We introduce a simple, robust, and principled measure of uncertainty in survey histograms

Motivation

- Growing interest in determinants and consequences of economic uncertainty.
- Research benefits from recent data sets on consumers’ probabilistic forecasts, like Survey of Consumer Expectations (SCE).

Goal of this paper: Propose a new measure of expectation uncertainty.

Stylized Facts on Response Behavior

- Many consumers use only one or two bins (see Figure 2). The latter behavior is rare for professional forecasters (e.g., SPF).
- Similarly, use of outer bins more common among consumers than among professionals.
- Response behavior correlated to socio-demographic characteristics.

Our Proposal

Quantify uncertainty via the entropy function of the Ranked Probability Score (RPS):

\[ \text{RPS}(p, k) = \sum_{j=1}^{K} p(j) \log \left( \frac{p(j)}{p(k)} \right) \]

where \( p(j) \) is the cumulative probability of the \( j \)th bin, \( p(k) \) is the cumulative probability of the \( k \)th bin, and \( K \) is the number of bins.

Advantages:
- Simple; robust; theoretical motivation via entropy function; no assumptions needed.

Simulation Evidence

We validate the RPS via two simulation studies:
- Both the RPS and the measure by Engelberg et al. (2009) are robust across various sets of histogram bin definitions.
- The RPS is robust to small changes in the probabilities. Standard deviation \( \sigma \) obtained from Engelberg et al. (2009) approach is not.

Empirical Evidence

Figure 1: Probabilistic expectations of inflation (Survey of Consumer Expectations, December 2017 wave)

Figure 2: Number of bins used for different variables. Sample: Jan, Dec 2017 of SCE.

Figure 3: For each variable and month the figure shows the mean ERPS obtained from Engelberg et al. (2009) approach is not.

Figure 4: Subjective uncertainty across socio-demographic groups. Sample: Jan, 2014; Dec, 2017 of SCE.