RETHINKING THE MEASUREMENT OF HOUSEHOLD INFLATION EXPECTATIONS: PRELIMINARY FINDINGS

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Introduction

Inflation expectations play a crucial role in modern monetary policy. In economic models with rational expectations, the long-run behavior of inflation expectations, and hence inflation itself, is an equilibrium outcome determined exclusively by the public’s beliefs about the policy rule followed by the central bank. Following this fundamental insight from the rational expectations revolution, central banks increasingly communicate their policy reaction function in terms of possible paths for inflation expectations and by establishing inflation targets attempting to “anchor” the public’s long-run inflation expectations. In addition, a wide range of household
inter-temporal decisions can be affected by expectations and uncertainty about future inflation.¹

Indeed, Fed Chairman Bernanke has argued that accurate and consistent measurements of inflation expectations represent an important source of information for appropriately calibrating monetary policy and deepening our understanding of economic behavior (Bernanke 2007). However, while survey-based measures of inflation expectations are widely used and valued, the information they provide is limited and their validity not sufficiently evaluated. Currently the main source of information on consumer inflation expectations in the U.S. is the Reuters/ University of Michigan Survey of Consumers (henceforth the “Michigan Survey”). It surveys a nationally representative monthly random sample of around 500 households.² In addition to a range of questions about current economic conditions, the survey elicits year-ahead point forecasts for expected changes in “prices in general,” asking ‘By about what percent do you expect prices to go up/down on the average, during the next 12 months?’ followed by specific prompts. Similar wording is used to elicit 5-10 years-ahead point forecasts. In their basic form these questions on price changes have remained unchanged over the last 30 years and share a feature common with many other inflation expectation surveys: they use simplified wording asking about “prices in general” rather than directly asking about “the rate of inflation.”

However, studies in survey design have long suggested that the use of simplified wording such as “prices in general” provides no assurance that

¹ In fact, one definition of price stability ascribed to Alan Greenspan, is an environment where economic agents do not take into account uncertainty about future inflation in their decision-making.

² The Michigan survey does have a limited panel aspect in that about 200 of the 500 respondents each month are from the survey sample 6 months before, while the other 300 are new respondents. For further details see Curtin ( ).
all respondents interpret it in the same way, or in the way that it may be interpreted by economists. Valid measurement requires respondents to agree with one another, and with the economic modelers, regarding what the survey question entails. As far as we know, the questions in the Michigan Survey measuring expectations for "prices in general" have not previously been systematically validated, in terms of how it is interpreted by respondents, how their interpretations of the question affect their responses, and how well their responses correlate to relevant behaviors. If respondents have different interpretations of a question, their responses may show larger disagreements. Indeed, another feature Michigan’s question about "prices in general" shares with other inflation expectation surveys is the high dispersion of responses around the median, which is partly related to observable characteristics of respondents such as age, sex, education and income. Further, a large number of respondents with certain observable characteristics consistently expect changes in "prices in general" to be significantly above current inflation rates. For example, from May 2008 to July 2008 one quarter of the respondents to the Michigan Survey expected price changes of greater than or equal to 10% over the next 12 months, with between 10 to 15% reporting so in the months thereafter. Other surveys ask questions about the past change in prices and find that some of the dispersion about future price changes is related to dispersion of views about past price changes.3

In improving the measurement of inflation expectations of households, it is important to move beyond the current practice of asking consumers

3 The dispersion and perceptions of higher rates of inflation than reflected in published consumer price indices has also produced a large literature questioning the appropriateness of the rational expectations assumption (see, for example, Mankiw et al, 2003). Others have questioned whether inflation expectations are a leading indicator of future inflation pressures or are more of a backward looking indicator (see Cecchetti et. al 2007).
only for their point forecasts and to assess agents’ uncertainty about future inflation realizations. It is now commonly understood that the Fisher equation of a century ago was incomplete. The costs of inflation run not just through inflation expectations, but also through the risk of inflation, which is a related, but distinct concept. Uncertainty about future inflation clouds the decision making of consumers and businesses and reduces economic well-being. 4 Without this uncertainty, consumers and businesses would be better able to plan for the future. Recent discussions (Mishkin, 2008) have suggested that a central bank might address these two costs differently.

Tracking inflation uncertainty is also important for assessing central bank credibility and effectiveness of communications. An increase in uncertainty about future inflation outcomes may be used as an early warning system of any erosion in central bank credibility. Central bank communications have stressed the importance of outlook risk, further highlighting the need for informative quantitative risk measures to be included as part of the policymaker’s tool kit. Moreover, to the extent that uncertainty about future inflation affects consumers’ inter-temporal decisions, such a measure is of direct relevance for tracking and forecasting economic conditions, and may be itself an object of interest for monetary policymakers.

Bernanke (2007) has also argued in favor of collecting better information on wage expectations. Like inflation expectations, wage expectations affect consumer inter-temporal decisions, and are therefore of great value for understanding and forecasting economic behavior. Moreover, since price-setting behavior by firms is at least partly dependent on total labor cost, wage dynamics are an important determinant of actual and expected

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4 For a discussion of alternative pathways through which inflation uncertainty affects economic decision making and welfare, see Golob (1994).
inflation. At the same time, because economic agents may set wages with reference to the expected rate of inflation, data on wage expectations provide an additional information source for analyzing inflation dynamics and the interaction between wage and price determination (the basis of the so-called “wage-price spiral”). Despite the obvious importance of wage expectations, as noted by Chairman Bernanke (2007), information on nominal wage expectations is particularly scarce.5

Finally, relatively little is known about the way in which individuals form and update expectations about future inflation. As argued by Chairman Bernanke (2007), “a fuller understanding of the public’s learning rules would improve the central bank’s capacity to assess its own credibility, to evaluate the implications of its policy decisions and communications strategy, and perhaps to forecast inflation”. Tracking individual respondents over time would enable us to study how they revise expectations over time, and how such revisions vary across people who express different levels of uncertainty about future inflation outcomes.

In light of the importance of inflation expectations, approximately three years ago the Federal Reserve Bank of New York, in collaboration with the Cleveland Fed, initiated the Household Inflation Expectations Project (HIEP), to assess the feasibility of improving the measurement and analysis of consumer inflation and wage expectations through surveys.6

The project’s main goals are (i) to assess the information content and validity

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5 Notable exceptions are survey questions on expected weekly earnings analyzed by Dominitz (1998) and on expected future income by Guiso et al (1992), Manski (1993) and Dominitz and Manski (1996).

6 The past decade has witnessed a marked increase in the number and use of surveys of inflation expectations by Central Banks internationally. Several Central Banks have launched their own surveys of expectations or contracted with outside organizations to develop and conduct new surveys on their behalf with the same aim of improving the overall quality and usefulness of survey data on inflation expectations.
of the Michigan Survey measures; (ii) to improve the quality of existing measures and to better align the measurement of household inflation expectations with the central role that inflation expectations play in current monetary policy formulation and communication; (iii) to improve our understanding of how consumers form and update their inflation expectations; (iv) to empirically assess the links between inflation expectations and consumer choice behavior. The project represents a unique collaboration among FRS research staff, academic economists, and a team of psychologists at Carnegie Mellon University specialized in risk perceptions and decision sciences.

As initial steps towards these broad goals, our project to date has primarily focused on (i) analyzing how respondents interpret the Michigan Survey questions and respond to their format; (ii) testing a broader set of questions asking about inflation expectations using different question wordings (in addition to “prices in general”) and time horizons, to complement the Michigan Survey; (iii) eliciting individual uncertainty about future inflation outcomes; (iv) measuring expectations about wages; (v) tracking the same set of households over time (i.e. introducing a panel dimension in our data collection effort) in order to study persistence and responsiveness of inflation expectations to inflation surprises.

Overview of the project to date

After an initial set of exploratory meetings by a working group of Fed economists, academic economists, experts in survey design and psychologists, we carried out 30 in-depth open-ended cognitive interviews of consumers, jointly with a team of psychologists at Carnegie Mellon University. Although the sample of interviewees was small and non-representative of the general population, such cognitive interviews typically provide qualitative insights that cannot be obtained on a written survey.
The cognitive interviews were designed to examine respondent’s familiarity with the concept of inflation, and how they interpret the Michigan question about expected changes in “prices in general” and alternative questions asking for inflation expectations. The main findings of these interviews were that (a) all interviewees had heard of the term “inflation” and could give a reasonable definition; (b) interviewees had many interpretations of the Michigan question about “prices in general,” with some interpreting it as asking about “inflation” while others interpreting it as asking about prices they paid, using salient examples such as gas prices; (c) interviewees had more focused interpretations when they were asked for their expectations about “the rate of inflation” with none mentioning salient example prices; and (d) interviewees wanted to express their forecast uncertainty, often using ranges instead of point forecasts.

The findings from these interviews helped guide us in developing alternative questions for measuring inflation expectations and led to a set of survey modules designed to analyze the properties of the Michigan question and of several alternative questions asking about the “rate of inflation” and “the prices you pay for the things you usually spend money on” using a larger sample. In addition, we designed a preliminary set of questions to allow respondents to systematically express their forecast uncertainty as well as their expectations about wage changes.7

First, we constructed a survey module on inflation expectations for inclusion in the American Life Panel, an internet survey conducted by

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7 The survey modules were designed in collaboration with a team of behavioral psychologists from Carnegie Mellon University (CMU) led by Wandi Bruine de Bruin and Baruch Fischhoff. Olivier Armandier and Rob Rich (FRB-NY), academic consultants (Charles Manski, Kenneth Wolpin, Eric Johnson), a team from RAND’s Roybal Center for Financial Decision Making led by Jeff Dominitz and Arie Kapteyn, all provided valuable input. Each module was pilot tested on small samples by the CMU team.
RAND. The sample population for this survey is based on the Michigan Survey and includes respondents who agreed to participate in further interviews after completing their participation in the Michigan Survey. This module has been repeated since November 2007 roughly every six weeks and allows us to contrast it to, as well as complement the information derived from, the Michigan Survey. In what follows we refer to the data generated by this series of modules, administered at a regular frequency to the same sample of respondents, as the “Fed-ALP panel”.

We also fielded two longer surveys as part of the ALP, to test in depth the information content of a wide range of alternative inflation expectations. Finally, the Carnegie Mellon team is currently conducting a detailed psychometric survey to further examine the reliability and validity of the Michigan question about “prices in general” as well as questions using alternative wording. This survey also includes an exploratory set of questions to study the perceived and empirical links between inflation expectations and consumer behavior. Such behavior includes purchases of big durable items (including housing), mortgage refinancing, credit card debt management and other borrowing and saving decisions.

**Summary of main findings to date**

Our analysis of the Reuters/Michigan Survey of Consumers identified a number of important shortcomings and potential for improved survey design. We found that ambiguous question wording, where respondents are asked about changes in “prices in general”, leads to heterogeneity in question interpretation. For a significant fraction of respondents it elicits responses that focus on the most visible, often increasing prices of specific goods they buy, such as food, gasoline or heating oil. The tendency to think more about salient prices is most common among those with lower financial literacy. In addition to ambiguous question wording, we also identified
issues with selective follow-up questions in the Michigan Survey, which may lead to measurement biases.

Our findings suggest that the ambiguity in question meaning can be reduced by directly asking about the “rate of inflation”, which causes respondents to think about the prices of items that US residents pay for in general, closer to the definition of inflation that economists have in mind. This alternative question had a high response rate and improved construct validity, exhibiting less disagreement (less dispersion) across respondents, lower overall forecast uncertainty, and expectations that were less strongly correlated with price expectations for gas and food. These findings hold across the board, with respect to both near- and longer-term inflation expectations, as well as past inflation.

Our analysis shows that it is feasible and fruitful to measure forecast uncertainty. We have successfully implemented a probabilistic version of various inflation expectations questions, where respondents are asked to assign probabilities to alternative inflation outcomes. These questions had a very high response rate (over 95%) with responses displaying expected properties. For example, we found uncertainty about future inflation realizations to be negatively correlated with financial literacy and positively correlated with the use of ranges to express point forecasts.

The results show that disagreement is not always a good proxy for uncertainty about future inflation. Tracking uncertainty in inflation expectations is crucial to assess central bank credibility and effectiveness of communication, to better understand the linkages between expectations and actual behavior, to improve our forecast accuracy, and to detect potential turning points in inflation expectations. The latter is particularly important in the recent environment, where we have observed a rapid shift from somewhat elevated inflation expectations to concerns about deflation, with various sources arguing that the current liquidity expansion may give rise to future inflationary pressures.
Similarly, we find that respondents are willing and able to provide point as well as density forecasts about future wages. During the survey period, respondents expected wages to rise significantly less than prices, and expressed less uncertainty about future wage changes than about future price changes.

Finally, repeated measurement of expectations for the same set of consumers over time was found to provide useful insights into inflation expectations dynamics. The evidence points to considerable persistence in inflation expectations and uncertainty over time. We find that those who are more uncertain are more likely to make greater (absolute) revisions to their forecasts, which is consistent with Bayesian updating.

**Current Patterns**

There is considerable heterogeneity across individuals in the levels and trends in inflation expectations. As seen in Figure 1, which shows trends in year-ahead point forecasts in the Michigan Survey by income level, differences can be substantial. Additional evidence from our own survey indicates that the heterogeneity across demographic groups is strongly related to variation in financial literacy, and that part of this variation in turn is attributable to different question interpretations by those with different levels of financial literacy. Answers to the question asking about the “rate of inflation” reveal a different time pattern for the median forecast of year-ahead inflation with a less dramatic increase during the oil price spike of 2008 (Figure 2).

As part of our survey we introduced a new question to measure medium term (3 years ahead) inflation expectations. The trends shown in Figure 3 indicate that until recently near-term (1 year ahead) expectations exceeded medium term (3 years ahead) expectations, but this pattern has now reversed. Interestingly, we found this reversal to be particularly strong for higher income and higher educated respondents.
Disagreement and individual forecast uncertainty (as measured by the interquartile range of the forecast density) are distinct and complementary concepts, with each being a relatively poor proxy for the other. Disagreement in point forecasts is more volatile (with a spike during the summer of 2008) and often moves in opposite direction to individual uncertainty about future inflation realizations. Moreover, while disagreement increased slightly during the past year, median uncertainty instead declined considerably (Figure 4).

The individual density forecasts allow us to measure the probability of tail events. As shown in Figure 5, after a run up in expectations of deflation during the second half of last year, individuals have started to lower the probability they assign to year-ahead deflation. However, deflation expectations remain at a much higher level than they were pre-crisis. In contrast, for the medium term, deflation expectations have instead returned to pre-crisis levels. Near and medium term risks for high inflation have subsided during the past year. Medium term risk of high inflation now exceeds the short term risk.

Finally, the recent decline in year-ahead inflation expectations has been accompanied by a parallel decline in wage-growth expectations, with individuals generally expecting a continued and widening decline in real wages (Figure 6).

**Next Steps**

While we believe that the new measures we have developed will improve our ability to monitor important aspects of consumer inflation expectations, much remains to be learned about how consumers form and act upon their expectations. In future research we hope to go beyond direct measurement and focus on the following two areas:

1. Learn more about the way in which households form and update their expectations, the speed and manner in which expectations respond
to new information, and the specific role of monetary policy announcements and other public sources of information.

(2) Study the links between inflation expectations and consumer behavior: such behavior includes purchases of big durable items (including housing), mortgage refinancing, credit card debt management, other borrowing and saving decisions, investment in human capital (e.g., student loans), wage negotiation and renegotiation, etc.

Research in both areas will help us further improve our understanding of the processes by which expectations are formed and updated by households, which in turn may help us design survey questions that enable respondents to express their expectations more accurately. It will also help predict how consumers respond to new information, surprises, anticipated or unanticipated shocks in the economic and financial environment. The speed and possible heterogeneity in the updating process can be of crucial importance for the central bank in order to forecast responses to policy actions and other events.

References


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