

# Households' Beliefs

## Advancing Macro Finance Workshop

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# Outline

How do **households** form **beliefs**, for example about **income** and **house prices**, and what are the **implications**?

1. What are beliefs? How to measure them?
2. What determines beliefs empirically? (empirics)
3. Which is the right model of belief formation? (theory)
4. How do beliefs affect outcomes? (positive implications)
5. How should beliefs shape policy? (normative implications)

# What Are Beliefs?

What are beliefs?  $\pi_t^i(s^\tau)$

- ▶ (Individual) perceptions over future values of relevant variables

$$x_t^i(s^t) = f(\text{future variables})$$

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What are beliefs?  $\pi_t^i(s^\tau)$

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$$x_t^i(s^t) = f(\text{future variables})$$

- ▶ Future variables may be endogenous
- ▶ Complicated infinite dimensional objects
  - ▶ Means, variances, covariances, tails, ...
  - ▶ Expectations may be enough (or not)
- ▶ Full cross-section of individual beliefs matters
- ▶ **Theoretical frameworks are necessary**

# Which Beliefs Are Relevant for Households?

- ▶ Which beliefs are most relevant for households?
  1. **House prices**
  2. **Income** (e.g. unemployment risk)
  3. Financial asset returns: stocks, bonds, ...
  4. Inflation
  5. Others
    - ▶ Human capital
    - ▶ Longevity risk

# Beliefs and Outcomes

- ▶ How has the literature studied the role of beliefs?

**“Environment”**  $\xRightarrow{(1)}$  **Beliefs**  $\xRightarrow{(2)}$  **Outcomes**

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- ▶ Some papers focus on (1): belief formation
- ▶ Other papers focus on (2): beliefs as primitives
- ▶ **Nothing wrong with some “division of labor”**
  - ▶ As long as results can be easily connected

# How to Measure Beliefs?

1. **Surveys** (direct measurement of subjective beliefs)
  - ▶ NY Fed Survey of Consumer Expectations (from Dec 2012)
    - ▶ Housing Survey, Household Spending, Labor Market, ...
  - ▶ Michigan Survey of Consumers
  - ▶ Other central bank surveys (e.g. Bundesbank)
2. **Revealed preference** (from individual choices or equilibrium outcomes, e.g., demands, prices, volume, etc.)
  - ▶ (Observe) Outcomes  $\implies$  (Recover) Beliefs



# Surveys vs. Revealed Preference

- ▶ **Survey data shown to be helpful**
  - ▶ Provides time series and cross-sectional facts
  - ▶ Caveats:
    - ▶ Do individuals understand the questions? Panel structure alleviate these problems
    - ▶ Often limited to simple questions

# Surveys vs. Revealed Preference

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  - ▶ Caveats:
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    - ▶ Often limited to simple questions
- ▶ **Revealed preference approach lagging**
  - ▶ Maybe better individual data can help?
  - ▶ Insurance literature exploits choices of insurance plans
    - ▶ Can a similar approach recover house price beliefs?
  - ▶ Work on recovering heterogeneous beliefs in betting
    - ▶ Gandhi and Serrano-Padial (2015)
  - ▶ Which particular instruments would reveal relevant information for house price or income expectations?
    - ▶ e.g. TIPS+Nominal Treasuries  $\Rightarrow$  Break-even inflation
    - ▶ e.g. Options  $\Rightarrow$  Implied volatility
- ▶ **Remark:** quantitative work calibrated to fit belief dynamics implicitly uses a revealed preference approach

# NY Fed SCE

## Home price change expectations

One-year ahead

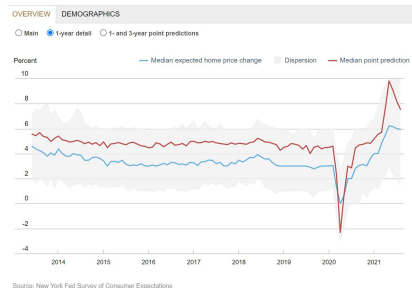
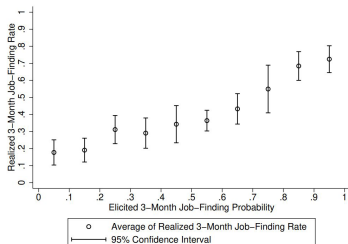


Figure 2: Averages of Realized Job-Finding Rates, by Bins of Elicited Probabilities (SCE)



Notes: The figure shows a binned scatter plot with the average realized job-finding rates shown for different bins of elicited job-finding probabilities. The job-finding rates are at the three-month horizon. Survey weights are used for averages, and the sample is restricted to unemployed workers in the SCE, ages 20-65, and includes only interviews that were followed by three consecutive monthly interviews.

- ▶ Left figure from NY Fed SCE
- ▶ Right figure from Mueller, Spinnewijn, Topa, AER 2021

# Belief Shifters

- ▶ How to avoid measuring beliefs directly?
  - ▶ **Beliefs shifters**: instead of measuring  $f(\cdot)$  in

$$\text{beliefs} = f(\text{environment}),$$

let's understand

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- ▶ **Experiments** (feed beliefs to individuals; field and lab)
- ▶ Examples:
  - ▶ Bontan/Perez-Truglia (2020): field experiment shifting beliefs
    - ▶ Contact individuals who recently listed a property
    - ▶ Randomize non-deceptive information to create exogenous shocks to their home price expectations.
    - ▶  $\uparrow$  1pp expectation causes 2.44 pp  $\downarrow$  in probability of selling the home within six months
  - ▶ Armona/Fuster/Zafar (2019): information experiment
    - ▶ Measure individual expectations over local house prices
    - ▶ Feed information
    - ▶ Remeasure individual expectations

# What Determines Beliefs Empirically?

- ▶ Individual beliefs seem to be shaped by individual environment
1. **Extrapolation** from (recent or not so recent) experiences
    - ▶ Case/Shiller (2003) measure expected future home price growth, finding evidence consistent with extrapolation
    - ▶ Vissing-Jorgensen (2003); Cogley/Sargent (2008); Greenwood/Shleifer (2014): stock returns
    - ▶ Malmendier/Nagel (2011): inflation
    - ▶ Kuchler/Zafar (2019): individual experiences determine beliefs over aggregate house prices
  2. **Social connections**
    - ▶ Bailey/Cao/Kuchler/Stroebel (2018): experiences of friends, via social connections, determine beliefs
  3. **Socioeconomic status**
    - ▶ Das/Kuhnen/Nagel (2019): higher SES people are more optimistic about the macro-economy, but in recessions this expectations gap narrows
  4. **Tenure status**
    - ▶ Kindermann/LeBlanc/Piazzesi/Schneider (2021): renters and owners update beliefs about rents and house prices differently

# What Determines Beliefs Empirically? Looking Forward

- ▶ **Individual conditions shape individual beliefs**
- ▶ There are still open questions about specific mechanisms
  - ▶ Lack of unified framework
  - ▶ Do we have a sense of the **quantitative** importance of each of the mechanisms?
  - ▶ Do the conclusions of surveys/experiments extend well to other contexts? External validity

# Which Is the Right Model of Belief Formation? RE Benchmark

- ▶ Benchmark: (full-information) **Rational Expectations**
  - ▶ RE sidestep belief formation process
  - ▶ What Sargent would call the “*communism of RE*”
    - ▶ Model, agent, god all share the same belief
  - ▶ Very useful at eliminating free parameters
- ▶ **Empirical evidence inconsistent with RE**
  - ▶ It is not enough to show that individual experiences affect beliefs
  - ▶ Extrapolation may be rational
- ▶ **Is the RE model a straw man?**



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- ▶ **Rational/Bayesian learning**
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- ▶ **Behavioral learning** (some examples)
  - ▶ Extrapolative expectations: Metzler (1940), Glaeser/Nathanson (2017)
  - ▶ Adaptive expectations: Fisher (1911), Friedman (1950)
  - ▶ Overconfidence: Scheinkman/Xiong (2003), Eyster/Rabin/Vayanos (2018)
  - ▶ Natural expectations: Fuster/Laibson/Mendel (2010)
  - ▶ Diagnostic expectations Bordalo/Shleifer/Vishny (2018/19)
  - ▶ Social dynamics: Burnside/Eichenbaum/Rebelo (2011)
- ▶ **Too much of a good thing?**

# Which Is the Right Model of Belief Formation? Looking Forward

- ▶ Which theory does a better job at explaining existing evidence?
- ▶ Can we distinguish between different models/theories?
  - ▶ Full information vs dispersed information
  - ▶ Rational vs behavioral
  - ▶ Information sets

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- ▶ Tension between
  - i) microfoundations
  - ii) tractability/parsimony
  - iii) empirical fit
- ▶ If the empirical literature describes well the mapping “environment  $\Rightarrow$  beliefs”, can we skip the theory of belief formation?
  - ▶ Not really: Lucas critique

# How Do Beliefs Affect Individual Outcomes?

- ▶ Direct evidence already partially discussed
  - ▶ Stock market participation/Portfolio composition: Malmendier/Nagel (2011)
  - ▶ House purchase decision: Bailey/Cao/Kuchler/Stroebel (2018)
  - ▶ Renting vs owning: Kindermann/LeBlanc/Piazzesi/Schneider (2021)
  - ▶ Leverage decisions: Bailey/Davila/Kuchler/Stroebel (2019)
  - ▶ Mortgage choice: Malmendier/Nagel (2016)
- ▶ Beliefs determine households' balance sheets (*Anthony*)

# How Do Beliefs Affect Aggregate Outcomes?

- ▶ Uniform changes in beliefs can affect aggregates
  - ▶ e.g. in representative agent models
- ▶ But belief **heterogeneity** (cross-section of beliefs) critically important for aggregates
  - ▶ Via frictions/constraints (*Adam*)

Individual Beliefs  $\implies$  Belief Heterogeneity  $\xRightarrow{\text{Frictions}}$  Outcomes

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- ▶ Theoretical/quantitative work
  - ▶ **House prices** (boom-bust cycles): Glaeser/Nathanson (2014); Landvoigt (2017); Kaplan/Mitman/Violante (2020); Chodorow-Reich/Guren/McQuade (2021)
  - ▶ **Leverage cycles**: Geanakoplos (2010), Simsek (2013)
  - ▶ **Aggregate demand**: Caballero/Simsek (2020)
  - ▶ **Volume**: DeFusco/Nathanson/Zwick (2020)

# How Do Beliefs Affect Aggregate Outcomes?

- ▶ Frictions and beliefs interact non-trivially
- ▶ **Short sales:** belief dispersion can create overvaluation with short-sale constraints
  - ▶ Miller (1977), Scheinkman/Xiong (2003)
  - ▶ Similar effects with other limits to arbitrage
- ▶ **Credit constraints:** belief differences between borrowers and lenders determine equilibrium leverage
  - ▶ Geanakoplos (2010), Simsek (2013), Bailey/Davila/Kuchler/Stroebele (2019)
  - ▶ Lender's beliefs may be more important than households' beliefs – Baron/Xiong (2017)
  - ▶ Feedback between investment and leverage
- ▶ **Search frictions:** prices driven by beliefs of transacting agents
  - ▶ Piazzesi/Schneider (2009), Guren (2018)



# How Do Beliefs Affect Aggregate Outcomes?

- ▶ Broad takeaways
  - ▶ Frictions can amplify role of beliefs (but not always)
  - ▶ Environment matters: same change in beliefs may have different implications depending on economic conditions
  - ▶ Small amount of belief dispersion may have a large impact on aggregates
- ▶ **Scope to provide sharp tests of the theories**

# How Should Beliefs Shape Policy?

**“Environment”**  $\xRightarrow{(1)}$  **Beliefs**  $\xRightarrow{(2)}$  **Outcomes**  $\xRightarrow{(3)}$  **Welfare**

- ▶ What are the normative implications of households' beliefs?

# How Should Beliefs Shape Policy?

“Environment”  $\xRightarrow{(1)}$  Beliefs  $\xRightarrow{(2)}$  Outcomes  $\xRightarrow{(3)}$  Welfare

- ▶ What are the normative implications of households' beliefs?
- ▶ Non-trivial policy objective: two possibilities
  1. **Non-paternalistic approach**
    - ▶ Rationale for intervention comes from different frictions
    - ▶ Beliefs only matter through other frictions
  2. **Paternalistic approach**
    - ▶ Incorrect beliefs provide rationale for intervention
    - ▶ Brunnermeier/Simsek/Xiong 2014, Spinnewijn 2015, Davila 2015, Blume/Cogley/Easley/Sargent/Tsyrennikov 2018, Caballero/Simsek 2020, Davila/Walther 2021

# How Should Beliefs Shape Policy? Looking Forward

- ▶ Many open questions
  - ▶ Who should be regulated? Households? Lenders? Both?
  - ▶ Do normative conclusions hinge on the exact model of how investors form beliefs?
  - ▶ Should a policy-maker provide information to households?
    - ▶ Systematically? With discretion?
    - ▶ Should different households receive different information?
- ▶ Some of these issues studied in the context of inflation and monetary policy
  - ▶ Not so much on house prices/income etc.
  - ▶ Not so much with individual belief heterogeneity
- ▶ **Welfare analysis only makes sense in well-accepted environments**

# Conclusion

- ▶ Individual beliefs are a function of individual experiences
  - ▶ Growing survey evidence supporting this view
  - ▶ Lack of unified framework to model belief formation
- ▶ Beliefs affect individual and aggregate outcomes
  - ▶ Aggregate implications of beliefs are sensitive to frictions
- ▶ There is scope to think hard about policy