

Exposure to frequent price changes shapes inflation expectations

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Policymakers seek to manage inflation expectations, but we understand little about how households form and update their expectations of inflation. The column tests Lucas's conjecture that the price changes households observe, rather than all price changes, drive expectations. A measure of individual household consumption weighted by the frequency of purchase is a statistically and economically significant driver of households' expectations. This challenges the modelling assumptions that central bank policymakers currently make.

For monetary policy, when interest rates are low the management of inflation expectations takes centre stage (Coibion et al. 2018). In conventional times, policymakers presume that inflation expectations are well anchored, and move interest rates so that their changes in nominal rates translate fully into changes in perceived real interest rates (the Fisher equation). Changes in perceived real interest rates, in turn, affect firm and household consumption, savings, investment, and pricing decisions.

But when nominal interest rates cannot be lowered due to the effective lower bound, and when quantitative easing has reached its limits, the direct management of household inflation expectations is the last resort of policymakers to lower perceived real interest rates.

So it is important to manage inflation expectations directly. As Janet Yellen wrote while she was chairing the Federal Reserve:

"With nominal short-term interest rates at or close to their effective lower bound [...], the broader question of how expectations are formed has taken on heightened importance. [...] Many central banks [...] are adopting policies that are directly aimed at influencing expectations of future interest rates and inflation." (Yellen 2016).

But the surprising variation in inflation expectations across households with similar characteristics (Armantier et al. 2017) shows how little we understand of the processes through which households form and update their expectations of inflation. A natural conjecture, which dates back to at least Lucas (1975), is that the price changes households observe, and to which they are exposed in their own consumption bundles, might shape inflation perceptions and expectations. Lucas describes individuals as populating different islands, on which they focus on the prices they observe to form expectations about the aggregate price level:

"[T]he history of prices [...], observed by an individual is his source of information on the current state of the economy and of the market i in which he currently finds himself; equivalently, this history is his source of information on future price." (Lucas 1975)

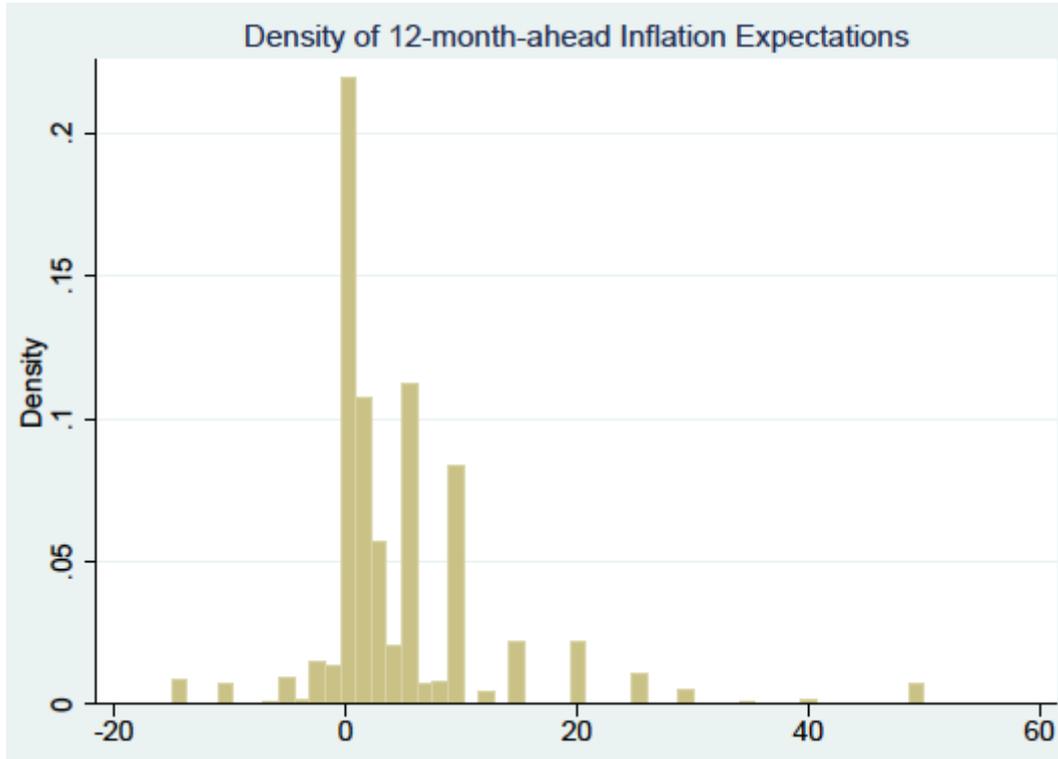
Survey evidence for Lucas's conjecture

Building on this, we have tested the hypothesis that households' differential exposure to grocery price changes might help us understand the stark differences in inflation

expectations we observe in the data (D’Acunto et al. 2019). We used a large representative panel of 60,000 Americans for which, for the first time, we were able to observe both a large set of expectations, as well as detailed grocery bundles at the individual level.

Consistent with the earlier US evidence, inflation expectations at the individual level were upward-biased, dispersed, and rounded towards multiples of five (Figure 1).

Figure 1 Distribution of individuals’ numerical inflation expectations

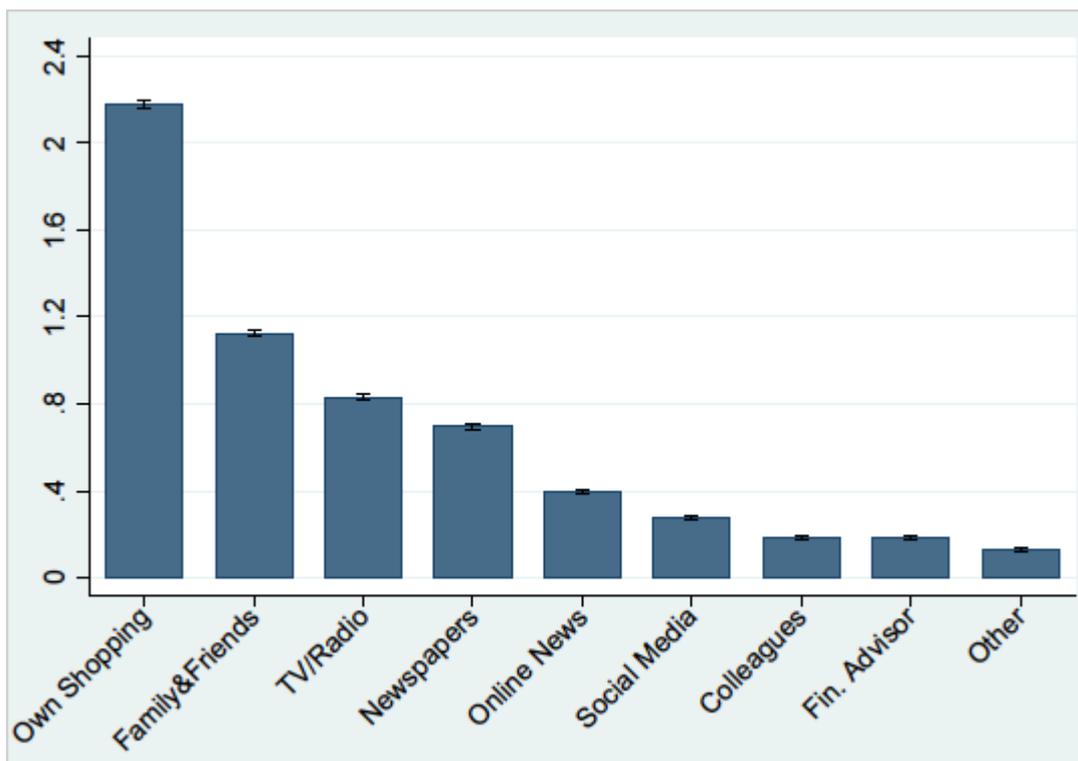


Source: D’Acunto et al. (2019).

Figure 1 shows that individuals’ expectations deviate substantially from the benchmark of full information rational expectations, even though this is the assumption of almost all models used by central banks around the world when designing and evaluating policy.

Lucas did not aim to provide a literal description of reality, but his assumption triggered a debate about its logical consistency and realism. Critics argued that consumers could easily access aggregate inflation statistics and that no empirical support for this assumption existed in field data. Yet, when we fielded our survey and asked households how they formed inflation expectations, a majority cited the price changes observed while grocery shopping as the most important source of information (Figure 2).

Figure 2 Relative importance of sources of information when forming inflation expectations



Source: D'Acunto et al. (2019).

Kaplan and Schuhlhofer-Wohl (2017) showed that households differed significantly in the grocery prices they paid, despite similar consumption bundles, generating an interquartile range of realised inflation between 6.2% to 9.0%. In the language of Lucas, the price signals consumers observed on their islands varied dramatically, even though they ate the same fruits.

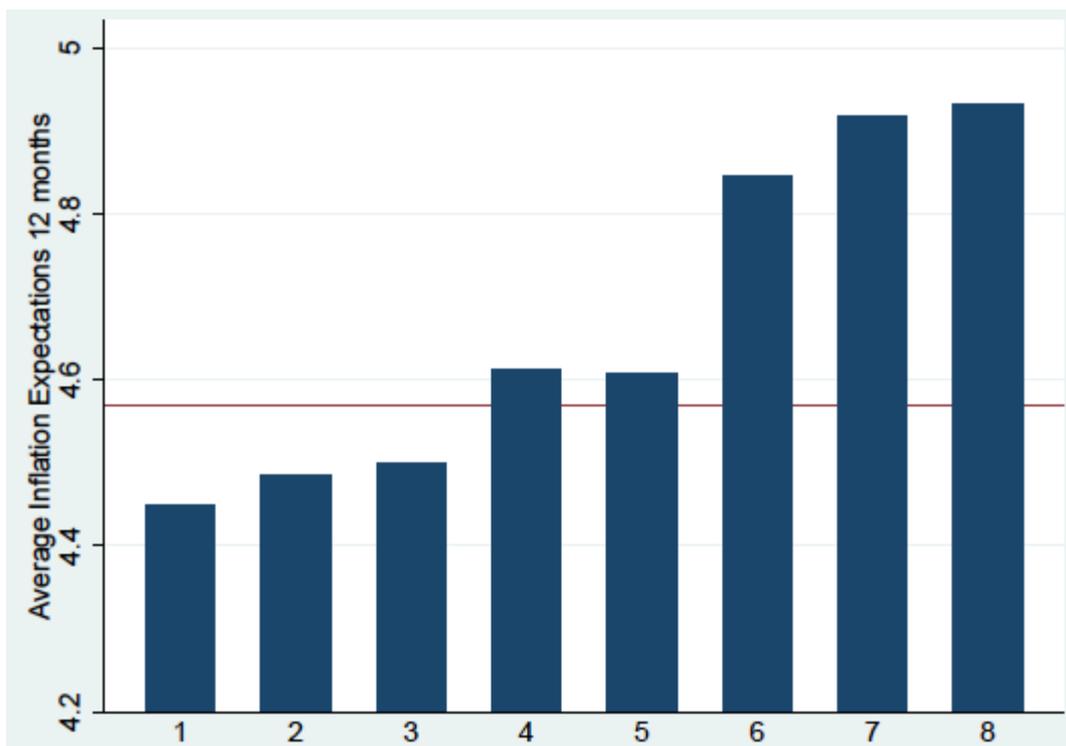
If personal price changes are relevant when we form expectations, those expectations should vary substantially in the cross-section. And, indeed, the average interquartile range in one-year-ahead expected inflation in the Michigan Survey of Consumers is 3.8% since 1999. Many respondents report inflation expectations as high as 50% and as low as -30% (Bachmann et al. 2014).

A direct test of the hypothesis: Household CPI

We constructed two measures. We called the first measure of observed household-level price changes the 'Household CPI'. It was constructed like the Consumer Price Index (CPI), but for each household's non-durable consumption basket instead of a representative consumption basket. We found that the Household CPI was a significant predictor of 12-month-ahead inflation expectations.

For example, when we averaged expected inflation within eight equal-sized bins of Household CPI (Figure 3), the range from the lowest to the highest Household CPI bin was associated with a 0.5 percentage point difference in expected inflation, which is economically important given that the inflation rate was around 1% in the same period.

Figure 3 Relationship between personal inflation and inflation expectations



Source: D’Acunto et al. (2019).

These results held when we conditioned on a rich set of demographics. Previous research has associated inflation expectations and consumption choices with individual-level time-invariant characteristics, such as cognitive abilities or sophistication (D’Acunto et al 2019 b, c, d). But within-individual analyses across the two survey waves also confirmed our baseline results, and so these characteristics cannot explain our findings.

Why do consumers make use of grocery-price changes when forming inflation expectations? One possibility is that individuals face cognitive constraints when gathering information about overall inflation. They rely on the price changes in their daily lives as the cheapest source of information. Alternatively, individuals may form beliefs relying on processes that differ from the standard rational-inattention framework, and hence call for enriching such a framework to explain the facts. For instance, research in cognitive psychology documents that frequent stimuli affect perceptual learning, irrespective of individuals' attention to such stimuli. In this context, Georganas et al. (2014) have provided laboratory evidence that, when forming expectations, individuals give more weight to price changes to which they are exposed frequently.

A direct test of the hypothesis: Frequency CPI

Motivated by this evidence, we constructed a second, frequency-based measure of household-level inflation that we called the 'Frequency CPI'. We used the frequency of purchases in the base period to weigh shopping price changes (in the Household CPI, we weighed expenditure shares).

The positive association between inflation expectations and the Frequency CPI was 20%-40% larger than the association with the Household CPI. Adding both the Household CPI and the Frequency CPI as independent variables in the same specification, the coefficient associated with Household CPI is zero and loses statistical significance. The statistical and economic significance of the Frequency CPI barely changes.

Real outcomes

Earlier research has shown that our outcome variable, the cross-sectional variation of inflation expectations, is economically important because it is associated with other expectations and real outcomes in a way that is consistent with economic theory. Malmendier and Nagel (2015) and Armona et al. (2019) have shown this for housing and mortgage choices, and D’Acunto et al. (2016) for consumption and saving decisions. We expanded this evidence to other outcomes:

- Consumers whose inflation expectations were higher also had higher wage and house-price inflation expectations.
- Real outcomes related to household inflation expectations. Consumers with higher inflation expectations held larger (fixed-rate) mortgages. Conditional on holding any investments, consumers with higher inflation expectations also invested more in real assets such as real estate, whose value is less affected by inflation. Based on the logic of the Euler equation, consumers with higher inflation expectations should also save less, which we confirmed in the data.

The influence of grocery shopping on expectation formation is particularly striking because the inflation index on which US policymakers mainly focus, the Core Consumer Price Index, does not include grocery prices. The rationale for the exclusion of food (and energy) prices is that those categories are particularly volatile, reflect supply shocks that are unrelated to trend changes in the economy's overall price level, and tend to reverse quickly. Motley (1997) and others have questioned this rationale, arguing that short-run movements contain useful information about incipient inflation. Our findings suggest another reason why economists and policymakers might focus more on non-core inflation: it offers insights into households' actual expectations-formation process.

Our results also challenge the premise of inflation-targeting and expectations-management policies as implemented in the US and abroad (Del Negro et al. 2012, D’Acunto et al. 2019a). Some US policymakers have recognised that the focus on core inflation of a representative consumption bundle might lead to policy mistakes. For instance, according to James Bullard, president of the St. Louis Federal Reserve:

“With trips to [...] the grocery store being some of the most frequent shopping experiences for many Americans, it is hardly helpful for the Fed credibility to appear to exclude all those prices from consideration in the formation of monetary policy.” (Schnurr 2011)

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