODUCTION

Perceptions and forecasts of inflation have the potential to affect a variety of economic outcomes. At an individual level, accurate estimates of inflation are important when undertaking major financial decisions, such as taking out a loan or investing in a pension plan, as well as for ongoing financial management of personal savings, consumption and credit. In the wider economy, systematic influences on estimates of inflation can be expected to affect wage negotiations, consumer confidence and the transmission of monetary policy.

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We show that, despite its importance for economic decision-making, the large majority of people in Ireland overestimate price rises substantially. Between 2002 and 2007, less than 15 per cent of the population perceived inflation to be within two percentage points of its actual value, as measured by the Consumer Price Index (CPI). Our aim is to offer a contribution to understanding this systematic misperception of price changes and to give an indication of why misperceptions may matter. We reveal significant variation in the accuracy of perceptions by social group and show that the misperception of inflation is associated with attitudes and intentions regarding future consumption and saving. In other words, certain sections of society perceive inflation less accurately than others and an initial analysis suggests that their mistaken reading has behavioural consequences.

## II RELATIONSHIP TO PREVIOUS RESEARCH

In both theoretical and applied macroeconomics, expected (as distinct from perceived) inflation is considered to be an important variable. It features in a wide range of macroeconomic models and appears regularly in the public statements of central banks. Especially following Lucas (1973) and the “rational expectations revolution”, there have been a number of attempts to gauge the accuracy of people’s expectations and, to a lesser extent, perceptions of inflation (e.g. Fama, 1975; De Menil and Bhalla, 1975; Carlson, 1977; Jonung, 1981; Jonung and Laidler, 1988). Large errors have been recorded for both. Expectations and perceptions are very strongly correlated (0.735 in our own data), suggesting that the errors in expectations are related to misperceptions of current inflation. This section briefly reviews the findings, the hypotheses advanced to explain them and their relevance for the present paper.

The accuracy of people’s expectations and perceptions depends on the medium-term inflation climate. During the 1970s, when inflation was high, the expectations of both the general public and professional economists tended to be too low. Thereafter, expectations of inflation have been too high. The errors in people’s estimates display both serial correlation and correlation with other publicly available information, such as interest rates and unemployment (Thomas, 1999). Jonung and Laidler (1988; see also Jonung, 1981) confirmed the same result for inflation perceptions, measured over an inflation cycle in Sweden: mean perceptions followed a smoother path over the cycle than actual inflation. This finding (and others since) rules out the possibility that the primary cause of biased inflation expectations is rational consideration of future probabilistic events that fail to occur, or the “Peso problem” (Friedman

and Schwartz, 1982), since the same argument cannot apply to perceptions of current inflation.

The scale of the bias is considerable. Reviewing literature between 1981 and 2008, a period of generally low and stable inflation in developed economies, Ranyard et al. (2008) conclude that mean perceptions of inflation are generally higher than official figures by several percentage points and sometimes by over ten percentage points (e.g. Bates and Gabor, 1986). In the first instance, our analysis tests for the presence and scale of overestimation in Ireland.

Perceptions and expectations of inflation also vary considerably by social group. In the US, the mean inflation perceptions of women, younger people, people of lower educational attainment, single people and members of minorities, are higher than those of other social groups (Bryan and Venkatu, 2001a; 2001b). Similar differences by gender and socioeconomic group have been reported in Austria (Fluch and Stix, 2007) and Italy (Margarini, 2008). One possible explanation is that different social groups tend to buy different products (Jonung, 1981). However, perceptual differences have been recorded too consistently across time periods and nations for genuine price movements among different product categories to account for them.

Our data consists of a large sample and sufficiently detailed background information to permit a more extensive multivariate analysis of inflation perceptions across social groups. It is generally assumed that whatever underlies the tendency to overestimate inflation also underlies these intergroup differences (e.g. Bryan and Venkatu, 2001b; Ranyard et al., 2008). We test this assumption. The distribution of inflation perceptions for all social groups is subject to a strong right-skew. Hence, it may be the case, for instance, that women have a higher mean perception and yet are more likely also to underestimate inflation. With a strongly skewed distribution, intergroup differences may be due to a group possessing a stronger upward bias, or to that group perceiving inflation less accurately among a population where the perception of all groups is skewed. We test this by employing an original modelling approach to inflation perceptions.

It is more difficult to distinguish empirically between the various hypotheses proposed to explain people's overestimation of inflation. Jonung (1981) argues that people may be influenced by their past experience, such that those who have lived through periods of higher inflation tend to have an upward bias. In Ireland between 2002 and 2007, this hypothesis predicts lower estimates of inflation among younger adults and is therefore one hypothesis we test directly. A range of psychological biases have also been put forward to explain overestimation of inflation, which are harder to test with survey data. Most rest on the idea that consumers' perceptions are a weighted

combination of their experience during transactions. Bates and Gabor (1986) cite Tversky and Kahneman's (1974) "availability" heuristic, suggesting that biases may result if consumers can more easily recall frequent, recent and larger price changes. Brachinger (2008) applies Prospect Theory (Kahneman and Tversky, 1979) to inflation perceptions, arguing that because price increases are felt as losses they are weighted more heavily than gains associated with equivalent price decreases. Lastly, systematic biases in the way past prices are remembered may play a part (e.g. Kemp, 1987; Brachinger, 2008).

In addition to personal experience of transactions, media reports of official inflation figures appear to be a significant but modest influence. On the one hand, awareness of official figures is relatively low: recent surveys in Austria and Italy found that a minority of people could provide an estimate of official inflation (Fluch and Stix, 2007; Malgarini, 2008), while three-quarters of Italians incorrectly believed consumer durables were excluded from official calculations. On the other hand, people who are aware of official figures do have, on average, more accurate perceptions, although they remain inclined to overestimate. Soroka (2006) provides evidence for a "social amplification" effect, whereby the greater inclination of the media to report upwards rather than downwards movements of inflation pushes perceptions upwards. Thus, some input to perceptions from official figures is likely, although it too may contribute upward bias.

Our analysis cannot distinguish between these competing, or perhaps complimentary, hypotheses. Nevertheless, the more comprehensive analysis by social group we offer is suggestive of reasons why some groups may have more accurate perceptions than others. Furthermore, if inflation perceptions are linked to economic behaviour, then the existence of large differences between social groups raises concerns about how variation in financial literacy may affect economic outcomes (Braunstein and Welch, 2002; de Meza, Irlenbusch and Reyniers, 2008).

A final relevant strand of empirical literature concerns the impact on perceived inflation of the 2002 Euro cash changeover. Perceived inflation rose sharply across the whole Euro Area for several years following the cash changeover, despite stable and low inflation (see Dohring and Mordonu, 2007, for review). The origin of this striking phenomenon remains a puzzle and the present study does not directly address possible explanations, which are the subject of a separate paper (*in preparation*). However, the phenomenon is relevant in two respects. First, any theory of what drives the distribution of individual inflation perceptions may shed light on why this large step jump in perceptions occurred. Second, the data for the present study were gathered during the period when inflation perceptions in Ireland were strongly affected by the cash changeover, so it may be an important influence.

The primary motivation for investigating inflation perceptions, which we share, is the belief that they are likely to affect individual economic decisions. Yet whether misperceptions do indeed have an impact on economic decision-making has been much less explored (Ranyard *et al.*, 2008), as few studies have examined links between economic perceptions and economic behaviour at an individual level. Katona (1975) showed that an index of consumer sentiment was linked to consumption behaviour, providing some evidence that people's general economic outlook affects their economic decisions. Our data allow us to explore a more specific behavioural link, by relating the extent of misperception of inflation to attitudes and intentions regarding consumption and saving.

### III DATA

The data for the analysis are drawn from the EU Consumer Survey for Ireland. Each month a representative sample of adults aged 16 and over was contacted by telephone based on a random stratified sampling procedure. The completed monthly sample was usually around 1,350-1,400 questionnaires, with interviewing taking place from 60 randomly selected sampling points throughout Ireland. The data is re-weighted for regional location, household size and respondent characteristics. The usual response rate was approximately 57 per cent. Prior to 2002, the survey asked consumers about their perception and expectation regarding the *direction* of price changes, but did not attempt to measure the magnitude of that change; the perceived or expected inflation rate. From July 2002, however, the price questions in the survey were expanded to ask about the magnitude of perceived changes in prices over the last 12 months, as well as expectations for price changes over the coming 12 months. Following Jonung and Laidler (1988), the main variable of interest is perceived inflation, which is obtained from the survey question:

*By what per cent do you think that prices have increased/decreased in the last 12 months?*

Respondents are not prompted or required to select from a range of responses – the question is open-ended.<sup>1</sup> The dataset available for this analysis covers the period July 2002 to December 2007. This provides us with a total dataset of 76,715 respondents, of which 66 per cent provided an estimate for the current rate of inflation.

<sup>1</sup> This is in contrast to the University of Michigan and ISAE (Italy) where confirmation is sought if the answer exceeds a certain level.

We first consider how consumers perceived the direction of price change. Table 1 presents consumers' perceptions on an annual basis. Over the period, the CPI completed a cycle (right column), beginning and ending with inflation at just under five per cent, falling to just over two in the middle. The bulk of consumers throughout the period perceived that prices had risen. Over 30 per cent thought that prices were "very much higher" and 35 per cent responded that prices were "quite a bit higher". However, the proportion of consumers who responded that prices were "very much" higher declined, from nearly one in two consumers in 2002 to less than one in five by 2007, despite the fact that inflation as measured by the CPI was largely unchanged. This pattern of falling qualitative perceptions, beginning at what was in fact an historical high, is typical of inflation perceptions across the Euro Area for the period following the cash changeover (Dohring and Mordonu, 2007).

Table 1: *Mean Perception of Prices Compared with 12 Months Ago*

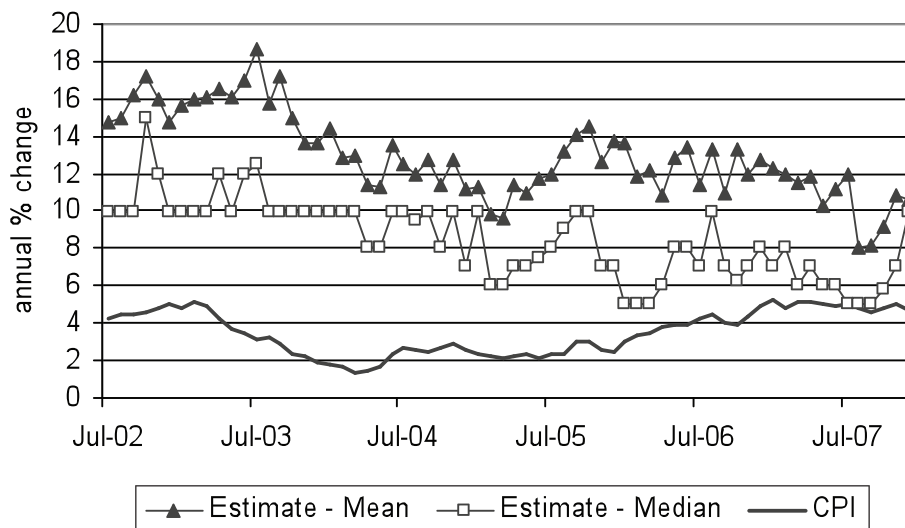
	<i>Very Much Higher</i>	<i>Quite a Bit Higher</i>	<i>A Little Higher</i>	<i>About the Same</i>	<i>Lower</i>	<i>Total</i>	<i>Mean CPI</i>
	%						
2002*	48.9	31.7	16.4	2.8	0.1	100	4.6
2003	45.7	32.4	17.9	3.6	0.4	100	3.5
2004	32.7	37.1	23.4	5.9	0.9	100	2.2
2005	28.1	34.9	28.6	7.7	0.8	100	2.4
2006	22.1	37.7	30.5	8.9	0.9	100	4.0
2007	18.4	38.9	32.1	10.1	0.5	100	4.9
Total	32.5	35.5	24.9	6.5	0.6	100	3.5

\* Six months from July-December.

We next turn to quantitative estimates of inflation. Consistent with previous findings in other countries, respondents substantially overstated price rises. Overall, the mean estimate by consumers for the current rate of inflation was 13.2 per cent, compared with a mean of 3.5 per cent for the official measure of annual inflation. Figure 1 shows that overestimation was fairly consistent. Although the average estimate declined over the period, it remained substantially above the official record of inflation. Across this five-and-a-half year period of relatively low and stable inflation, less than 15 per cent of the population perceived inflation to be within 2 percentage points of its actual value, as measured by the CPI. Although the proportion estimating inflation within this range increased across the period, as the euro changeover effect diminished, the figure was still less than 20 per cent in 2007. The large

majority of the population misperceives inflation, believing prices to be rising much faster than the official figure records.

Figure 1: *Inflation Perceptions: Survey Data Compared to the CPI*



Sources: CSO and EU Consumer Survey.

Table 2 reports the mean inflation perceptions for a number of different demographic and socioeconomic groups. Again, the pattern is consistent with previous findings. Current inflation is significantly and substantially overestimated by all groups, although it is evident that differences between groups exist. For example, the mean estimate of male respondents is 10.7 per cent, compared to a mean estimate of 15.4 per cent for female respondents. Inflation perceptions fall as educational attainment rises. Over the period in question the mean estimate of current inflation for those with a primary school education or lower is 16.1 per cent, while those with a third-level education or above estimate inflation at 10.6 per cent.

It is particularly interesting to note that of the work status categories, those working in home duties have the highest inflation perception, at 17 per cent. Assuming that the frequency of making purchases contributes to the formation of perceptions and that those in home duties do the majority of the household shopping, this finding can be considered quite surprising – housewives have the least accurate perception of price changes, at least in our data. One possibility is that whatever psychological mechanism underlies the upward bias is actually strengthened by frequent purchases. It is worth

Table 2: *Inflation Perceptions by Demographic and Socioeconomic Group*

<i>Year</i>	<i>2002*</i>	<i>2003</i>	<i>2004</i>	<i>2005</i>	<i>2006</i>	<i>2007</i>	<i>Total</i>	<i>Std. Dev</i> <i>(2002-07)</i>
Male	12.9	12.4	10.1	9.7	10.1	9.0	10.7	12.1
Female	18.2	19.0	14.6	14.2	14.2	12.0	15.4	16.3
Primary	18.4	18.9	15.2	15.0	14.5	13.5	16.1	17.7
Junior Cert	16.7	17.4	14.1	14.1	13.8	11.6	14.7	15.8
Leaving/Other 2nd Level	15.9	16.3	12.8	12.2	13.1	11.4	13.7	14.7
Third Level	13.4	12.8	10.0	9.7	10.0	8.6	10.6	11.7
Working	14.6	14.6	11.8	11.1	11.7	9.9	12.3	13.5
Retired	14.5	14.9	10.8	11.0	10.8	10.9	12.0	14.6
Home Duties	20.3	21.2	16.0	15.7	15.0	12.8	17.0	17.3
Other	14.3	14.8	11.7	12.8	13.6	10.7	13.0	14.8
Married/Couple	16.1	16.1	12.4	12.3	12.5	10.6	13.3	14.5
Single etc.	14.8	15.4	12.6	11.5	11.9	10.8	12.9	14.8
16-29 Years	14.6	14.4	12.1	11.1	11.3	9.4	12.4	13.7
30-49 Years	16.0	16.1	12.5	12.4	13.0	10.7	13.4	14.3
50-64 Years	16.0	16.4	12.9	11.7	12.6	11.0	13.4	15.2
65+ Years	15.2	15.9	12.0	12.6	10.9	10.7	12.8	15.3
Income Quartile 1	16.8	19.6	14.9	14.4	13.5	13.6	15.8	17.5
Income Quartile 2	18.2	17.4	13.8	14.6	14.2	12.4	14.9	16.3
Income Quartile 3	16.9	15.5	12.4	12.6	13.7	11.3	13.4	14.9
Income Quartile 4	14.6	16.9	10.0	8.6	9.4	8.6	11.2	12.1
All	15.6	15.9	12.5	12.1	12.3	10.6	13.2	14.6
Mean CPI	4.6	3.5	2.2	2.4	3.9	5.0	3.5	1.2

\* Six months from July.

noting, however, that the standard deviation of perceptions for those in home duties is also higher. It is not clear, based on the psychological biases proposed to explain overestimation of inflation (Bates and Gabor, 1986; Kemp, 1987; Brachinger, 2008), why a group with greater purchase frequency would have more dispersed perceptions. An alternative possibility is that those in home duties are less likely to be influenced by official figures, increasing both the bias and dispersion of perceptions. The final column of Table 2 suggests a relationship between the standard deviation and the mean, as one might expect with a skewed distribution. As suggested in the previous section, therefore, the differences between the groups may amount to more than the observation that some groups overestimate inflation by a greater amount.



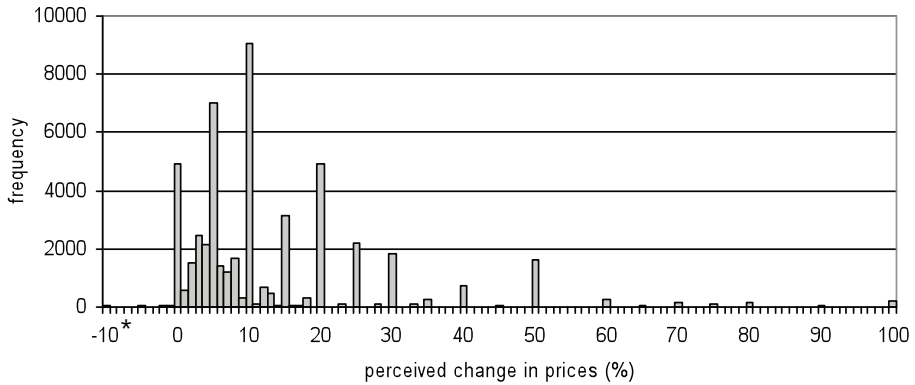
The full distribution is shown in Figure 2. There is a clear tendency of the estimates towards salient values. Respondents are drawn towards round numbers, especially prominent ones, such that in the distribution of estimates there are “spikes” at round numbers and particularly those that are divisible by five. This is not uncommon. Bryan and Palmqvist (2005) report a similar finding for survey data on inflation expectations in the US and Sweden. Curtin (2005) finds “digit preference” in the Michigan survey data.<sup>2</sup> This is an important consideration when it comes to assessing the usefulness of the quantitative estimates and how best to model them. While the new question on the survey elicits greater useful variation between respondents and generates a more precise estimate of the misperception of inflation relative to its value as measured by the CPI, it also introduces a degree of measurement error resulting from a bias towards salient numbers.

The strong right-skew is evident in Figure 2. Perceived inflation in fact ranges from – 70 per cent to 100 per cent, although these extreme estimates are a very small proportion of overall responses. The upper tail of the distribution is nevertheless quite long: just over one quarter of responses are over 20 per cent. In contrast, the lower tail of the distribution is truncated, with just 0.6 per cent of consumers perceiving falling prices. Analysis of the interquartile range reveals that half of the respondents perceive inflation to be between 5 and 20 per cent. The mode of the distribution is 10 per cent, cited by 17.9 per cent of replies. Nearly 10 per cent perceived prices to be unchanged – a zero inflation rate. This is difficult to explain, as the official measure of inflation shows that since January 1990, inflation has ranged from 1 per cent to 7 per cent. It could be that these consumers perceive inflation to be very low and so round their estimate to zero. Alternatively it may result from the fact that the prices of many goods do not change regularly. If these goods make up all of a consumer’s purchases then that consumer would perceive inflation to be zero.

It is worth asking what the historical distribution of the CPI looks like in reality, since one possible influence on perceptions is historical experience (Jonung, 1981) and there is some evidence over long time periods that inflation expectations display regression towards the historical mean (Thomas, 1999). The two panels of Figure 3 provide the distributions of the monthly CPI for Ireland for two time periods, January 1977 – August 2008 and January 1990 – August 2008. Hence, one can think of these distributions as representing the different inflation histories experienced by younger and older adults. It is notable that both distributions, like the distributions of estimates themselves, have a strong right skew.

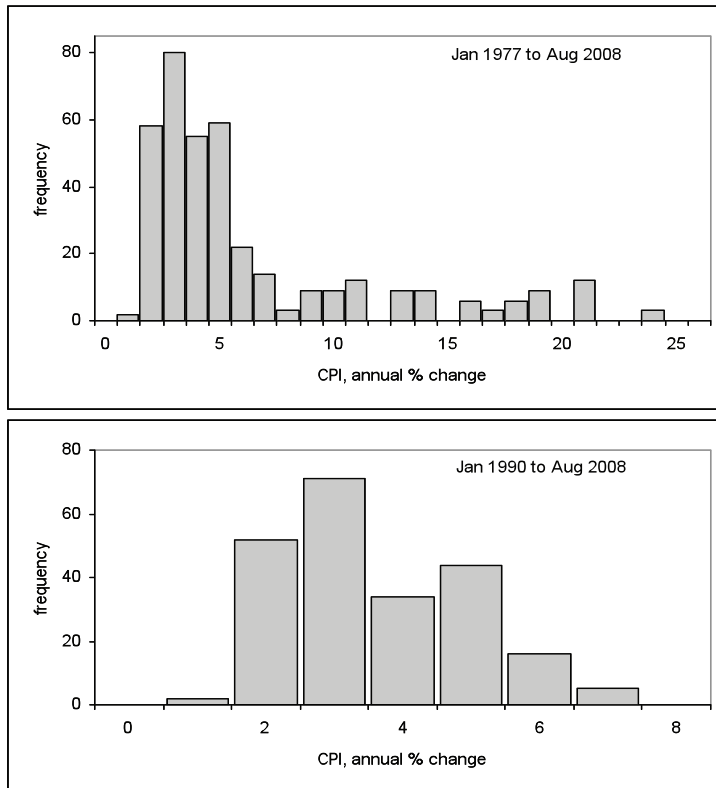
<sup>2</sup> See also Lindén (2006) using EU data and Malgarini (2008) using Italian data.

Figure 2: *Distribution of Consumer's Inflation Perceptions*



\*A small proportion of inflation perceptions, 0.07 per cent, are less than -10 but are not included in the graph.

Figure 3: *Distribution of CPI for Two Time Periods*



Given this, if consumers have any uncertainty about present inflation and employ history as a guide, it makes sense that their guess is generally higher than the prevailing CPI, since the mean of the historical distribution of the CPI is above its median. For our first period, 1977 to 2008, the difference between the mean and median is quite wide, with a mean of 5.9 and a median of 3.9. The gap narrows for the second period, 1990 to 2008, when the mean is 3.1 and the median is 2.8. Historical influences may therefore bias perceptions upwards. On the other hand, the hypothesis that older people's perceptions will have a stronger upward bias is neither confirmed in Table 2 nor in the multivariate analysis that follows. Still, this skew in the distribution of the CPI itself remains a potential factor in the overestimation of inflation.

#### IV DETERMINANTS OF ACCURATE INFLATION PERCEPTIONS

The development of an appropriate multivariate model to explore the determinants of quantitative inflation perceptions is econometrically challenging. Initially we attempted to assess the accuracy of perceptions by modelling the magnitude of the error. However, the skew of the distribution and the clumps of observations at salient values, including a zero inflation rate, resulted in a poor fit. Malgarini (2008) employs least squares estimation to model the estimate (as distinct from error), but we find such an approach results in highly non-spherical errors, as again might be expected given the unusual nature of the distribution of estimates. We also explored the possibility of estimation via generalised least squares, but because the error distribution is both highly skewed and subject to extreme values in each tail, it does not conform easily to a known distribution. Note also that the quantity and systematic nature of the extreme observations is such that it is not clear that they can be treated as outliers.

Our approach is instead to categorise the quantitative estimates. This allows us to distinguish between accurate responses, underestimations and overestimations of different magnitudes, such that the determinants of each can be considered separately. The obvious downside is that categorisation throws away variation.<sup>3</sup> Furthermore, there remains a question regarding the

<sup>3</sup> Potentially categorisation also results in the quantitative indicator of inflation perceptions, which was introduced to the survey in 2002, being no more analytically useful than the pre-existing qualitative one. However, using the categorical qualitative indicator as the dependent variable and employing the same model as is presented in this section produces a clearly inferior fit (including when the sample is limited only to respondents who were able to provide a quantitative estimate). Hence, although variation is discarded, the categories based on the quantitative indicator appear to be more systematically related to the explanatory variables than those arising from the qualitative indicator.

appropriate model to use. Christensen, van Els and van Rooij (2006), who also categorised quantitative estimates, employed ordered probit analysis. As described in Section II, however, the overestimation of perceived inflation and the accuracy of perception. It is hence questionable whether categories ranging from underestimation, through relatively accurate perception, to overestimation, are best considered as ordered categories for the purposes of examining what drives inflation perceptions. Our view is that rather than an ordered regression model, a non-ordered multinomial model may be more appropriate.

Indeed, whether significant explanatory variables are better thought of as associated with higher estimates or less accurate estimates is a testable hypothesis. We employ a multinomial logistic regression model in which the dependent variable has three categories: “underestimation” by more than 1 percentage point relative to the CPI; “accurate” estimation, within a band from 1 percentage point below to 2 percentage points above the CPI (inclusive); and “overestimation” by more than 2 percentage points.<sup>4</sup> The “accurate” category forms the reference for the dependent variable and we therefore present coefficients and odds ratios that estimate *separately* the association between the explanatory variables and the likelihood of underestimating or overestimating inflation. If a given explanatory variable, such as gender or socioeconomic status, is associated with higher perceived inflation, we would predict that the coefficient on that variable should be positive when comparing the likelihood of overestimation relative to accurate perception, but negative when comparing the likelihood of underestimation relative to accurate perception. If, instead, the given variable is associated with less accurate inflation perception, the coefficients for both sections of the model should have the same positive sign.<sup>5</sup>

A broad range of standard background variables is available from the EU Consumer Survey for inclusion in the model: gender, age (7 categories), educational attainment (5 categories), income quartile, marital status (6 categories) and occupational class (8 categories). In addition, dummy variables

<sup>4</sup> We skew the band defining accurate perception in approximate accordance with the skew of the distribution of the monthly CPI, as described in Section III. In fact, our results are largely insensitive to the definition of “accurate” and to this asymmetry. For example, the coefficients are very similar if the “accurate” category is defined as perceptions falling within 2 percentage points either side of the CPI, although the model is a marginally poorer fit.

<sup>5</sup> Although the category for perception exceeding the CPI by more than 2 percentage points includes over half the respondents who gave an estimate, our results are not sensitive to the number of dependent variable categories. Further categorisation of the overestimates into modest and larger values (between 2 and 5 percentage points and those higher still, or 2 and 10 percentage points and those higher still) does not alter the coefficients significantly. Hence, we report the more parsimonious three category model.

for time (65 monthly dummies) are included in order to control for the effect of the Euro changeover (and other time specific effects). In line with the international evidence, the coefficients on the dummy variables display statistically significant variation over time that is consistent with the changeover having induced higher inflation perceptions. The coefficients for the likelihood of overestimation decrease with time, while for underestimation they increase (not shown).

The multinomial regression model is presented in Table 3. Coefficients and odds ratios relating to the likelihood of underestimating inflation are provided in the left-hand columns and those relating to overestimation are given in the right-hand columns. Consistent with previous findings, there is a strong and significant association between socioeconomic and socio-demographic characteristics and the perception of inflation. However, the pattern in Table 3 offers a substantially different interpretation to that suggested previously (Bryan and Venkatu, 2001a, 2001b; Christensen, van Els and van Rooij, 2006; Fluch and Stix, 2007; Malgarini, 2008).

Considering first the likelihood of overestimation, women and those under the age of 50 are significantly more likely to perceive inflation to be well above the CPI. There are also strong effects of educational attainment and income, with those in lower socioeconomic groups more likely to overestimate. These coefficients are in keeping with previous findings. We also note, however, the role of marital status. Single people are less likely than married people to overestimate inflation. It is tempting to interpret this finding as relating to the increased likelihood that single people manage their own household finances, although other interpretations may be possible. The significant coefficient for cohabitantes is consistent with this interpretation, since they are more likely to have recently been single. Lastly with respect to overestimation, higher occupational classes are less likely to perceive inflation well above the CPI, although the interesting exception to this is those in the “unskilled manual” category, who are also less likely to overestimate (relative to the “skilled manual” reference category). One possible reason for this could be the greater likelihood that people in this category receive benefit payments, the annual increments for which may focus attention on inflation. We unfortunately have no way to test this hypothesis with the present data and other interpretations are again possible.

Although different in certain nuances, the right hand columns of Table 3 look not unlike previous multivariate analyses of inflation perceptions. The left hand columns, however, represent a departure. If gender, age and socioeconomic status drive the perception of inflation upwards, the coefficients for the likelihood of significant underestimation of inflation should be of the opposite sign to those for overestimation. They are not. Instead, it is clear that

Table 3: *Multinomial Regression for Accuracy of Quantitative Inflation Estimate*

<i>Dependent Variable Reference</i> <i>Accurate (-1% &lt;Error &lt; 2%)</i>	<i>Underestimation</i> <i>(Error &lt; -1%)</i>		<i>Overestimation</i> <i>(Error &gt;2%)</i>	
	$\beta$ (s.e.)	<i>exp</i> ( $\beta$ )	$\beta$ (s.e.)	<i>exp</i> ( $\beta$ )
Intercept	-0.869*** (0.141)		0.347*** (0.106)	
Female	0.167*** (0.036)	1.182	0.498*** (0.027)	1.646
Age (40-49 Years)				
16-19	0.079 (0.145)	1.083	-0.115 (0.110)	0.891
20-29	0.104 (0.074)	1.109	0.041 (0.056)	1.042
30-39	0.044 (0.054)	1.045	0.018 (0.040)	1.019
50-59	-0.092* (0.054)	0.913	-0.206*** (0.040)	0.814
60-69	-0.085 (0.074)	0.918	-0.263*** (0.057)	0.769
70 plus	-0.092 (0.064)	0.912	-0.457*** (0.049)	0.633
Educational Attainment (Third level)				
Primary	0.280*** (0.074)	1.323	0.417*** (0.057)	1.518
Lower Second Level	0.058 (0.060)	1.059	0.204*** (0.046)	1.226
Higher Second Level	0.105** (0.050)	1.111	0.190*** (0.038)	1.210
Other Second Level	-0.090 (0.063)	0.914	0.003 (0.046)	1.003
Income (Top Quartile)				
Bottom Quartile	0.554*** (0.080)	1.740	0.657*** (0.062)	1.707
2nd Quartile	0.416*** (0.058)	1.517	0.584*** (0.044)	1.792
3rd Quartile	0.261*** (0.045)	1.299	0.422*** (0.034)	1.525
Marital Status (Married)				
Cohabiting	0.058 (0.094)	1.060	-0.190** (0.074)	0.827

Table 3: *Multinomial Regression for Accuracy of Quantitative Inflation Estimate (Contd.)*

<i>Dependent Variable Reference</i> <i>Accurate (-1% &lt;Error &lt; 2%)</i>	<i>Underestimation</i> <i>(Error &lt; -1%)</i>		<i>Overestimation</i> <i>(Error &gt; 2%)</i>	
	$\beta$ (s.e.)	<i>exp</i> ( $\beta$ )	$\beta$ (s.e.)	<i>exp</i> ( $\beta$ )
Separated	0.029 (0.107)	1.030	-0.112 (0.082)*	0.894
Widowed	0.135* (0.076)	1.145	-0.105 (0.060)	0.900
Divorced	-0.079 (0.170)	0.924	-0.084 (0.129)	0.919
Never Married	0.039 (0.053)	1.040	-0.199*** (0.041)	0.820
<i>Occupational Class (Skilled Manual)</i>				
Professional/Manager	-0.028 (0.058)	0.973	-0.171*** (0.044)	0.843
Non-Manual	-0.061 (0.059)	0.941	-0.165*** (0.045)	0.847
Self-Employed	0.255*** (0.067)	1.291	-0.002 (0.052)	0.998
Farmer	-0.076 (0.083)	0.927	0.015 (0.062)	1.015
Unskilled Manual	-0.037 (0.075)	0.963	-0.170*** (0.057)	0.844
Never Worked	-0.165 (0.170)	0.848	-0.255* (0.133)	0.775
Other	-0.165 (0.174)	0.848	0.145 (0.128)	1.156
Monthly Dummies		YES		YES
N		41,500		
-2 Log Likelihood		55690.134		
Nagelkerke R <sup>2</sup>		0.130		

\*  $p < 0.1$ ; \*\*  $p < 0.05$ ; \*\*\*  $p < 0.01$  (p-values for Wald test of  $\beta_1 = 0$ ).

women and those of lower educational attainment and income, as well as being more likely to *overestimate* inflation, are also more likely to *underestimate* it. The coefficients for age also maintain their sign, although they are non-significant, as are the coefficients for marital status. Occupational status is also largely non-significant with respect to underestimation, although the self-employed appear to be particularly likely to underestimate inflation – a result we find hard to interpret.

The mean and variance of a skewed distribution are not independent. Hence, if there is reason for estimates of inflation to be skewed upwards across all social groups, then those groups with less accurate estimates will have higher mean estimates also. Thus, the results presented here suggest that the association between inflation perceptions and social groups is more subtle than previously thought. It is true that women, younger people and those in lower socioeconomic groups perceive, on average, prices to be rising faster than do men, older people and those in higher socioeconomic groups. However, in addition to being more inclined to overestimate inflation, these groups are also more inclined to underestimate it. Certain groups are perhaps not so much inclined to perceive higher inflation as to perceive it less accurately in a world where everyone tends to overestimate it.

## V DO MISPERCEPTIONS OF INFLATION AFFECT ECONOMIC BEHAVIOUR?

Although the misperception of inflation is systematic and sizeable, it is possible that it is ultimately of little economic significance. There is no guarantee that even large inaccuracies in the perception of price changes have an impact on ongoing household financial decisions.

It is straightforward to generate contrasting hypotheses for how misperceptions might affect behaviour. One possibility is that those who perceive inflation to be high might also perceive real interest rates to be low and may hence be less likely to save and more likely to borrow and spend. Alternatively, it is also possible that individuals who perceive higher inflation will be less likely to spend. Their perception of high inflation may be influenced by their perception of changes in their own real incomes, such that higher inflation implies lower affordability. More simply, if they believe the present period is one of high inflation, this may translate into a perception of poor value for money. It is possible to question the economic rationality of each of these possible behavioural responses, depending on different assumptions about past and future prices and income. Hence, while the direction of the relationship between perceived inflation and consumption is an empirical question, it should be borne in mind that its empirical answer could be subject to change over time, just as the relationship between actual and perceived inflation is (see Section II).

Naturally, we would ideally like to have data relating to individual economic decisions, such as actual consumption and saving levels or engagement with various financial services. Although falling short of this ideal, the EU Consumer Survey nevertheless contains two useful questions



relating to attitudes, which ask about the advisability of buying and saving in the present economic climate, plus three questions relating to behavioural intentions, which ask about household spending plans over the next year, the intention to buy a car (within the next two years) and the intention to buy a house (within the next two years). While we cannot be sure that these indicators are related to subsequent behaviour, it is nevertheless a reasonable contention. Should there prove to be an association between the misperception of inflation and attitudes or behavioural intentions regarding consumption and saving, it would be consistent with the view that misperception of price changes has at least some economic consequences.

Dealing first with the attitudinal questions, the survey asks with respect to buying “large items of household equipment, such as furniture, washing machines, TV sets etc.” whether “for people in general the present time is a good time to buy; neither a good time or a bad time; or a bad time to buy – the purchase should be postponed”. Hence, the wording of the question makes clear that the answer carries behavioural advice about whether or not to make large purchases. We construct a binary variable from this question, assigning a 1 to respondents (25.5 per cent) who say it’s a good time to buy and 0 to the rest. The question about saving simply asks whether, in view of the general economic situation, it is “a reasonable time to save”. We assign the value 1 to respondents (65.7 per cent) who replied that it was “certainly” or “perhaps” a good time to save and 0 to those who said it was “probably not” or “certainly not” a good time to save.

We employ these two variables as dependent variables in logistic regression models, where the null hypothesis is that they will be unaffected by perceptions of inflation. Obviously, given the significant relationships uncovered in Section III, it is important to control for relevant socio-demographic and socioeconomic characteristics. We therefore include the same explanatory variables as for the previous multinomial model, as well as the monthly dummy variables.

One might argue that the regression of an attitude on a perception is mediated more by personal psychological factors than by a link between what people observe and how they subsequently behave. For instance, someone who feels pessimistic about the economy (or is inclined to be negative generally) might be more likely to give a negative answer to both a question about inflation and a question about the benefit of spending or saving. We cannot control for personality. However, recall that the inflation question on the survey asked respondents to estimate a percentage figure, not to evaluate a statement or express a point of view. Furthermore, another survey question allows us to control for individual economic outlook. Respondents were asked how the “general economic situation will develop”, with five categories ranging

from “get a lot better” to “get a lot worse”. This control variable ought to pick up variation in pessimism. The possibility of other unobserved personality traits influencing both perceptions of prices over the past year and attitudes to future economic behaviour cannot be ruled out, however.

Table 4 presents coefficients and odds ratios relating to inflation perceptions and pessimism from logistic regression models for both attitudinal dependent variables.<sup>6</sup> Looking at the left hand model, people who underestimate inflation are substantially more likely to agree that the present is a good time to make large household purchases, while those who overestimate it are less likely to agree with this. The gradient in the coefficients is consistent and highly significant. The gradient in the coefficients for economic sentiment is also strong and highly significant. Turning to the right hand model, overestimation of inflation is significant for attitudes towards saving too, with those who overestimate inflation being less inclined to think it is a good time to save.

One could argue that these models present a somewhat contradictory picture, since overestimation of inflation is associated with negative attitudes to both consumption and saving, while money must be either spent or saved. However, it must be borne in mind that these questions are about attitudes. It is not contradictory to believe both that inflation is such that it is likely to erode savings (i.e. that the real interest rate is low) and that price changes have reduced affordability or resulted in poor value for money. It is simply that the likely behavioural consequences of these attitudes are in opposition to one another and will to some degree, therefore, balance each other out. The net effect on decision-making with respect to consumption and saving we cannot know, but misperceptions of inflation appear to be associated with relevant attitudes.

The three answers to survey questions on behavioural intentions are similarly recoded as binary responses and employed as dependent variables in logistic regression models. For the first model, we assign the value 1 to respondents (30.6 per cent) who said they were planning to spend less on household items over the next 12 months, the value 0 to those planning to spend the same or more. Two more variables for the intention to buy a car and a house are constructed such that those respondents who stated that they would “perhaps” or “certainly” buy a car (house) over the next two years are given the value 1 (34.7 per cent for car purchase, 18.9 per cent for house purchase), otherwise the value 0.

<sup>6</sup> For ease of explanation, full models including coefficients for all regressors are not shown here, but are available from the authors on request.

Table 4: *Logistic Regression for Attitudes to Consumption and Saving*

	<i>Good Time to Buy</i>		<i>Good Time to Save</i>	
	$\beta$ (s.e.)	exp ( $\beta$ )	$\beta$ (s.e.)	exp ( $\beta$ )
Sociodemographic Controls				
<i>Gender, Age, Marital Status</i>		YES		YES
Socioeconomic Controls				
<i>Educational Attainment, Income, Occupational Class, Age-Gender Interactions, Age-Marital Status Interactions</i>		YES		YES
Inflation Perception (Accurate)				
Underestimate (>1% pts. below CPI)	0.161*** (0.029)	1.175	-0.067* (0.036)	0.936
Modest Overestimate ( $\geq$ 2% pts. above CPI)	-0.078** (0.029)	0.925	-0.148*** (0.030)	0.863
Large Overestimate (>10% pts. above CPI)	-0.347*** (0.031)	0.707	-0.405*** (0.030)	0.667
General Economic Sentiment (Stay the Same)				
Get a Lot Better	0.747*** (0.072)	2.110	0.093 (0.080)	1.097
Get a Little Better	0.304*** (0.027)	1.355	0.151*** (0.029)	1.163
Get a Little Worse	-0.163*** (0.025)	0.849	-0.170*** (0.024)	0.843
Get a Lot Worse	-0.493*** (0.044)	0.611	-0.615*** (0.035)	0.541
Monthly Dummies		YES		YES
N		50,570		50,570
-2 Log Likelihood		57106.596		61313.739
Nagelkerke R <sup>2</sup>		0.064		0.057
Hosmer Lemeshow Test (p value)		0.036		0.500

\*  $p < 0.1$ ; \*\*  $p < 0.05$ ; \*\*\*  $p < 0.01$  (p-values for Wald test of  $\beta_i = 0$ ).

Rather than asking respondents about how people generally ought to take economic decisions at the time of the interview, the questions used to construct these dependent variables ask specifically about the behaviour of the respondent's household over the coming period. Hence, in addition to concerns mentioned above about the influence of general economic pessimism on the response, we also control for the individual's level of optimism or pessimism with respect to their own household. An extra categorical control variable is

added that measures sentiment regarding the outlook specifically for the household's finances.

Coefficients from the three logistic regression models are provided in Table 5, in similar fashion to Table 4. For household spending, there is a consistent gradient across the inflation perception categories. Those who underestimate inflation are less likely to state an intention to rein in spending than those who perceive inflation accurately, while those who overestimate it are more likely to state the intention to do so, especially if they overestimate inflation by more than 10 percentage points. In the second model, overestimating inflation has a substantial and significant association with the intention to buy a car – those perceiving high inflation are less inclined to buy. In both cases, levels of general economic and personal financial sentiment are significant.

We suggest that these two models of consumption intentions, relating to household spending and car purchase, while controlling for general and personal economic outlook, constitute evidence that the misperception of inflation is likely to affect individual economic decision-making. They are consistent with the hypothesis that individuals who perceive inflation to be higher also think consumption is less affordable or offers less value for money. If the stronger influence of inflation misperception on behaviour were via perceptions of real interest rates, one might expect intention to purchase a car, in particular, to be positively related to overestimation.

The third model in Table 5 makes us more inclined to conclude that misperception is likely to affect behaviour. Intention to buy a house is not significantly associated with inflation perceptions, although like the other dependent variables described in this section it is strongly associated with economic optimism. We believe this result makes sense: households understand that the factors affecting house prices are different from those affecting prices generally. Furthermore, if our variable for inflation perceptions were acting as a proxy for some other form of economic confidence not controlled for by our variables for general and personal optimism, or for some unobserved psychological trait, we would anticipate that it would show up as significant in this third model. Its insignificance therefore reinforces our contention that the associations between inflation misperceptions, attitudes and intended behaviour, are meaningful.

Still, although the effects we report here are highly statistically significant, some caution is appropriate. For instance, it could be argued that those who perceive inflation accurately are more financially literate and so more likely to state intentions with confidence. The failure to find a significant effect of misperceptions on house prices again offers a degree of reassurance here. Alternatively, at least in some of the models, causality might run in the

Table 5: *Logistic Regression for Behavioural Intentions Regarding Household Spending, Car Purchases and House*

	<i>Cut Household Spending</i>		<i>Buy Car in Next Two Years</i>		<i>Buy House in Next Two Years</i>	
	$\beta$ (s.e.)	exp ( $\beta$ )	$\beta$ (s.e.)	exp ( $\beta$ )	$\beta$ (s.e.)	exp ( $\beta$ )
Sociodemographic Controls <i>Gender, Age, Marital Status</i>	YES		YES		YES	
Socioeconomic Controls <i>Educational Attainment, Income, Occupational Class, Age-Gender Interactions, Age-Marital Status Interactions</i>	YES		YES		YES	
Inflation Perception (Accurate)						
Underestimate (>1% pts. below CPI)	-0.167*** (0.038)	0.847	-0.038 (0.034)	0.962	0.030 (0.051)	1.031
Modest Overestimate (>2% pts. above CPI)	0.059* (0.030)	1.061	-0.055* (0.028)	0.946	0.042 (0.041)	1.043
Large Overestimate (>10% pts. above CPI)	0.198*** (0.031)	1.219	-0.156*** (0.029)	0.855	-0.011 (0.044)	0.989
General Economic Sentiment (Stay the Same)						
Get a Lot Better	0.072 (0.082)	1.074	0.275*** (0.077)	1.317	0.431*** (0.102)	1.539
Get a Little Better	-0.122*** (0.030)	0.885	0.114*** (0.027)	1.121	0.141*** (0.040)	1.152
Get a Little Worse	0.043* (0.025)	1.044	-0.021 (0.024)	0.979	0.014 (0.036)	1.014
Get a Lot Worse	0.314*** (0.037)	1.369	-0.082** (0.038)	0.921	0.026 (0.059)	1.026
Personal Financial Pessimism (Stay the Same)						
Get a Lot Better	-0.123 (0.097)	0.884	0.425*** (0.084)	1.529	0.875*** (0.092)	2.400
Get a Little Better	-0.095** (0.030)	0.909	0.221*** (0.026)	1.247	0.272*** (0.036)	1.312
Get a Little Worse	0.252*** (0.026)	1.287	-0.207*** (0.026)	0.813	-0.040 (0.041)	0.961
Get a Lot Worse	0.572*** (0.054)	1.772	-0.490*** (0.064)	0.613	-0.129 (0.100)	0.879
Monthly Dummies	YES		YES		YES	
N	50,570		50,570		50,570	
-2 Log Likelihood	57552.675		61638.760		32815.826	
Nagelkerke R <sup>2</sup>	0.037		0.132		0.164	
Hosmer Lemeshow Test (p value)	0.385		0.092		0.281	

\* p < 0.1; \*\* p < 0.05; \*\*\* p < 0.01 (p-values for Wald test of  $\beta_i = 0$ ).

opposite direction to that suggested, e.g. someone who intends to buy a car in the near future might conceivably keep a closer eye on prices than someone who does not (Lindén, 2005). On the other hand, it should also be noted that because the models control for economic pessimism, which itself may be influenced by misperception of inflation, the true impact of misperception on behaviour may actually be underestimated here, i.e. increased pessimism about the future is one potential causal route by which the overestimation of inflation might influence behaviour.

Overall, the pattern across the models is consistent with the idea that perceptions of price rises have a systematic impact on economic behaviour, while the direction of the relationship suggests that people associate perceived inflation with erosion of income and/or poor value for money. We consider it likely, therefore, that the misperception of inflation by Irish consumers has consequences for individuals and the wider economy.

## VI DISCUSSION

The present analysis confirms that inflation perceptions in Ireland display the same empirical pattern as has been observed elsewhere. Inflation is, on average, substantially overestimated – more so in the years immediately following the Euro cash changeover. Furthermore, there is a wide dispersion of perceptions, containing both overestimates and underestimates, with less than 15 per cent of the population perceiving inflation to be within 2 percentage points of the contemporaneous figure for the CPI.

Our empirical analysis cannot distinguish between most of the various hypotheses put forward to explain the overestimation of inflation. The direction of the relationship between age and perceptions does suggest that there is more to the phenomenon than a bias in the direction of previous experience, e.g. whether one lived through the 1970s. More likely, then, is that psychological biases come into play, be it the salience of specific price changes, loss aversion or biased memory for past prices, although we also note that the distribution of actual inflation is itself subject to a right skew.

Our results provide a new perspective on the different inflation perceptions of social groups. The findings suggest that whatever forces underlie the overestimation of price rises across the population may not also be behind the differences recorded between social groups, since women and those in lower socioeconomic groups are more likely to underestimate as well as to overestimate inflation. The findings are consistent with the perspective that psychological biases tend to cause overestimation, while better knowledge of official figures is likely to reduce both overestimation and the dispersion of

perceptions within a more knowledgeable social group. Our analysis also suggests that groups with more reason to be cognisant of official figures (e.g. people more likely to manage their own household finances) tend to have more accurate perceptions.

Yet the more novel contribution of this paper is to relate misperceptions of inflation to attitudes and intentions with respect to future economic behaviour. Misperceptions are associated with attitudes to both consumption and saving. More tellingly, overestimation of inflation is related to intentions to reduce consumption in the coming year. Thus, many people misperceive inflation substantially and it seems that this misperception may well influence their economic decision-making.

Taking a wider perspective, the empirical investigation of inflation expectations and perceptions began in earnest following the rational expectations revolution. At least for the population generally, it is not easy to reconcile the systematic misperception of inflation with the rational expectations approach. Of course, it may be the case that the minority of people involved in decisions of greater importance to the macroeconomy, such as wage negotiators or those who lend and borrow on a large scale, are the same minority of people who perceive inflation accurately. A positive relationship between accuracy of perception and its importance for the specific decisions faced by the individual concerned would be in line with the principles of bounded rationality.

Nevertheless, we think it very likely, given the results above, that a substantial proportion of consumer decision-making does not take inflation into account as the assumption of economic rationality, bounded or otherwise, suggests it should. Very many people substantially misperceive price rises, in an environment where the costs of obtaining accurate information are very small. Furthermore, their misperception appears to have behavioural consequences. This suggests that concerns about variability in financial literacy across social groups (Braunstein and Welch, 2002; de Meza, Irlenbusch and Reyniers, 2008) are not misplaced.

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