# Are Stated Expectations Actual Beliefs? New Evidence for the Beliefs Channel of Investment Demand

Haoyang Liu
Federal Reserve Bank of New York

Christopher Palmer
MIT and NBER

July 2020

# Believe what I say or what I do?

- Explosion of research on beliefs in macrofinance (including real estate)
- Growing interest in role of expectation formation and heterogeneity

- Measure actions alone?
  $\Rightarrow$ can't separately identify role of beliefs, preferences, and constraints
- Measure expectations alone?
  $\Rightarrow$ don't know dynamics of expectations or mapping to choices

- Solution: track both expectations and decisions

$\rightarrow$ Relaxes rational expectations but takes stated expectations as given

# How useful are surveyed expectations?

- But do **stated** beliefs reflect **actual** beliefs used in investment decisions?

# How useful are surveyed expectations?

- But do **stated** beliefs reflect **actual** beliefs used in investment decisions?

Maybe Yes...

- Stated expectations ⇒ Investment
- Armantier et al. (2015) Armona et al. (2018) Giglio et al. (2020) ...
- Large structural lit combines stated expectations and actions
- Demand for university real estate center involvement

# How useful are surveyed expectations?

- But do **stated** beliefs reflect **actual** beliefs used in investment decisions?

Maybe Yes...

- Stated expectations ⇒ Investment
- Armantier et al. (2015) Armona et al. (2018) Giglio et al. (2020) ...
- Large structural lit combines stated expectations and actions
- Demand for university real estate center involvement

Maybe No...

- Rounding (Dominitz & Manski 1997)
- Level- vs. change-framing effects
- Cognitive psych lit on numerical representation
- Beliefs vs. preferences (Cochrane 2011)
- Weak empirical correlation between investment and beliefs

# Mapping from expectations $\mapsto$ choices not foregone conclusion

"There has, nevertheless, been awareness that the willingness and ability of respondents to report probabilistic expectations does not imply that persons regularly think probabilistically and use subjective probability distributions to make decisions. It has long been known that survey respondents are willing and able to respond to questions seeking point predictions of uncertain events or verbal assessments of likelihood. Yet **persons need not use point predictions or verbal assessments of likelihood to make decisions**."

-Manski (2018, *NBER Macroeconomics Annual*)

# Where we come in

1. **Stated** beliefs don't fully capture **actual** expectations used in decision making

# Where we come in

1. **Stated** beliefs don't fully capture **actual** expectations used in decision making
2. Some stated beliefs factors also have *independent* effects on investment

# Where we come in

1. **Stated** beliefs don't fully capture **actual** expectations used in decision making
2. Some stated beliefs factors also have *independent* effects on investment
3. We focus on past returns given extrapolation and momentum in real estate prices

# Where we come in

1. **Stated** beliefs don't fully capture **actual** expectations used in decision making
2. Some stated beliefs factors also have *independent* effects on investment
3. We focus on past returns given extrapolation and momentum in real estate prices
4. Perceived past returns improve investment predictions even conditional on stated beliefs (using Survey of Consumer Expectations housing module)

# Where we come in

1. **Stated** beliefs don't fully capture **actual** expectations used in decision making
2. Some stated beliefs factors also have *independent* effects on investment
3. We focus on past returns given extrapolation and momentum in real estate prices
4. Perceived past returns improve investment predictions even conditional on stated beliefs (using Survey of Consumer Expectations housing module)
5. Robust to accounting for risk aversion, demand correlates, measurement error, multicollinearity, misspecification, etc.

# Where we come in

1. **Stated** beliefs don't fully capture **actual** expectations used in decision making
2. Some stated beliefs factors also have *independent* effects on investment
3. We focus on past returns given extrapolation and momentum in real estate prices
4. Perceived past returns improve investment predictions even conditional on stated beliefs (using Survey of Consumer Expectations housing module)
5. Robust to accounting for risk aversion, demand correlates, measurement error, multicollinearity, misspecification, etc.
6. Consistent with model of cognitive uncertainty extended to allow for risk aversion

# Theory has no independent role for $\hat{r}_{t-1}$

Simplest asset allocation model: single risky asset with normally distributed return, share $\phi$

$$\phi = \frac{\hat{E}_t[r_{t+1}] - R_f}{\alpha \hat{\sigma}_t^2}$$

# Theory has no independent role for $\hat{r}_{t-1}$

Simplest asset allocation model: single risky asset with normally distributed return, share $\phi$

$$\phi = \frac{\hat{E}_t[r_{t+1}] - R_f}{\alpha \hat{\sigma}_t^2}$$

- Factor such as perceived past returns $\hat{r}_{t-1}$ could affect $\phi$ through $\hat{E}_t[r_{t+1}]$, $\hat{\sigma}_t$, and $\alpha$.

# Theory has no independent role for $\hat{r}_{t-1}$

Simplest asset allocation model: single risky asset with normally distributed return, share $\phi$

$$\phi = \frac{\hat{E}_t[r_{t+1}] - R_f}{\alpha \hat{\sigma}_t^2}$$

- Factor such as perceived past returns $\hat{r}_{t-1}$ could affect $\phi$ through $\hat{E}_t[r_{t+1}]$, $\hat{\sigma}_t$, and $\alpha$.

$\rightarrow$ After flexibly controlling for $\hat{E}_t[r_{t+1}]$, $\hat{\sigma}_t$, and $\alpha$, belief factors like $\hat{r}_{t-1}$ do not enter $\phi$.

# Theory has no independent role for $\hat{r}_{t-1}$

Simplest asset allocation model: single risky asset with normally distributed return, share $\phi$

$$\phi = \frac{\hat{E}_t[r_{t+1}] - R_f}{\alpha \hat{\sigma}_t^2}$$

- Factor such as perceived past returns $\hat{r}_{t-1}$ could affect $\phi$ through $\hat{E}_t[r_{t+1}]$, $\hat{\sigma}_t$, and $\alpha$.

$\rightarrow$ After flexibly controlling for $\hat{E}_t[r_{t+1}]$, $\hat{\sigma}_t$, and $\alpha$, belief factors like $\hat{r}_{t-1}$ do not enter $\phi$.

- Contrast: we show $\hat{r}_{t-1}$ important predictor of $\phi$ even conditional on these factors.
- Empirics support interpreting $\hat{r}_{t-1}$ as another component of beliefs channel.

# Usual approach to beliefs channel

$$\phi = \frac{\hat{E}_t[r_{t+1}] - R_f}{\alpha \hat{\sigma}_t^2}$$

Because $\hat{E}_t[r_{t+1}]$ and $\hat{\sigma}_t$ are treated as sufficient statistics for past info, typical expectation paper features "divide-and-conquer" approach:

- Stage 1. Expectation Formation:

$$\hat{r}_{t-1}, X, Z... \Rightarrow \hat{E}_t[r_{t+1}]$$

- Stage 2. Expectations Affecting Behavior:

$$\hat{E}_t[r_{t+1}] \textbf{ (without } \hat{r}_{t-1}, ...) \Rightarrow \text{behavior } (\phi)$$

# Usual approach to beliefs channel

$$\phi = \frac{\hat{E}_t[r_{t+1}] - R_f}{\alpha \hat{\sigma}_t^2}$$

Because $\hat{E}_t[r_{t+1}]$ and $\hat{\sigma}_t$ are treated as sufficient statistics for past info, typical expectation paper features "divide-and-conquer" approach:

- Stage 1. Expectation Formation:

$$\hat{r}_{t-1}, X, Z... \Rightarrow \hat{E}_t[r_{t+1}]$$

- Stage 2. Expectations Affecting Behavior:

$$\hat{E}_t[r_{t+1}] \textbf{ (without } \hat{r}_{t-1}, ...) \Rightarrow \text{behavior } (\phi)$$

$\rightarrow$ Contrast: we show $\hat{r}_{t-1}$ not fully incorporated into $\hat{E}_t[r_{t+1}]$; still matters in Stage 2.

# Aside: focus on past returns especially in housing market

- Theory: nothing particularly special about past returns.
- However, plausible and measurable factor in expectations formation, especially given that:

  **(a)** Momentum important feature of housing market price dynamics
  (Glaeser et al. 2014, DeFusco et al. 2017, Guren 2018)

  **(b)** Strong role for extrapolative beliefs
  (Piazzesi Schneider 2009, Glaeser Nathanson 2017, Armona et al. 2018)

  **(c)** Literature on personal experience effects (e.g., Malmendier Nagel 2011)

- Our data: past returns affect forecasted returns with coefficient ~0.22

# Puzzle: Expectations Effect $\ll$ Experience Effect

Evidence for stated expectations $\Rightarrow$ investment: statistically significant but magnitude small

Example: Giglio et al. (2020)

- 1 p.p. increase in *expected* return $\Rightarrow$ 0.8 p.p. higher equity share
- "...one order of magnitude smaller than implied by standard model..."

# Puzzle: Expectations Effect $\ll$ Experience Effect

Evidence for stated expectations $\Rightarrow$ investment: statistically significant but magnitude small

Example: Giglio et al. (2020)

- 1 p.p. increase in *expected* return $\Rightarrow$ 0.8 p.p. higher equity share
- "...one order of magnitude smaller than implied by standard model..."

Past experience $\Rightarrow$ behavior: Larger magnitude.

- Malmendier Nagel (2011) $+1$ p.p. in *experienced* stock return $\Rightarrow$ $+1.7$ p.p. equity share

# Puzzle: Expectations Effect $\ll$ Experience Effect

Evidence for stated expectations $\Rightarrow$ investment: statistically significant but magnitude small

Example: Giglio et al. (2020)

- 1 p.p. increase in *expected* return $\Rightarrow$ 0.8 p.p. higher equity share
- "...one order of magnitude smaller than implied by standard model..."

Past experience $\Rightarrow$ behavior: Larger magnitude.

- Malmendier Nagel (2011) $+1$ p.p. in *experienced* stock return $\Rightarrow$ $+1.7$ p.p. equity share

If we believe Past experience $\Rightarrow$ Stated expectation $\Rightarrow$ Behavior...

...reconciling magnitudes requires extreme ($> 2$) extrapolation...

# Puzzle: Expectations Effect $\ll$ Experience Effect

Evidence for stated expectations $\Rightarrow$ investment: statistically significant but magnitude small

Example: Giglio et al. (2020)

- 1 p.p. increase in *expected* return $\Rightarrow$ 0.8 p.p. higher equity share
- "...one order of magnitude smaller than implied by standard model..."

Past experience $\Rightarrow$ behavior: Larger magnitude.

- Malmendier Nagel (2011) $+1$ p.p. in *experienced* stock return $\Rightarrow$ $+1.7$ p.p. equity share

If we believe Past experience $\Rightarrow$ Stated expectation $\Rightarrow$ Behavior...

...reconciling magnitudes requires extreme ($> 2$) extrapolation... but MN find $\sim$0.62.

# Puzzle: Expectations Effect $\ll$ Experience Effect

Evidence for stated expectations $\Rightarrow$ investment: statistically significant but magnitude small

Example: Giglio et al. (2020)

- 1 p.p. increase in *expected* return $\Rightarrow$ 0.8 p.p. higher equity share
- "...one order of magnitude smaller than implied by standard model..."

Past experience $\Rightarrow$ behavior: Larger magnitude.

- Malmendier Nagel (2011) $+1$ p.p. in *experienced* stock return $\Rightarrow$ $+1.7$ p.p. equity share

If we believe Past experience $\Rightarrow$ Stated expectation $\Rightarrow$ Behavior...

...reconciling magnitudes requires extreme ($> 2$) extrapolation... but MN find ~0.62.

$\rightarrow$ Solution: maybe past experience directly affects investment, too (bypassing stated beliefs)

# Explanation? Cognitive Uncertainty + Risk Aversion

Enke and Graeber (2020)

- People respond to cognitive noise ("cognitive uncertainty") and shrink their beliefs towards "mental defaults"
- Stress response triggered by complex situations to revert to default

- We extend model to allow for risk aversion when facing decisions with real stakes
- Example: shrinking investment allocation towards 50:50 split between risky and risk-free

→ Our context: last year's returns are a mental default on which investors base investments

# Cognitive uncertainty in our context: $\hat{r}_{t-1}$ serves as a mental anchor

- When asked about home price forecast, the investor uses all available information

$$\hat{E}[r_{t+1}] = \beta_r \hat{r}_{t-1} + \beta_{GDP} \hat{E}[GDP] + \beta_{rent} \hat{E}[\text{rent growth}] + \cdots = 11\%$$

# Cognitive uncertainty in our context: $\hat{r}_{t-1}$ serves as a mental anchor

- When asked about home price forecast, the investor uses all available information

$$\hat{E}[r_{t+1}] = \beta_r \hat{r}_{t-1} + \beta_{GDP} \hat{E}[GDP] + \beta_{rent} \hat{E}[\text{rent growth}] + \cdots = 11\%$$

- But when actually making an investment choice, she kicks the tires on that forecast.
- Key: $\hat{r}_{t-1}$ feels relatively salient and certain and the investor doesn't discount it.

# Cognitive uncertainty in our context: $\hat{r}_{t-1}$ serves as a mental anchor

- When asked about home price forecast, the investor uses all available information

$$\hat{E}[r_{t+1}] = \beta_r \hat{r}_{t-1} + \beta_{GDP} \hat{E}[GDP] + \beta_{rent} \hat{E}[\text{rent growth}] + \cdots = 11\%$$

- But when actually making an investment choice, she kicks the tires on that forecast.
- Key: $\hat{r}_{t-1}$ feels relatively salient and certain and the investor doesn't discount it.

*What do I know about GDP? Why 11% and not 8% or 15%?*
*After all, I'm pretty sure last year's returns were 5%...*

# Cognitive uncertainty in our context: $\hat{r}_{t-1}$ serves as a mental anchor

- When asked about home price forecast, the investor uses all available information

$$\hat{E}[r_{t+1}] = \beta_r \hat{r}_{t-1} + \beta_{GDP}\hat{E}[GDP] + \beta_{rent}\hat{E}[\text{rent growth}] + \cdots = 11\%$$

- But when actually making an investment choice, she kicks the tires on that forecast.
- Key: $\hat{r}_{t-1}$ feels relatively salient and certain and the investor doesn't discount it.

*What do I know about GDP? Why 11% and not 8% or 15%?*
*After all, I'm pretty sure last year's returns were 5%...*

$\Rightarrow$ Discounts other signals, shrinks her 11% forecast towards 5%, and bases decisions on 7%

# Empirically checking for cognitive uncertainty behavior

- Stated forecast

$$\hat{E}[r_{t+1}] = \beta_r \hat{r}_{t-1} + \beta_{GDP} \hat{E}[GDP] + \beta_{rent} \hat{E}[\text{rent growth}] + \cdots$$

- Actual expectations used in investment decision

$$\tilde{E}[r_{t+1}] = \tilde{\beta}_r \hat{r}_{t-1} + \tilde{\beta}_{GDP} \hat{E}[GDP] + \tilde{\beta}_{rent} \hat{E}[\text{rent growth}] + \cdots$$

$\tilde{\beta}_r > \beta_r$, $\tilde{\beta}_{GDP} < \beta_{GDP}$, $\tilde{\beta}_{rent} < \beta_{rent}$ $\cdots$

# Empirically checking for cognitive uncertainty behavior

- Stated forecast

$$\hat{E}[r_{t+1}] = \beta_r \hat{r}_{t-1} + \beta_{GDP} \hat{E}[GDP] + \beta_{rent} \hat{E}[\text{rent growth}] + \cdots$$

- Actual expectations used in investment decision

$$\tilde{E}[r_{t+1}] = \tilde{\beta}_r \hat{r}_{t-1} + \tilde{\beta}_{GDP} \hat{E}[GDP] + \tilde{\beta}_{rent} \hat{E}[\text{rent growth}] + \cdots$$

$\tilde{\beta}_r > \beta_r$, $\tilde{\beta}_{GDP} < \beta_{GDP}$, $\tilde{\beta}_{rent} < \beta_{rent}$ $\cdots$

**PS** Why not use $\tilde{\beta}$ when stating returns? $\hat{E}[r_{t+1}]$ a better predictor of $r_{t+1}$ than $\tilde{E}[r_{t+1}]$!

# Roadmap

1. **Data and Descriptive Evidence**
2. Regression Evidence on Beliefs and Investment Decision Making
3. Direct Measure of Decision Factors
4. Conclusion

# Data and Descriptive Evidence

# Survey Questions: Perception and Expectation of Home Prices

Housing module of the NY Fed Survey of Consumer Expectations: 2015-2020

- **Perceived** home price growth in local zip code over **past** 12 months
- **Expected** home price growth in local zip code over **next** 12 months
- Demographic variables: age, education, income, liquid savings, married, homeownership, race, gender, numeracy, census region, urban or rural
- Risk tolerance measure

# Investment Experiment

Consider a situation where you have to decide how to invest $1,000 for one year. You can choose between two possible investments.

The first is a fund that invests in your local housing market, and pays an annual return equal to the growth in home prices in your area. The second is a savings account that pays **2%** of interest per year.

What proportion of the $1,000 would you invest in:

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

| | | |
|---|---|---|
| The housing market fund | | % |
| The savings account | | % |
| **TOTAL** | 0 | |

# Can we trust this hypothetical investment measure?

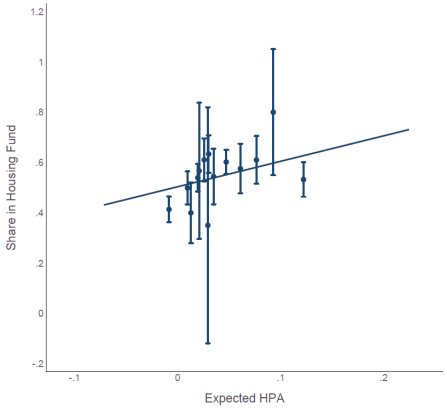
- Without real stakes, how externally valid is this measure?
- Armona Fuster Zafar (2018) allow some respondents chance at receiving gross return of their own constructed fund
- See also "proper scoring rules" literature
  (Shuford, Albert, and Massengill 1966, Savage 1971, Armantier et al. 2015)
- Results robust to using only the incentivized subsample

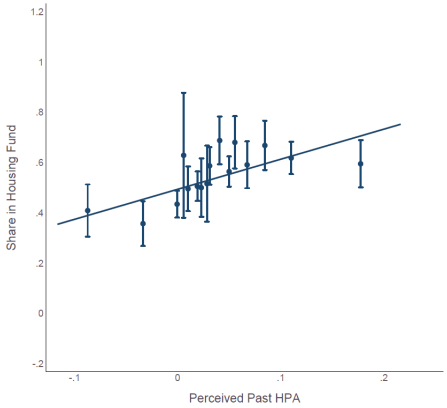
# Other Survey Measures of Investment

- Probability of buying an **investment** property within the next 3 years.
- Probability of moving within the next 3 years
  $\hookrightarrow$ If Pr(moving) $\geq$ 5% we ask Pr(**owning** conditional on moving)
- View housing as a good investment (1-5 scale)

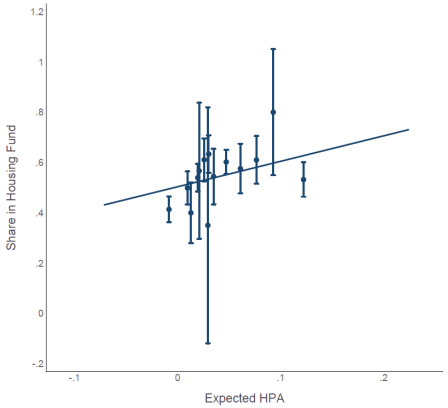
$\rightarrow$ Theoretical prediction: ceteris paribus, higher beliefs $\Rightarrow \uparrow$ Pr(invest)

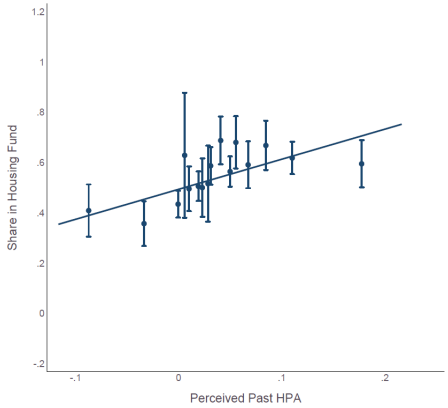
# Perceived past returns better predict investment than do stated forecasts



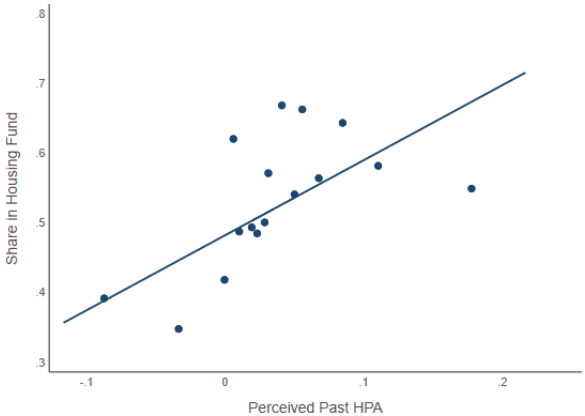
# Perceived past returns better predict investment than do stated forecasts




- Slopes for expected HPA and perceived past HPA about the same
- Statistical relationship between investment and past HPA stronger

# Controlling for forecasted HPA, past HPA still has significant slope




→ Controlling for expected HPA does not reduce slope for past HPA

# What's to say $\hat{r}_{t-1}$ effect is about beliefs? Alternative Explanations

$$\phi = \frac{\hat{E}_t[r_{t+1}] - R_f}{\alpha \hat{\sigma}_t^2}$$

1. $r_{t-1}$ correlated with *distribution* of expected returns $(\hat{\sigma}_t^2)$
2. $r_{t-1}$ correlated with risk aversion $(\alpha)$
3. Correlated with omitted demand factors
4. Multicollinearity between $\hat{E}_t[r_{t+1}]$ and $\hat{r}_{t-1}$
5. Measurement error in survey stated expectations

# Regression Evidence

# Demographics as Omitted Demand Factors

$$Y_{it} = \alpha + \beta_1 \hat{r}_{it-1} + \beta_2 \hat{E}_t[r_{it+1}] + X_i'\phi + \varepsilon_i$$

- $Y_{i,t}$ is an investment outcome of interest.
- $\hat{r}_{i,t-1}$ is respondent $i$'s perception of home price growth over the last 12 months.
- $\hat{E}_t[r_{i,t+1}]$ is respondent $i$'s expected home-price growth over the next 12 months.
- $X_i$ is a rich set of demographic controls (age, education, income, liquid savings, married, homeownership, race, gender, numeracy, census region, urban or rural)

# $\hat{r}_{i,t-1}$ predicts investment better than $\hat{E}_t[r_{i,t+1}]$

| Dependent Variable: Share in a Housing Fund (2015 Experiment) | | | | | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| $\hat{E}_t[r_{i,t+1}]$ | 1.00*** | | 0.44 | 0.81*** | | 0.41 |
| | (0.29) | | (0.31) | (0.29) | | (0.30) |
| $\hat{r}_{i,t-1}$ | | 1.18*** | 1.06*** | | 0.93*** | 0.83*** |
| | | (0.20) | (0.22) | | (0.21) | (0.22) |
| Demographics | | | | X | X | X |
| Observations | 1012 | 1012 | 1012 | 1012 | 1012 | 1012 |
| R-Squared | 0.01 | 0.03 | 0.04 | 0.12 | 0.13 | 0.13 |

# But than just mean expected returns should matter...

Alternative story:

- $\hat{r}_{t-1} \Rightarrow$ Downside risk $\Rightarrow$ Behavior.
- Importance of $\hat{r}_{t-1}$ could be driven by investors' consideration of downside risk.

# But than just mean expected returns should matter...

Alternative story:

- $\hat{r}_{t-1} \Rightarrow$ Downside risk $\Rightarrow$ Behavior.
- Importance of $\hat{r}_{t-1}$ could be driven by investors' consideration of downside risk.
- Inspired by (Engelberg Manski Williams 2009), SCE collects belief probabilities:
  - $\Pr(HPA > 10\%)$
  - $\Pr(0\% < HPA \leq 10\%)$
  - $\Pr(-5\% < HPA \leq 0\%)$
  - $\Pr(HPA \leq -5\%)$

# Robustness to Controlling for the Forecasted Distribution of Returns

| Dependent Variable: Share in a Housing Fund (2015 Experiment) | | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| $\hat{E}_t[r_{i,t+1}]$ | 0.20 | 0.17 | 0.13 | -0.27 |
| | (0.30) | (0.31) | (0.31) | (0.54) |
| $\hat{r}_{i,t-1}$ | 0.75*** | 0.74*** | 0.66*** | 0.83** |
| | (0.22) | (0.22) | (0.22) | (0.37) |
| Pr(HP Decreases) | -0.12*** | | | |
| | (0.04) | | | |
| Sample | Full | Full | Full | Disaster=0 |
| Probabilities | | X | | |
| Probabilities Cubic | | | X | X |
| Demographics | X | X | X | X |
| Observations | 1012 | 1012 | 1012 | 447 |
| R-Squared | 0.137 | 0.138 | 0.150 | 0.192 |

# Results Robust to Controlling for Risk Tolerance

| Dependent Variable: Share in a Housing Fund (2015 Experiment) | | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Risk Tolerance (1-10) | 3.38*** | | 3.18*** | |
| | (0.49) | | (0.94) | |
| $\hat{E}_t[r_{i,t+1}]$ | | 0.13 | 0.12 | 0.09 |
| | | (0.31) | (0.31) | (0.31) |
| $\hat{r}_{i,t-1}$ | | 0.66*** | 0.64*** | 0.58*** |
| | | (0.22) | (0.22) | (0.22) |
| Risk Tolerance Score Fixed Effects | | | | X |
| Probability Cubic | | X | X | X |
| Demographics | | X | X | X |
| Observations | 1012 | 1012 | 1012 | 1012 |
| R-Squared | 0.048 | 0.150 | 0.160 | 0.169 |

# Address Forecasted and Past HPA Multicollinearity

- Given importance of extrapolative beliefs, expected and past HPA highly correlated.

$\Rightarrow$ Challenging to separately interpret coefficients for expected and past home price growth.

# Address Forecasted and Past HPA Multicollinearity

- Given importance of extrapolative beliefs, expected and past HPA highly correlated.

$\Rightarrow$ Challenging to separately interpret coefficients for expected and past home price growth.

- Should bias away from individual significance. Emphasize significance of $r_{t-1}$
- Further address nonlinearities by being more nonparametric in controls for forecasted HPA
- Within fine bins of $\hat{E}_t[r_{t+1}]$, respondents have approx. same forecast
- Even matching on forecasted returns, past returns still strong predictor of investment

# Perceived Past HPA Improves Action Prediction for Other Outcomes

| | Pr(Buy non-home next year) | | Pr(Buy home) | | Viewing Housing Good Investment | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| $\hat{E}_t[r_{i,t+1}]$ | 0.12*** | 0.19** | -0.53** | -0.24 | 0.20*** | 0.12*** |
| | (0.029) | (0.052) | (0.18) | (0.14) | (0.044) | (0.030) |
| $\hat{r}_{i,t-1}$ | 0.092* | 0.074* | 0.11 | 0.050 | 0.20*** | 0.15*** |
| | (0.041) | (0.030) | (0.15) | (0.098) | (0.013) | (0.016) |
| Pr(HP Decreases) | | 0.005 | | -0.033 | | -0.027*** |
| | | (0.011) | | (0.035) | | (0.0032) |
| Demographics | | X | | X | | X |
| Distribution of HP | | X | | X | | X |
| Observations | 5,375 | 5,375 | 3,575 | 3,575 | 5,387 | 5,387 |
| R-Squared | 0.002 | 0.089 | 0.005 | 0.253 | 0.033 | 0.087 |

# Direct Measure of Decision Factors

# Why do I do what I do? Just ask!

- Building on a nascent literature of letting investors **self-report choice factors** (e.g., Choi and Robertson 2020), we reran the hypothetical $1,000 investments with one adjustment.

# Why do I do what I do? Just ask!

- Building on a nascent literature of letting investors **self-report choice factors** (e.g., Choi and Robertson 2020), we reran the hypothetical $1,000 investments with one adjustment.

- Before asking for investment allocation, we ask treatment group whether they consider their
  - **(a)** own return forecasts or
  - **(b)** their memory of past home-price growth

  more when making investment decisions

# Why do I do what I do? Just ask!

- Building on a nascent literature of letting investors **self-report choice factors** (e.g., Choi and Robertson 2020), we reran the hypothetical $1,000 investments with one adjustment.

- Before asking for investment allocation, we ask treatment group whether they consider their
  - **(a)** own return forecasts or
  - **(b)** their memory of past home-price growth

  more when making investment decisions

- Control group asked about investment decisions without the extra question

# Self-Reflection Experiment

Consider a situation where you have to decide how to invest $1,000 for one year. You can choose between two possible investments.

The first is a fund that invests in your local housing market, and pays an annual return equal to the growth in home prices in your area.
The second is a savings account that pays **2%** of interest per year.

Which factor do you consider more when making this investment decision?

- ○ Expected return on the local housing market over the *next* 12 months
- ○ Realized return on the local housing market over the *past* 12 months

For 2020 treatment group only
Not included in 2020 control group or 2015

What proportion of the $1,000 would you invest in:

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

| | | |
|---|---|---|
| The housing market fund | | % |
| The savings account | | % |
| **TOTAL** | 0 | |

# Explicitly ask whether people rely more on $r_{t-1}$ or $r_{t+1}$

- 41% of respondents report relying more on $r_{t-1}$ than $r_{t+1}$
- Risk-loving and college-educated respondents more likely to rely on $r_{t+1}$ instead of $r_{t-1}$.
- For both forward- and backward-looking, asking about decision induces *less* reliance on expected returns
- While opposite to our ex-ante hypothesis, consistent with cognitive uncertainty.
- Further evidence for cognitive uncertainty: rent growth is a "shrunk factor"

# Self-reflection reduces reliance on $r_{t+1}$

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| $\hat{E}_t[r_{i,t+1}]$ | 1.46*** | 1.39** | 1.21** | 1.17** |
| | (0.56) | (0.55) | (0.59) | (0.60) |
| $\hat{r}_{i,t-1}$ | 0.98*** | 0.82** | 0.96*** | 0.80** |
| | (0.37) | (0.38) | (0.36) | (0.37) |
| $\hat{E}_t[r_{i,t+1}] \times$ Treated | -1.47** | -1.40** | -1.35* | -1.30* |
| | (0.71) | (0.68) | (0.74) | (0.72) |
| $\hat{r}_{i,t-1} \times$ Treated | 0.49 | 0.57 | 0.38 | 0.44 |
| | (0.52) | (0.53) | (0.52) | (0.52) |
| Treated | 4.36 | 4.08 | 4.71 | 6.13 |
| | (3.18) | (3.15) | (4.76) | (4.67) |
| Distribution of Expected Return | | | X | X |
| Individual Controls | | X | | X |
| Observations | 808 | 808 | 808 | 808 |
| R-Squared | 0.069 | 0.166 | 0.083 | 0.178 |

# Conclusion

- Do stated beliefs elicited by expectation surveys reflect actual beliefs used in investment decisions?
- We document systematic gap between forecasted price growth and actual beliefs
- Perceived past returns robustly improve action prediction, *strengthen* beliefs channel
- Beliefs matter! But would underappreciate if using stated beliefs as sufficient statistic
- Evidence consistent with form of cognitive uncertainty: financial risk induces investors to rely on signals they are more certain about