Measuring Macroeconomic Expectations and Their Causal Effects

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Motivation I

- **Expectations** play a central role in economics.

- Therefore it is important to understand...
  - how households and firms **form** expectations.
  - how expectations **causally** affect household and firm behavior.

- To shed light on these questions we need a **toolkit** to...
  - measure **expectations** about economic variables.
  - **exogenously vary expectations and attention** to provide causal evidence.

Goal of this lecture

- Provide you with an overview of **state-of-the-art survey methods** to...

  - measure expectations.

  - exogenously manipulate expectations.

Outline of talk

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Measuring Expectations
  Standard elicitation techniques: the toolkit
  Examples

Information treatments
  Attention versus information
  Mitigating anchoring and demand effects
  Exciting areas of for future research

Standard elicitation techniques: the toolkit

An example

- Example: say you are interested in respondents' beliefs about US inflation over the next year.

- How would you measure that belief?

- What considerations would you have on your mind when deciding on the right measure?

Design considerations

- Who are the participants?
  - What is their background knowledge? Do they know how inflation is defined?
  - Key issue: which features of the prediction problem do participants pay attention to?
  - How much heterogeneity in cognitive abilities will there be in your sample?

- What is your research question?
  - What **models** do you want to speak to?
  - Is your research question focused on **measurement** or **causal effects**?

- Precise questions are great as they are conducive to increasing **interpersonal comparability** and as they **map more closely to models**.

Four types of broad elicitation techniques

- Qualitative questions (likert scale)

- Quantitative point beliefs

- Probabilistic elicitations

- Qualitative open-ended questions (lecture 2)

Qualitative beliefs I

- Example: say you are interested in respondents' inflation expectationsbigskip
- You could ask people a simple qualitative question: how likely is it that the inflation rate will be higher than today in 12 months from now? (Very unlikely, unlikely, likely, very likely)

Qualitative beliefs II

- **Advantage**: the response options do not require any quantitative skills and therefore should be easy to understand.

- **Disadvantages**:
    1. Response options are not easily interpersonally comparable.
    2. People might hold systematically different beliefs about what the question means.
    3. Verbal response scales are relatively crude and therefore limit the extent of information that can be conveyed.

Quantitative beliefs I

- Respondents are asked to state their beliefs on **a numerical scale**.

- What do you think the US inflation rate (in %) will be over the next 12 months?

- It's good practice to ask a qualitative question about confidence in beliefs. E.g. How confident are you in your previous estimate? (Very confident, confident, not confident, not confident at all)

Quantitative beliefs II

Your forecast for the future

Recall that, in previous years, the US inflation rate has mostly varied between 1.5% and 2.5%. Recently, however, the inflation rate has increased. It is now at 6.8%.

What do you think the US inflation rate (in %) will be over the next 12 months?

[   ] %

How confident are you in the above prediction?
Please answer on a scale from 1 (Not confident at all) to 6 (Very confident).

Not confident at all					Very confident
1	2	3	4	5	6
○	○	○	○	○	○

→

What are the **advantages/disadvantages** of this approach?

Quantitative beliefs III

- Advantage: Interpersonal comparability and relatively straightforward for respondents to understand.

- Clear disadvantages:
  - Do not allow for individuals to express their **uncertainty** about outcomes.
  - It is unclear which feature of their subjective belief distribution over potential future outcomes respondents report.
    - While researchers often implicitly or explicitly interpret point beliefs as the mean over the respondent's subjective distribution, **respondents may report their median or mode belief**.

Probabilistic beliefs I

- In probabilistic belief elicitation, respondents **state probabilities for the occurrence of different mutually exclusive events**.

- You elicit the entire distribution, not just a point estimate

- Partition the possible values into bins, e.g. inflation decreases between 0 and 5 percent, inflation increases between 0 and 5 percent, inflation increases between, 5 and 10 percent, etc.

Probabilistic beliefs II: example

Your forecasts for the future

Recall that, in previous years, the US inflation rate has mostly varied between 1.5% and 2.5%. Recently, however, the inflation rate has increased. It is now at 6.2%.

Next, we would like you to think about the different things that may happen to inflation **over the next 12 months**. We realize that this question may take a little more time. **In your view, what would you say is the percent chance that, over the next 12 months...**

(Please note: The numbers need to add up to 100%.)

The rate of inflation will be 12% or higher.	0	%
The rate of inflation will be between 8% and 12%.	0	%
The rate of inflation will be between 4% and 8%.	0	%
The rate of inflation will be between 2% and 4%.	0	%
The rate of inflation will be between 0% and 2%.	0	%
The rate of deflation (the opposite of inflation) will be between 0% and 2%.	0	%
The rate of deflation (the opposite of inflation) will be between 2% and 4%.	0	%
The rate of deflation (the opposite of inflation) will be between 4% and 8%.	0	%
The rate of deflation (the opposite of inflation) will be between 8% and 12%.	0	%
The rate of deflation (the opposite of inflation) will be 12% or higher.	0	%
Total	0	%

Probabilistic beliefs III: increasing comprehension

- Increasing comprehension of elicitation

- Then endow respondent with 100 balls / points that they can allocate to different bins to express their relative confidence

- Ideally use a **visual tool** to make the procedure more intuitive and graphically represent pdf

Probabilistic beliefs: Visual tool
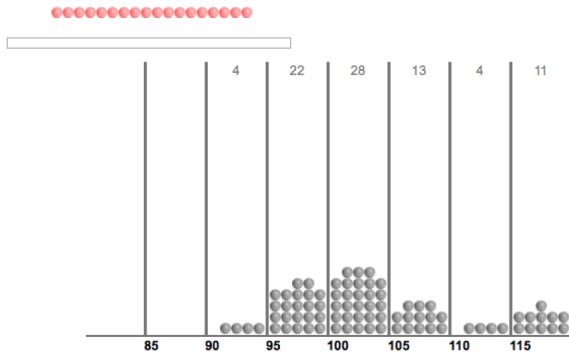
Common problems I

- Problem with eliciting beliefs in surveys:

- We model people's beliefs as well-defined subjective probability distributions

- But **many people do not hold well-defined probability distributions**!
  - Focal point responses (50:50)
  - Internally inconsistent and highly volatile answers

Common problems II

- Ket take-aways for survey design:

    - **Not overburdening** participants with excessively complex questions

    - ... even if this comes at the cost of **sacrificing some "rigor"** from the viewpoint of economic models

    - Using **intuitive elicitation formats**

    - Assessing the extent to which responses reflect **genuine beliefs** rather than confusion

Examples

Measuring disagreement in expectations: Firms
Coibion, O., Gorodnichenko, Y., & Kumar, S. (2018)

- New survey of firms' macroeconomic beliefs in New Zealand.
- Despite nearly twenty-five years under an inflation targeting regime, there is widespread dispersion in firms' beliefs about both past and future macroeconomic conditions, especially inflation
- Beliefs about recent and past inflation being much higher than those of professional forecasters

*Panel A: Errors about Different Macroeconomic Variables*
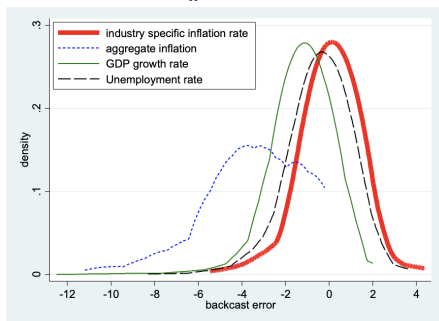
Measuring Uncertainty of firms

Bachmann, R., Carstensen, K., Lautenbacher, S., & Schneider, M. (2024)

- Top managers provide a forecast of one-quarter-ahead sales growth, but also for **best and worst case sales growth scenarios**.
- **New measure of uncertainty**: Difference between best and worst case sales growth rates (span).
- Higher subjective uncertainty when the firm experiences **unusual growth**, and more so if the experience is **negative**

Figure 3: Uncertainty and past sales growth
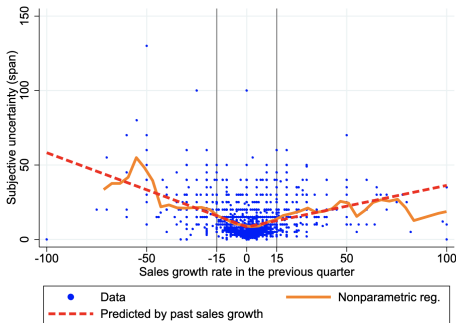
Questions?

Outline of talk

Information treatments

Information provision experiments I

- Correlation between beliefs and behavior is confounded for several reasons:

  - **Reverse causality** (e.g. induced by motivated beliefs)
    - E.g. people who just bought a house want to believe that house prices will further increase.

  - **Omitted variable bias** (e.g. character traits)
    - E.g. people with optimistic personality traits have both optimistic beliefs about future income and a low savings rate.

  - **Measurement error** in beliefs
    - People make errors in probabilistic belief elicitations.

Information provision experiments II

- To get **causal estimates** of beliefs on behavior researchers provide respondents with information.

- Standard design proceeds as follows:

  1. Measure **prior beliefs** about the variable of interest (e.g. likelihood of a recession in 2022).

  2. Researchers provide treatment group with information (e.g. forecast about likelihood of a recession in 2022 from a professional forecaster) and a control group with no information
     - In active control designs respondents receive **different pieces of information** in the different treatment groups.

  3. Measure behavior of interest (e.g. consumption behavior).

  4. Measure post-treatment beliefs (e.g. personal income expectations).

Learning about Macro variables

Coibion, O., Gorodnichenko, Y., & Kumar, S. (2018)

Study learning in response to information about macroeconomic variables.

Figure 6. Forecast Updating by Firms upon Receiving New Information.
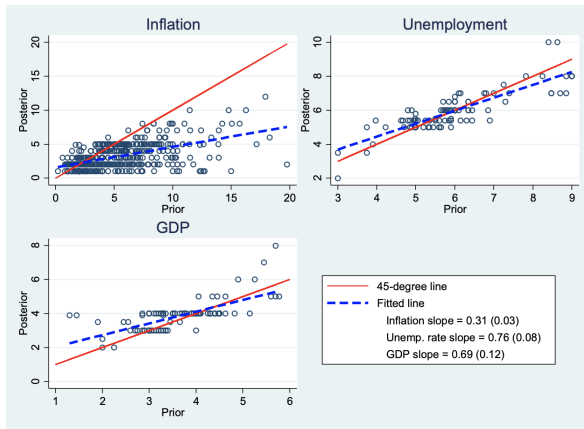
Patterns consistent with Bayesian learning.

The effect of macroeconomic uncertainty on spending
Coibion, O., Georgarakos, D., Gorodnichenko, Y., Kenny, G., & Weber, M. (2024)

- Provide different types of information about the first and/or second moments of future economic growth.
- This generates exogenous changes in perceived macroeconomic uncertainty.
- Employ an IV approach to study the causal effect of perceived uncertainty on spending.

Table 4. Effects of 1st and 2nd moments for expected growth rate of EA GDP on nondurable consumption.

	One month after treatment (October 2020)	Four months after treatment (January 2021)
	(1)	(2)
Posterior: mean	-0.82	-0.26
	(0.52)	(0.49)
Posterior: uncertainty	-4.61**	-4.51**
	(2.23)	(2.25)

Questions?

Attention versus information

Disentangling information from attention

- One key challenge in information experiments is to disentangle the effects of **priming/attention** from **genuine belief updating**.

- Common methods to **mitigate concerns about priming** include

  1. eliciting **prior beliefs** of respondents in both the treatment and the control group

  2. separate the information provision from the main outcomes with **follow-up studies**, and

  3. to include an **active control group** (that is, the control group also receives (differential) information).
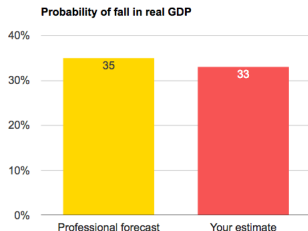
Active control group: An example
Roth & Wohlfart, 2020

Information about the likelihood of a recession:

Advantages of active control group designs
Haaland, Roth & Wohlfart, 2023

- In a design with a pure control group the variation hinges on prior beliefs. The identification mostly comes from **individuals with larger misperceptions** ex ante.
  - An active control group design generates variation in the relevant belief also among individuals with more accurate priors.

- Receiving an information treatment may have side effects, such as **uncertainty reduction, attention, and emotional responses**.
  - Such side effects should arguably be constant across groups that receive different pieces of information.

- Prior beliefs are **measured with error** and correlated with unobservables.
  - Thus, **causal identification** and the interpretation of heterogeneous treatment effects are more difficult in pure control designs.

Advantages of pure control designs
Haaland, Roth & Wohlfart, 2023

- Having a pure control group makes it easier to interpret correlations between the pre-treatment beliefs and the outcome of interest.

- Sometimes the **policy relevant question of interest** is concerned with the effect of providing a particular piece of information compared to not providing this information.
  - How do people change their inflation expectations when they hear about central bank communication (Coibion et al., 2020)?

- Sometimes it is not possible to have an active control group without **deceiving** respondents

Cross-learning
Haaland, Roth & Wohlfart, 2023

- Respondents may not only update beliefs about the object of interest, but at the same time change their beliefs about other variables.
  - **?** find that provision of information about inflation not only changes respondents' inflation expectations but also their beliefs about GDP growth.

- Cross-learning can complicate the interpretation of instrumental variables (IV) estimates exploiting randomized information provision.

- In the presence of substantial cross-learning it is **less straightforward to interpret the effects of information on behavior through the lens of belief changes**.

Dealing with cross-learning:
Chopra, Roth and Wohlfart, 2024

- Chopra et al. (2024) study the causal effect of expert forecasts about future home price growth on households' spending decisions, as measured in Nielsen Scanner data.

- Concern: respondents may learn about variables other than home prices (e.g. inflation, own income, etc).

- Mitigation strategy:
  - They provide respondents in all treatment groups with the same forecast about future inflation.
  - To detect cross-learning, they measure expectations about other variables in a follow-up survey.
  - In a follow-up experiment, they try to minimize concerns about cross-learning by fixing narratives behind the expert forecasts.

Mitigating anchoring and demand effects

Mitigating anchoring and demand effects I

- Information treatments are an important tool to get at **causality**.

- However, they may have **undesirable side effects**: demand and anchoring effects.

- The next few slides are about the **mitigation** of these undesirable side effects.

Mitigating anchoring and demand effects II

- Best practices to mitigate concerns about **numerical anchoring**:

  1. Measuring a quantitative beliefs on a **scale that differs from the scale on which the information is communicated**.

  2. One should also employ **qualitative measures of beliefs**, which are naturally immune to numerical anchoring.

  3. **Follow-up surveys**, conducted a few weeks after the initial information intervention, are an important tool used to mitigate concerns about numerical anchoring.
     - Numerical anchoring is a **short-lived phenomenon**.

Mitigating anchoring and demand effects III

- **Obfuscation in experiments**
  - Hiding the purpose of the experiment.

- Obfuscated follow-ups (Haaland and Roth, 2020, 2021)

- Obfuscated information treatment
  - Giving a cover story for the treatment information

Mitigating anchoring and demand effects IV

- **Only administer the information treatment in baseline survey** and do not collect any of the main outcome variables.
  - E.g. give different professional forecasts about the future unemployment rate.

- Survey company reinvites respondents a few weeks later to a **seemingly unrelated survey**, in which the main outcomes (e.g. consumption behavior in the last week) is collected.
  - Use **different survey layouts**
  - Mention only the affiliation of a subset of different researchers involved in each wave (study from Uni Bergen vs. study from U Cologne).
  - Ask a series of **unrelated questions**.

Linking information treatments to hard outcomes
Coibion, O., Gorodnichenko, Y., & Weber, M. (2022)

- Nielsen Homescanner data linked to information treatments
  - Provide eight different forms of information regarding inflation.

- Higher inflation expectations lead to a rise in the actual monthly spending of households, **as measured in the Nielsen scanner**.

Table 8: Effect of Inflation Expectations on Spending Decisions.

	Actual spending, horizon, month	
Dep. var. is indicated in the title of the panel	1st follow-up wave	2nd follow-up wave
	(1)	(2)
Panel A. Total Spending, survey		
Posterior inflation expectations	1.826***	1.015
	(0.690)	(0.638)
Observations	6,459	6,570
R-squared	0.414	0.414
1st stage F-stat	46.97	60.06
Panel B. Total Spending, scanner		
Posterior inflation expectations	0.950***	0.864**
	(0.286)	(0.336)
Observations	13,170	13,132
R-squared	0.751	0.696
1st stage F-stat	134.8	128.1

Take-aways

- Be aware of challenges when measuring beliefs.

- Design your surveys and experiments to minimize confounds, such as demand effects or cross-learning.

- Important to be aware of cognitive foundations of expectation formation.

Exciting areas of for future research

Exciting areas of research: Emotions

- **Emotions and expectation formation**
  - Gorodnichenko et al. (2023) use NLP techniques to study the emotions conveyed by the voice of the Fed charman.
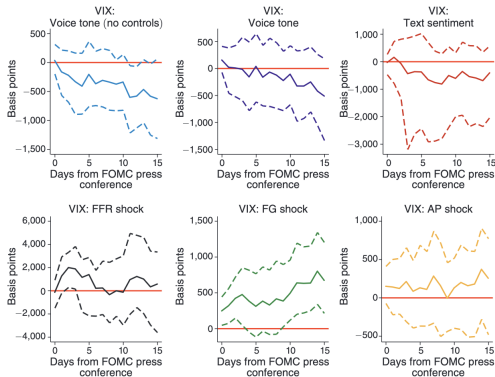

FIGURE 4. RESPONSE OF VIX (CBOE VOLATILITY INDEX) TO POLICY ACTIONS AND MESSAGES

- Surprisingly little work on measuring **consumer sentiment or economic anxieties**.

Exciting areas: Perceived Uncertainty and firm decisions
Kumar, S., Gorodnichenko, Y., & Coibion, O. (2023)

- Provide information about the first and/or second moments of future economic growth to generate exogenous changes in the perceived macroeconomic uncertainty

Table 3. Effects of Uncertainty on Firm Decisions relative to Plans

	Price	Employment	Capital stock	Wages	Advert. budget	R&D budget	Profit margin
	Dependent variable: Change relative to plan						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Posterior mean	-0.06***	-0.08	-0.02	-0.01	0.04	0.02**	-0.06***
	(0.02)	(0.10)	(0.02)	(0.01)	(0.02)	(0.01)	(0.02)
Posterior uncertainty	-0.11***	-0.62***	-0.07***	0.00	0.11***	0.00	0.01**
	(0.01)	(0.04)	(0.01)	(0.00)	(0.01)	(0.00)	(0.00)
Observations	2,020	2,020	2,020	2,020	2,020	2,020	2,020
R-squared	0.38	0.25	0.26	0.00	0.14	0.00	0.01
1st stage F stat: post. mean	438.2	438.2	438.2	438.2	438.2	438.2	438.2
1st stage F stat: post. var	437.8	437.8	437.8	437.8	437.8	437.8	437.8

Questions?