
The demographics of household inflation perceptions and expectations

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The Reserve Bank is interested in households' inflation expectations, as they can provide useful insight into how inflation pressures have evolved in the economy. The Marketscope survey of household inflation expectations suggests that households consistently over-predict inflation. This article uses the Marketscope survey unit record data to find the possible drivers of the average level of over-prediction in household inflation expectations. Gaining a better understanding of how various demographic groups participate (or not, as the case may be) in the survey, and their different perceptions of inflation, enables the Reserve Bank to obtain a more accurate read of households' true inflation perceptions. It discusses ways in which the Reserve Bank can improve households' understanding of inflation developments in the economy.

1 Introduction

Inflation expectations measures play an important role in the Reserve Bank's monetary policy process. Woodford (2001) highlights the increasing importance of managing expectations in effective monetary policy. Hence, it is important for the Reserve Bank to understand the inflation expectations of the different groups. In addition to helping the Reserve Bank to forecast inflation, inflation expectations can also be used to assess how effective the Reserve Bank has been in achieving credibility in keeping inflation under control.

This article looks at households' inflation expectations at the individual respondent level, to examine whether inflation targeting has had different impacts on the inflation perceptions of various demographic groups.

In the past, the Reserve Bank has tended to give more attention to the inflation expectations of businesses, relative to the expectations of households, when forecasting underlying inflation. This is because businesses have shown themselves to be better than households at estimating inflation. This may be due to the fact that many businesses involved in the inflation expectations surveys are key price makers through the setting of prices, and thus will have better information on price movements in the economy.

Regardless of the reason why businesses' inflation expectations provide a better estimate of actual inflation outcomes (as measured by the Consumers Price Index (CPI)) from a price stability standpoint the Reserve Bank

is still interested in the measure of household inflation expectations if it accurately reflects households' true perception of inflation. While businesses may be more useful in predicting underlying inflation, large deviations or changes in households' inflation expectations may point to issues regarding the stability of the economy. Furthermore, household inflation expectations provide some indication of inflation outcomes such as wage bargaining, spending patterns and thus the current phase of the business cycle. Any bias in inflation perceptions is undesirable given that the bias will distort the decisions of households in the economy. Therefore, it is important for the Bank to understand what drives these biases and look at ways of reducing them.

To gain a better understanding of the drivers behind the headline measure of the Marketscope survey of household inflation expectations, this article uses the unit record data to look at inflation expectations of various demographic groups. An analysis of the responses of individuals from June 1998 to September 2008 finds there are differences in perceptions of price movements across the demographic characteristics. Demographic characteristics of the respondent also had an influence on whether they answered the inflation questions at all.

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These findings have important implications for how the Bank uses this household inflation expectations measure. While the survey allocates weights to the respondents based on the distribution of the New Zealand population, and thus attempts to correct for the bias caused by those who choose not to participate in the survey, a proportion of the respondents do not answer the questions related to inflation while answering the other questions. This means there would be differences in the distributions of inflation expectations between respondents in the entire sample and the subset of those who answered all the inflation questions. If the inflation perceptions of these people who did not answer the inflation questions was in fact similar to that of respondents in their demographic group who answered the inflation questions, this selection bias would mean the weights allocated to the individual responses are likely to over- or under-represent certain various demographic characteristics of the New Zealand population.

The remainder of this article is structured as follows: section 2 describes the Marketscope survey of household inflation expectations, and how the headline measure has compared to actual inflation outcomes over the sample period. Section 3 examines the influence of various demographic characteristics on whether respondents will answer the inflation questions, and the influence on respondents' perceptions of past inflation and expectations of future inflation. Section 4 discusses the policy implications of the findings. Section 5 concludes.

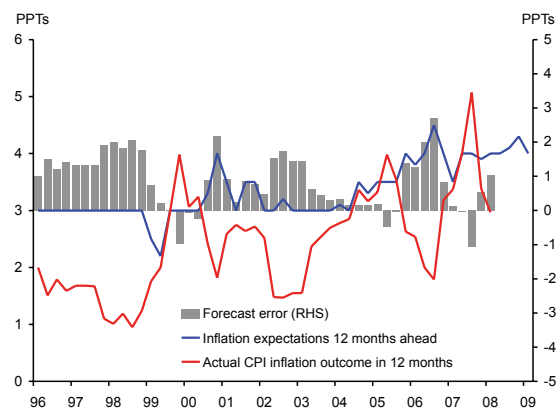
2 Perceived, expected and actual inflation

The Marketscope survey of household inflation expectations is a quarterly survey of 1,000 households, conducted as part of The Nielsen Company's regular 'omnibus' telephone surveys. The sample is chosen such that every telephone location throughout New Zealand has an equal chance of being interviewed. This random sample of males and females aged 15 years and over is then weighted based on age within gender within region (all interlocked), such that the sample would be representative of these characteristics of the New Zealand population. Respondents are asked

a range of demographic questions and their estimates of current and 12 month-ahead inflation.

Households have shown a tendency to both over estimate and over predict inflation (figure 1). This may be due to the greater frequency of purchases by households of the items that have tended to increase in price. However, analysis involving a reweighting of the CPI basket to contain only the items frequently purchased by households did not account for the difference in inflation perceptions between households and businesses (Ranchhod, 2003).

Figure 1
Marketscope one year-ahead inflation and actual inflation outcome (annual)

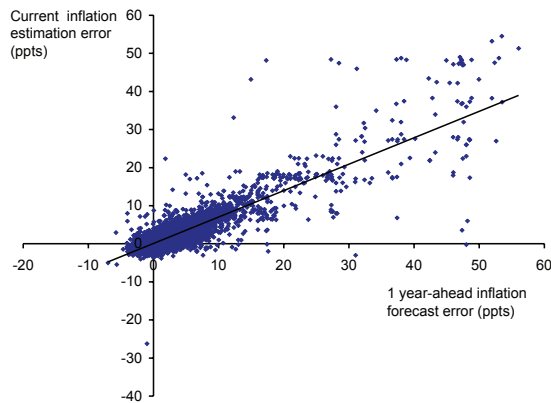


There have also been studies looking at the link between perceptions of current inflation and expectations of future inflation. The Bank of England (BoE) found half the respondents of the household inflation expectations survey reported that their perceptions of past inflation played an important role in forming their inflation expectations (Benford and Driver, 2008). The Federal Reserve Bank of Cleveland also found that the difference in inflation expectations amongst different income groups largely reflect differences in perceptions of price movements, with perceptions of inflation over the past year also overstated and to a greater degree than inflation expectations (Bryan and Venkalu, 2001).

Over the past decade, the Marketscope headline measure of both current inflation and one year-ahead expected inflation has tended to over-estimate inflation. The Marketscope survey also indicates that the errors of estimates of current inflation are closely related to errors on expectations of inflation in 12 months' time. Figure 2 plots each respondents' error on one

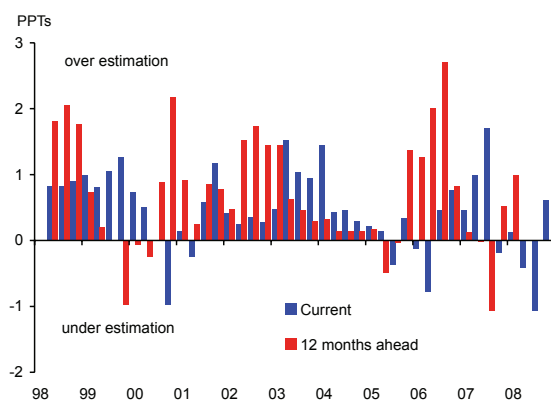
against the respondent's error on the other, and shows the strong positive correlation between the two errors. However, the average ratio between the current inflation estimate error and 1 year-ahead inflation expectations error is less than one, indicating that the degree of bias in estimating current inflation is less than that of estimating 1 year-ahead inflation. This probably reflects the fact that households are likely to have more information about current inflation than inflation in a year's time.

Figure 2
Estimation error on one year-ahead inflation and estimation error on current inflation



Over the sample period, there has been a gradual downward trend in the degree of over-estimation for both current inflation and 1 year-ahead inflation (figure 3).

Figure 3
Deviation of one year-ahead inflation expectations and current inflation estimates from actual inflation outcome



3 Influence of demographic characteristics on inflation perceptions and expectations

Overseas studies have tested whether there are differences in inflation expectations across demographic groups, with mixed results. The Reserve Bank of Australia (RBA) found that respondents with better education and whose jobs involved more access to information tended to have lower and more stable inflation expectations (Brischetto and de Brouwer, 1999). Similarly, a study by the Federal Reserve Bank of Cleveland found that lower income households tended to over-estimate inflation expectations to a greater extent (Bryan and Venkatu, 2001). In contrast, a study on household inflation expectation surveys in South Africa found that the inflation expectations of lower income and younger households are lower, and there was no difference amongst households of different education (Kershoff, 2000).

3.1 Probability of respondents answering the inflation questions by demographic groups

Our analysis of the unit record data in the Marketscope survey of New Zealand households also found that the demographic characteristics of respondents had an influence on their probability of answering the inflation questions (see Box A for further detail on the analysis). This has implications for both our interpretation of the headline measure of inflation estimates and expectations, and any policy aimed at improving the response rate for the inflation questions amongst the sample. We first discuss this finding and then look at the influence of demographic characteristics on the inflation question responses themselves.

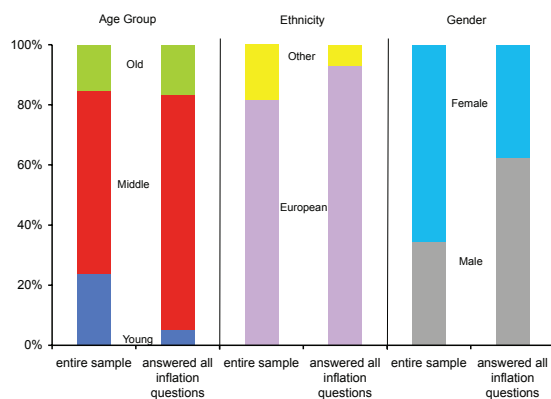
The analysis found that the age, employment status, ethnicity, inflation-adjusted income, gender, occupation skill of the respondent, and where the respondent resided influenced whether they would answer all the inflation questions (see Table 1 in Box A). For example, respondents aged under 25 years were much less likely to answer the inflation questions than respondents aged 25 years and over. Respondents who were male or European also had a higher probability of answering the inflation questions than

females or those of other ethnic groups. An increase in the real household income of the respondent increased the probability of answering the inflation questions, as did the skill level of the occupation of the respondent.

This has implications for the interpretation of the headline measures. While the entire sample of the household survey is weighted according to the distribution of age, gender and regional location of the New Zealand population, the subset consisting of the respondents who answered all the inflation questions (in addition to the questions relating to demographic characteristics) may not necessarily be representative of the New Zealand population. Our analysis assumes that those who did not answer the inflation questions were unwilling or unable to enumerate their expectations, rather than not having an expectation at all.

Figure 4 illustrates this difference in distribution for some of the key demographic characteristics found to have had a significant influence on answering the inflation questions, between the entire sample and the subset of those who answered all inflation questions. The weights based on the distribution of age, gender and region in the New Zealand population (as derived from the Census) are applied to the entire sample, including respondents who did not answer all inflation questions. Taking age group as an example, the proportion of respondents in the under-25 age group in the subset of respondents who answered all inflation questions is much smaller than in the entire sample. Combined with the significant influence found for the young age group on

Figure 4
Demographic distribution of entire sample compared with respondents who answered all inflation questions



their answers to the inflation questions, there are limitations over the ability to generalise the results based on only those who answered all inflation questions.

The difference in response rate to the inflation questions between demographic characteristics may reflect a genuine lack of knowledge about the inflation environment. If that was the case, policies aimed at increasing financial literacy and awareness of inflation issues, for example amongst lower income households in the economy, should improve the response rate for the inflation questions (this issue is addressed further in Section 4).

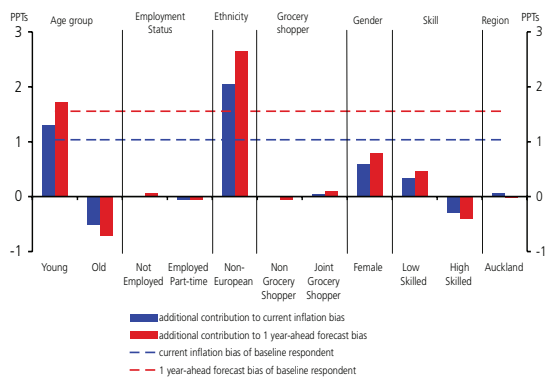
3.2 The influence of the demographic characteristics of the respondent on their inflation perceptions

We analysed the unit record data to quantify the effects of the demographic characteristics on the degree of over-prediction and over-estimation of inflation. Figure 5 illustrates the contribution of each demographic characteristic to inflation bias. We show this for both estimates of current inflation and expectations of one year-ahead inflation of the respondents, relative to a baseline respondent. The baseline respondent is the respondent with the demographic characteristics most common in the sample, and the median real household income.

The bars show how the demographic characteristic is associated with a higher or lower inflation bias, relative to the baseline respondent. For example, being in the “Young” category (ie, respondents aged under 25 years) adds on average 1.7 percentage points (as represented in the red bar in the “Young” column of the age group category) to the baseline inflation bias on one year-ahead expectations of 1.6 percentage points (as represented by the red line).

This means that the younger the respondent, the higher the upward inflation bias, with the difference particularly stark between respondents aged under 25 years old and respondents aged 25 years and over. Looking at ethnicity, respondents of non-European ethnicity had a much higher inflation bias relative to Europeans. The gender of the respondent mattered for inflation perceptions, with females having a higher inflation bias than males.

Figure 5
Contribution of key demographic characteristics to inflation perception bias



Meanwhile, occupation skill and real household income of the respondent also affected the inflation bias of the respondent. An increase in the real income of the respondent generally decreased inflation bias, as did the skill level of the respondent's occupation.

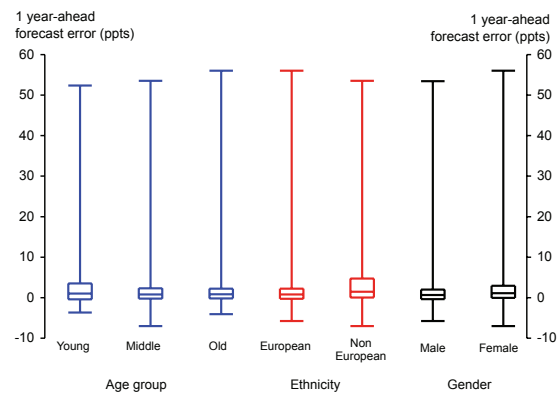
We had found a higher non-response rate amongst female respondents, those aged under 25 years old and those of non-European ethnic origin. If these non-respondents in fact had similar inflation perceptions to respondents in the same demographic group, and we were to correct for the under-representation of these demographic groups the headline inflation expectations measure would likely be even higher, given these demographic groups tend to have higher inflation perceptions.

These findings are in line with a similar study conducted by the Bank of England looking at the heterogeneity of inflation expectations amongst households (Blanchflower and MacCoille, 2009). Their analysis of micro-data from three different consumer surveys also found relatively high non-response rates amongst females, the young and those on the lowest incomes, thus pointing to the potential for bias of survey results. Comparing across the various surveys, they find non-response rates tend to be higher when quantitative responses are asked for. Turning to inflation perceptions, they find the more highly educated and higher income households generally have lower inflation expectations.

While some key demographic characteristics have a significant influence on inflation bias, a look at the distribution of estimation errors show there is actually a large degree of

overlap between the different groups, and a very wide range of perceptions within each demographic group (figure 6). Taking gender as an example, while there is a greater inflation bias for females relative to males, a large number of males and females have the same degree of inflation bias, as reflected in the positions of the boxes representing each. In this diagram, the top of the boxes are the 75th percentiles of responses, the bottoms are the 25th percentile, and the lines in between are the median responses.

Figure 6
Distribution of estimation error of 1 year-ahead for key demographic characteristics



4 Policy implications

It is possible that ethnicity, occupation skill level, nature of employment and real household income are capturing elements of education attainment of the respondent, which is not measured in the survey. Hence, the influence found in these demographic characteristics may be reflecting a difference in the awareness of economic issues. Maag and Lamla (2009) found the tone of media reports on inflation issues affected the dispersion in inflation expectations amongst households in Germany, with inflation reports emphasising the negative effects of high inflation reducing this dispersion. In addition, while the tone of the media coverage affected all educational groups, the reduction in inflation bias increased with increases in the level of education attainment. This indicates the more highly educated were more responsive to media reports about issues in the inflation environment.

Box A

Quantifying the effects of demographic characteristics on inflation perceptions

This Box outlines the econometric analysis used to quantify the effect of demographic characteristics on inflation perceptions. We first need to check for the potential influence of demographic characteristics on the probability of respondents in answering the inflation questions (estimate of inflation over the past year and expectations of one year-ahead inflation).

Firstly, a probit selection equation was estimated to predict the probability of the respondent answering the inflation questions based on their demographic characteristics. We focus on the key demographic characteristics that have been examined with respect to their influence on inflation expectations in previous studies: age, employment status (full-time, part-time or not at all), ethnicity, whether respondent was the main grocery shopper, household income, gender, skill of occupation, region respondent lives in, and quarter and year the survey was taken in.

To take into account of wage inflation over the sample period (with average weekly wages having increased by 44 percent from June 1998 to September 2008), we deflate the household income of respondents back to June 1998 levels before performing the regression.

The rest of the demographic characteristics are included as dummy variables in the equation, with the baseline chosen as the demographic characteristics that were most common over the sample period. Thus, the baseline respondent in this regression is aged 25 to 64 years, in full-time employment, European, main grocery shopper, male, in a semi-skilled occupation, and residing in a city other than Auckland.

Looking at the first part of the analysis, it was found that all of the demographic characteristics had a significant influence on the probability of the respondent answering all the inflation questions (table 1). The significance of the demographic characteristics points to the likely existence of selection bias in the subset of respondents

who answered all the inflation questions. While the entire sample is weighted to be representative of the New Zealand population in terms of age, gender and region the respondent resided in, these weights are not corrected for the possible under or over-representation of respondents according to demographics in the subset of respondents who answered all the inflation questions.

Table 1
Influence of demographic characteristics on probability of answering inflation questions

Characteristic	Coefficient	t-stat
<i>Age_Y</i>	-0.930	-32.190
<i>Age_O</i>	0.107	3.863
<i>Emp_N</i>	0.123	4.713
<i>Emp_{PT}</i>	0.071	3.326
<i>Ethn_O</i>	-0.510	-20.433
<i>Groc_N</i>	0.041	1.852
<i>Groc_J</i>	0.045	1.803
<i>Real Income</i>	0.338	21.368
<i>HIncome_T</i>	0.106	3.597
<i>Gender_F</i>	-0.704	-38.973
<i>Skill_L</i>	-0.233	-9.643
<i>Skill_H</i>	0.172	8.998
<i>Region_A</i>	0.056	3.423
<i>Season_M</i>	-0.003	-0.139
<i>Season_J</i>	0.001	0.051
<i>Season_S</i>	0.048	2.220
<i>t</i>	-0.033	-12.730
<i>Constant</i>	-2.933	-17.191

R² = 0.184
n = 31031

Inclusion of an explanatory variable that determines selection into the subset of respondents who answered all inflation questions, but at the same time is not related to the inflation estimates the respondent gives, would correct for this selection bias. However, no such variable exists for the survey, hence we can only acknowledge the potential of this selection bias to influence the analysis quantifying the effects of demographic characteristics on the degree of over-estimation and over-prediction of inflation.

OLS regressions of the estimation error on current

inflation and estimation error on one year-ahead inflation against the demographic characteristics were performed to quantify the contribution of each to the degree of over-estimation and over-prediction of inflation. Due to the possible presence of multicollinearity amongst a few variables, strong conclusions cannot be reached about the significance of individual variables. However, given the large amount of data, the contribution of each variable can be drawn from the analysis with some confidence. These contributions are shown as variable coefficients in Table 2.

We find all of the demographic characteristics have a significant influence on the probability of the respondent answering all the inflation questions. The differing distribution of demographic characteristics between the entire sample and the subset of the respondents who answered all the inflation questions raises issues for the representativeness of this subset from which the inflation expectations measure is derived.

Table 2
Influence of demographic characteristics on average inflation perception bias

Demographic characteristics:

Real income = natural log of the inflation-adjusted household income of respondent

Dummy variables for whether respondent is:

Age_y = aged under 25 years

Age_o = aged over 65 years

Emp_N = not employed

Emp_{PT} = employed part-time

Groc_N = not the main grocery shopper

Groc_J = the joint grocery shopper

Hincome_T = in the top income bucket

Skill_L = in a low-skilled occupation

Skill_H = in a high-skilled occupation

Region_A = residing in Auckland

Gender_F = female

Ethn_O = of ethnic origin other than European

Variables referring to when survey was conducted:

Season_m = March

Season_J = June

Season_S = September

t = year, with 1998=0,...2008=10

Characteristic	Current inflation estimate error		Error on 1 year ahead inflation expectations	
	Coefficient	t-stat	Coefficient	t-stat
<i>Age_y</i>	1.297	9.369	1.713	9.811
<i>Age_o</i>	-0.502	-4.858	-0.705	-5.292
<i>Emp_N</i>	-0.001	-0.011	0.061	0.463
<i>Emp_{PT}</i>	-0.059	-0.702	-0.044	-0.410
<i>Ethn_O</i>	2.052	17.674	2.642	17.724
<i>Groc_N</i>	-0.001	-0.020	-0.054	-0.564
<i>Groc_J</i>	0.033	0.374	0.106	0.944
<i>Real income</i>	-0.669	-10.773	-0.823	-10.411
<i>Hincome_T</i>	0.155	1.625	0.192	1.553
<i>Gender_F</i>	0.589	8.487	0.793	8.946
<i>Skill_L</i>	0.340	3.373	0.461	3.586
<i>Skill_H</i>	-0.290	-4.226	-0.403	-4.610
<i>Region_A</i>	0.066	1.080	-0.023	-0.289
<i>Season_m</i>	0.013	0.155	0.000	0.002
<i>Season_J</i>	-0.108	-1.360	-0.014	-0.143
<i>Season_S</i>	0.045	0.560	-0.078	-0.768
<i>t</i>	-0.023	-2.435	-0.038	-2.813
<i>Constant</i>	8.300	12.320	10.493	12.240
	R ² = 0.051		R ² = 0.059	
	n = 16805		n = 16044	

It appears financial literacy is a key factor in the heterogeneity of inflation expectations amongst households. Hence, educating the public on developments in inflation and the economy more generally would likely result in an improvement in the accuracy of inflation perceptions. The most effective way to improve financial literacy across a broad range of households would be through the formal schooling system, as part of the curriculum in secondary schools.

It is also possible the higher inflation perceptions of respondents with lower real household income may indeed reflect the inflation they are facing. As discussed in the introduction, earlier analysis involving a reweighting of the CPI basket to contain only the items frequently purchased by households did not account for the difference in inflation perceptions between households and businesses (Ranchhod, 2003). However, it is possible the different consumption baskets amongst households with different household incomes may lead to differing rates of household cost increases. Given higher-income households are likely to spend a greater proportion of their income on items that tend to fall in price, such as electronics, the smaller degree of upward bias in these respondents' expected inflation could be justified.

Related to this, it is possible the true inflation perception of respondents with lower household incomes is indeed higher. This would have implications for the saving rate of lower-income households. Higher perceptions of inflation would mean lower expected real interest rates, making spending more attractive relative to saving.

As discussed earlier, the weightings applied to the entire sample are likely to be over- or under-representing certain demographic characteristics. This limitation of the survey needs to be taken into consideration when interpreting the headline household inflation expectations measure. If we were to correct for the under-representation of females, respondents aged under 25 years old and those of non-European ethnic origin, the headline inflation expectations measure would likely be even higher, given these demographic groups tend to have higher inflation perceptions.

5 Conclusion

The Reserve Bank is interested in whether current measures of household inflation expectations provide an accurate read on households' true perception of inflation, as well as the demographic groups with the greatest inflation perception bias. An analysis of the Marketscope household omnibus survey at the unit record level provides some detail on the drivers behind the headline measure of household inflation expectations.

Many demographic characteristics have an influence on the probability of survey respondents answering the inflation questions. This may reflect genuine lack of knowledge about inflation developments. Because the Reserve Bank takes its communications role seriously, part of effective communication policy would include educating the public to improve financial literacy². In the longer term, inclusion of financial literacy into the school curriculum would lead to an improvement across a broad range of households. One outcome sought through these efforts would be a higher response rate to the inflation questions, and hence a more accurate measure of true household inflation expectations.

Furthermore, analysis of the responses to the inflation questions shows some demographic characteristics influence inflation perceptions. This suggests the Reserve Bank can potentially bring down the overall inflation bias of households with education efforts targeted towards those groups with the greatest bias in their perceptions. Such a focus should provide benefits for both our forecasting purposes and price stability more generally, through the better anchoring of inflation expectations and stabilisation of the economy.

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² See Widdowson and Hailwood (2007).

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