

Special Feature C

Inflation Expectations In Singapore: A Behavioural Approach

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Introduction²

The expectations of economic agents have significant impact on their decisions and are key determinants of macroeconomic outcomes such as inflation, economic growth and unemployment. For example, if a worker believes that consumer prices will rise sharply next year, she would demand a wage increase. Similarly, a homeowner with a fixed interest mortgage might make an early repayment if she expects price levels to fall, knowing that the real value of her mortgage debt will increase. In these cases, expectations about inflation could lead to changes in behaviour and in the aggregate, influence prices and become self-fulfilling.

It is no surprise, then, that policymakers are concerned with inflation expectations. Understanding inflation expectations can help policymakers improve their own forecasts and also better communicate the intent of, and strengthen the effectiveness of monetary policy (Barro and Gordon, 1983).

Indeed, effective communication of the central bank's outlook for inflation is one of the maxims of good monetary policy. Such communication

will help to ensure stability of prices and provide the correct "... anchoring of inflation expectations ...", despite shocks to aggregate demand (Bernanke, 2007).

Many central banks publish surveys of professional forecasters (see for example, MAS, 2018) and others also survey consumers on their expectations of future price changes. Some central banks like the US Federal Reserve Board or the Bank of England rely on a combination of past data, activity- and survey-based measures to gauge inflation expectations. However, survey-based estimates are plagued with different measurement and cognitive biases which in turn can affect the decision-making of different market participants, and adversely impact the prospects for the real economy. One of the major issues identified by survey designers is that "... *relatively little is known about how respondents interpret the survey questions, how their interpretation affects their responses, and how much their expectations influence their behaviour and beliefs about the economy ...*" (Bruine de Bruin *et al.*, 2010).

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² This project is a collaboration between BIT and SMU, and supported by the Economic Policy Group (EPG) at MAS. It is based on the Singapore Index of Inflation Expectations (SInDEX) that was initially developed at the Sim Kee Boon Institute of Financial Economics (SKBI) under the supervision of Dr Ghosh. Dr Ghosh would like to acknowledge the support of and numerous helpful discussions about this project with several colleagues at different institutions including Jun Yu, Ekkehart Boehmer, Roberto Mariano, Peter Philips, Anil Bera, Shurojit Chatterjee, Jeremy Goh, Melvyn Teo, Anthony Tay, John Sequeira, EPG, and seminar participants at SMU and The Conference Board. Dr Ghosh would like to acknowledge the funding from LKCSB, SMU through a research grant (grant approval number C207MSS14B004) from the Ministry of Education Academic Research Fund Tier 1. Dr Ghosh also acknowledges the funding for the data provided by SKBI in collaboration with MasterCard International, Agility Research and Strategy, besides able research assistance from Gin Nguyen.

Notwithstanding this, the number of inflation expectations surveys has increased around the world. The more notable surveys include the *Livingston Survey* of professional economists (conducted by the Federal Reserve Bank of Philadelphia), *Thomson Reuters/University of Michigan Surveys of Consumers* (the ‘Michigan Survey’), the Federal Reserve Bank of New York’s (FRBNY) *Household Inflation Expectations Project* (HIEP), the online FRBNY *Survey of Consumer Expectations* (SCE), the *Bank of England/GfK NOP Inflation Attitudes Survey*, and the European Commission’s *Business and Consumer Survey*. Most of these used questionnaires that include demographic, wage and price-related questions, and were sent to a wide cross-section of experts, individuals or households. We cannot understate the importance of the accuracy of such surveys. In the US context, it has been succinctly observed that:

“... The Federal Reserve needs reliable measures of expected inflation to formulate and gauge the thrust of monetary policy. In fact, inflation expectations have become more important to the Fed given the diminished stability of the link between the monetary aggregates and GDP expenditures since the early 1980s, and the greater role that has been thrust upon expected real short-term interest rates in the implementation of Federal Reserve policy.” (Thomas, 1999)

In Singapore, the Singapore Index of Inflation Expectations or SInDEx compiled by SMU (see for example, Ghosh and Yu, 2011) asks questions such as the following:

Based on your own opinions and what you have seen and heard, which of the following ranges best describe the 12-month ahead yearly overall inflation rate in Singapore?

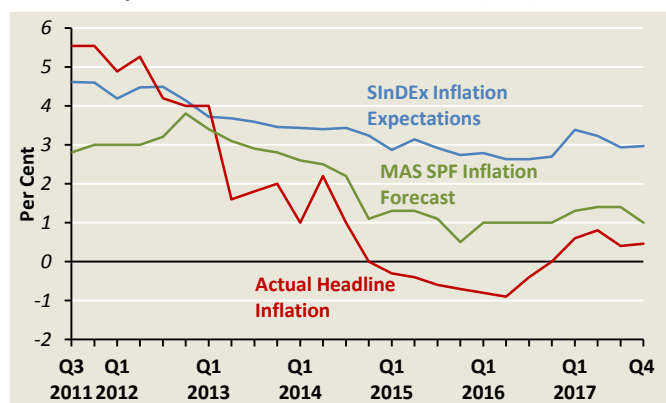
But there are reasons for caution in interpreting survey-based measures of inflation expectations. In both the US and Singapore, the median consumer inflation expectation is consistently higher than those from experts or macroeconomic models (Detmeister *et al.*, 2016). In the case of the SInDEx, for instance, there has been a non-trivial number of responses that could be characterised as ‘wild’, expecting inflation of more than 10% in a disinflationary period. When the data are examined subsequently, such predictions are typically not vindicated. (Chart 1)

There are two possible explanations for this phenomenon. Either consumers have predictable biases to their ‘true’ inflation expectations, or they do not give ‘true’ answers to inflation expectation questions. There have been a number of attempts to address this challenge. Some compare expectations to consumers’ estimates of past inflation. Others examine ‘turning points’ in consumer expectations, e.g., whether people predict that inflation is accelerating.

Our central hypothesis is that even if people behave as if they have sensible inflation expectations, the response they give when asked about inflation may not reflect this behaviour. Evidence from behavioural science also suggests that changing the questions used can create substantial differences in responses.

To understand the influence of cognitive biases on responses to the SInDEx with the aim of enhancing the survey, a collaborative project was undertaken by BIT and SMU, with support from EPG. This Feature describes two randomised experiments undertaken as part of the project, which assess whether asking people to estimate future prices leads to different answers compared to asking them about ‘inflation rates’.

Chart 1
Headline Inflation: Actual, SInDEx One-Year Ahead Expectations
and MAS Survey of Professional Forecasters (SPF) Median Forecast



Source: SInDEx

Note: For SInDEx and MAS SPF series, the horizontal axis corresponds to the period during which the survey was conducted.

Difficulties In Assessing Inflation Expectations

The first challenge with asking survey respondents about inflation is that many of them may not understand the term.

Suppose over the next 10 years the prices of the things you buy double. If your income also doubles, will you be able to buy less than you can buy today, the same as you can buy today, or more than you can buy today? [Answer options: less; the same; more; don't know; refuse to answer]

A global study found that only 50% of respondents could answer this question correctly (Klapper *et al.*, 2015). If half of the people who respond to inflation expectations surveys do not understand the question, then there is reason to doubt the reliability of their answers and to believe that the results are biased.

The second challenge is that question *framing* matters, as evidenced from a number of other contexts. A classic example is that of medical students being asked to make a hypothetical choice between radiation therapy and surgery. They were first presented with statistics on the effectiveness of each procedure. Researchers found that the students were much more likely to prefer radiation therapy when the statistics were framed as the percentage chance of immediate

death, as compared to the same statistics presented as percentage survival rate (McNeil *et al.*, 1982). Equally, survey respondents queried on how they spent a 2001 tax rebate in the US that was referred to as “withheld income” had dramatically different recollections of their expenditure than when the same rebate was referred to as “bonus income” (Epley *et al.*, 2006).

Similarly, when people make a numerical estimate, they are influenced by other numbers in their environment. This is known as *anchoring*. Sometimes anchors are relevant to the estimate—for example, when asked to make a donation to charity at their doorstep, people gave nearly three times more than when the request was accompanied by a suggested amount of \$20 (Fraser *et al.*, 1988). In other cases, they are not relevant at all. In one study, experimenters spun a wheel of fortune, which could land on 65 or 10. Participants were then asked to guess the percentage of African countries in the United Nations. Of course, none believed the two things were related, but when the wheel landed on 65, the average guess was 45%; when it landed on 10, it was 25% (Tversky and Kahneman, 1974).

Anchoring works because we begin with the presented figure, and then adjust—but we often adjust insufficiently (Epley and Gilovich, 2006). In

the question above, participants who started at 10 adjusted their estimate up, and those who started at 65 adjusted down, but both were ‘anchored’ to the initial figure. There is also evidence suggesting that these effects are more pronounced when the participant is more uncertain about the true figure (Mussweiler and Strack, 2000). Given that across the world, an average of only 50% of persons correctly answer a question about what inflation is, it is reasonable to assume that uncertainty on this topic is high.

In the case of a typical inflation question, much like the one used by the SInDEx above, providing

Experiment 1

Experiment 1 was a pilot survey run in October 2017, outside of the normal SInDEx schedule. Participants were recruited and remunerated in the same way as the previous SInDEx runs. This was used to test some initial theories and explore possible question formats.

Method

We ran a randomised experiment to compare the effects of differing question formats on stated inflation expectations. We randomised our sample of 400 participants into two groups. The control group was asked the usual questions relating to inflation in the normal SInDEx survey.

Our first hypothesis was that increasing the magnitude of the multiple choice answer set will lead to higher stated inflation expectations. To test this, we gave different sets of answer options to the control and treatment groups for the following question:

Based on your own opinions and what you have seen and heard, which of the following ranges best describe the 12-month ahead yearly overall inflation rate in Singapore?

answers as multiple choices could anchor responses—suggesting to the uncertain respondent that the middle choice is a ‘sensible’ answer (Benartzi and Lehrer, 2015).

If inflation expectations are subject to the influences above, we should be careful in the construction of our surveys as we may unwittingly influence respondents towards a certain response. This necessitates exploration of how different questions influence survey respondents’ stated inflation expectations—the intention of the joint study between BIT, SMU and EPG.

For the control group, the answer options were:

- *Less than 0%*
- *0% to less than 2%*
- *2% to less than 4%*
- *4% to less than 6%*
- *6% to less than 8%*
- *8% to less than 10%*
- *10% or more*
- *No idea*

For the treatment group, the answer options were:

- *Less than 0%*
- *0% to less than 6%*
- *6% to less than 12%*
- *12% to less than 18%*
- *18% to less than 24%*
- *24% to less than 30%*
- *30% or more*
- *No idea*

Our intention was to investigate whether people would be influenced to give higher inflation expectations when presented with options spanning a wider range. We compared the proportion of respondents expecting inflation of 6% or greater, which is taken to be the proportion of ‘wild’ responses given that Singapore has not experienced an inflation rate of 6% or more since the Global Financial Crisis.

Our second hypothesis was that respondents will give different answers if asked to forecast future prices in dollar terms, rather than in percentage rates of change.

The SInDEx normally asks for 1-year ahead and 5-year ahead expectations, for the following inflation measures:

- Headline;
- Singapore core, which excludes accommodation and private transport costs;
- International core, which excludes food and energy costs

Whilst the SInDEx asks for the two core measures directly, we wanted to explore a different approach where we presented free-text questions to the respondents in the treatment group asking for their forecasts for major CPI items in terms of absolute prices. We then carried out the necessary calculations to derive the forecasts for headline and core inflation. The hypothesis here is that people are better at answering questions about prices (in dollars) than price changes (in percentages).

Below we have listed what the average household in Singapore spent monthly on various items in 2016 and 2017. We want to know what you think buying the same items will cost in 12 months' time, November 2018.

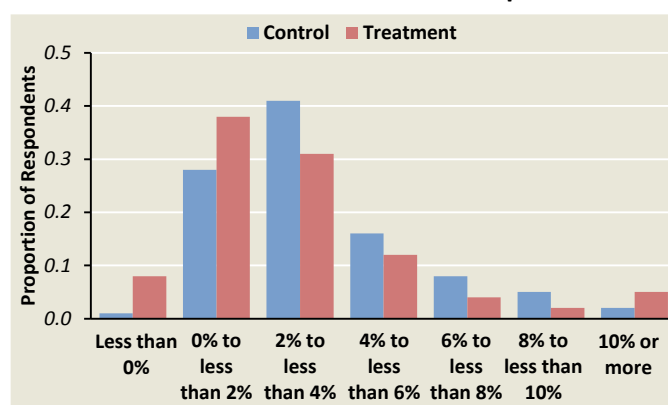
| Item | 2016 | 2017 | 2018 |
|-------------------|-----------|-----------|------|
| <i>e.g., Food</i> | \$1275.50 | \$1291.10 | ? |

We wanted to test if question formats that relied on absolute figures rather than percentage changes might change the distribution of answers. For example, past research has indicated that people may find absolute figures easier to process (Slovic *et al.*, 2000). This alternate question format was used to solicit both 1-year and 5-year ahead expectations.

Results

The results are consistent with our first hypothesis—respondents in the treatment group who were given the alternative multiple choice question format (with wider ranges of answers of up to 30% or more) were more than twice as likely to ‘expect’ inflation of above 6% (21% of respondents compared to 10% in the control group, $p < 0.05$). Our second hypothesis was also confirmed. Asking respondents to estimate actual future prices of goods in the CPI basket led to a different distribution of expected inflation rates compared to the direct results from the SInDEx questions in the control group ($p < 0.01$). (Chart 2)

Chart 2
Households' Core Inflation Expectations in Treatment and Control Groups



Experiment 2

Following the pilot survey, we ran an experimental survey alongside the SInDEX in December 2017. SInDEX usually recruits around 500 participants for each run, so we recruited an additional 500 for the experiment. As in Experiment 1, participants were recruited and remunerated in the same way as previous SInDEX surveys.

Method

The 1,000 participants were randomly allocated between a control group, doing the usual SInDEX survey, and a treatment group who were given a survey with a number of revisions and alterations.

Both groups were asked for their 1-year and 5-year ahead inflation expectations with multiple choices provided in percentage rates. However, as with Experiment 1, the revised survey for the treatment group also asked respondents to forecast actual prices of items in the CPI basket. Following the results from Experiment 1, we expected that the redesigned questions (asking in dollar terms and providing historical data as an ‘anchor’) should reduce the proportion of people with inflation expectations greater than 6%.

We also expected that if the same respondent is asked for inflation expectations in different ways, their responses could potentially be inconsistent.

In addition, we asked both groups to make hypothetical decisions that might be influenced by inflation—for example, whether to make an early repayment on a mortgage. This was intended as a consistency check on the responses, as accurately elicited inflation expectations should correlate with inflation hedging choices.

Finally, we asked the treatment group a set of standard financial literacy questions. We hypothesised that those who passed would be less likely to state inflation expectations of 6% or more.

Results

There was no statistically significant difference in the proportion of responses revealing inflation expectations that were greater than 6% between the treatment and control groups for the 1-year ahead forecasts ($p > 0.05$). However, we do see a difference in the 5-year ahead headline inflation forecasts ($p < 0.05$). (Chart 3)

We think the large difference between the treatment and control groups in the 5-year ahead expectations is explained by the unusually poor performance of the control survey results. Some participants could have misunderstood the question and answered what the total or cumulative (as opposed to annual) inflation rate will be over five years. That is, participants might have selected 6% or above to signify that prices in five years’ time would be 106% or more of current prices. Equally, the lower forecasts in the treatment survey could be because we averaged the stated 2022 dollar prices over the five intervening years at a constant rate, which might have artificially lowered the calculated responses.

When a respondent was asked about core inflation across the two different formats in the treatment survey with respect to absolute prices versus percentage price increases, their responses followed different distributions ($p < 0.05$, using a Kolmogorov-Smirnov test). This suggests that question format influences inflation expectation responses.

We did not detect a significant relationship between responses to our questions about inflation hedging behaviour and inflation expectations in either survey.

Finally, respondents who failed the financial literacy test were much more likely to give inflation expectations above 6% ($p < 0.05$). (Chart 4)

Chart 3
Proportion of Respondents who Responded
“More than 6%” in Treatment and Control Groups

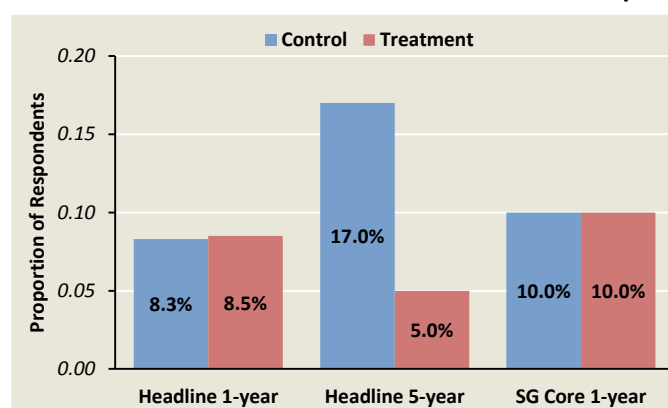
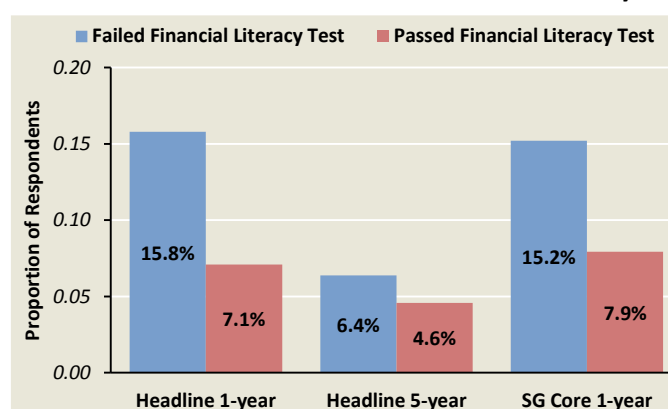


Chart 4
Proportion of Respondents who Responded “More than 6%”
based on their Performance in the Financial Literacy Test



Implications

Inflation expectations are challenging to measure—we cannot easily determine whether a response is ‘true’ or is the product of misunderstanding of the question or concept. This joint study has tried to apply a relatively new area of behavioural economics to an existing survey which has been refined over the years. Our results certainly demonstrate that changing question formats can lead to significantly different answers.

When we look at the median forecasts produced (using the standard SInDEX methodology), we do see pronounced differences. The 1-year ahead forecasts from the treatment surveys in both experiments were far lower than those of the control survey. However, we should be cautious

about drawing conclusions from this. The fact that these forecasts are closer to professional forecasts is not necessarily a sign of an improved question format—it could simply be that this format anchors respondents to lower forecasts overall.

As for the 5-year forecasts, our considered opinion is that the comparatively low median forecasts from the treatment survey in Experiment 2 is simply a combination of anchoring effects and the way we spread 5-year forecasts across all intervening years to estimate the respondent’s expectation. The 5-year forecasts for CPI is perhaps not a suitable question in surveys, particularly if we are interested to gauge the ‘animal spirits’ of

respondents, which might be better elicited through a simpler question about the perceived health of the economy.

It is very clear from the findings described above that the key bias influencing the formation of inflation expectations is anchoring, whereby consumers are influenced by immediately available information. The inclusion of financial literacy questions appears to effectively identify

those who are less able to answer questions on inflation, although whether this merits exclusion or reweighting of their responses requires further discussion.

Overall, our results support the hypothesis that stated inflation expectations are strongly influenced by question format, although they fail to indicate the most effective way to elicit expectations.

Recommendations

This Feature has highlighted and attempted to address the key issues on survey-based methods for measuring households' inflation expectations. We have attempted to mitigate the perceived biases in reported inflation expectations in the SInDEx survey by running experiments on the format and design of the questionnaire. In this concluding section, we highlight some recommendations for potential adoption in future surveys.

We first address the issues raised with regard to the questionnaire design. First, the respondents to the surveys may not be as well-informed as professional forecasters, whose expectations are routinely used by central banks. Hence, even with the same economic shocks and the absence of uncertainty in probability distributions, there would still be a certain degree of 'noise' in responses. Second, as an outcome of a fairly well-documented cognitive bias, providing only radio button-based numerical responses (as in many inflation surveys) may lead to a behavioural bias in responses. These issues can possibly be addressed by providing respondents with current information on inflation and other relevant macroeconomic variables, possibly presented in the form of charts, in conjunction with a free-text numerical response. This will help anchor responses and also evaluate the bias, if any, from these alternate formats. Lastly, we also need to address the questions posed regarding the behaviour/cognitive ability and, to a lesser extent, the professionalism of the respondents. This will help us to extract the 'signal' in the responses rather than the 'noise'.

In response to the findings of the report, we propose three main pathways to incorporate changes in the questions.

First, we need to evaluate the financial literacy or awareness of the respondents with respect to informed decision-making so as to shed some light on hedging behaviour, given future expected inflation. There was no definitive evidence that the inflation hedging questions used in this study were effective in eliciting further information over the financial literacy-type questions. However, to further investigate this, we propose to combine the inflation hedging questions with the financial literacy questions.

Second, there is always an element of speculation in how individuals form decisions. Do respondents look at the aggregate first before looking at components or vice versa? This is particularly important in reconciling certain aspects of the differences in the treatment and control groups in Experiment 2. We propose to look at individual component responses of (potentially) more 'accurate' respondents to investigate any persistent differences. This could be considered together with the finding that the treatment group had lower aggregate responses for overall inflation compared to the control group.

Finally, long-term inflation expectations were significantly lower in the treatment survey. While this could just be an anomaly, it can also be due to aggregating responses which were not well-informed or overly influenced by factors like

media attention. To address this last issue, we intend to provide more guidance through actual data, such as yields from CPF and/or Singapore Savings Bonds. This will serve the twin purpose of anchoring using a better benchmark, and providing respondents with the relevant information.

In summary, this is a study that was grounded in current research. However, as it is possibly also the first study of its kind straddling the disciplines of economics, finance and behavioural sciences, it should be viewed as a first and ongoing effort towards solving the nagging and hitherto open and challenging problem of measuring inflation expectations through public perception.

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