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

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The views expressed are ours and do not necessarily reflect those of the Federal Reserve Bank of New York or the Federal Reserve System.

Believe what I say or what I do?

- Explosion of research on beliefs in macrofinance (including real estate)
- 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?

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Maybe Yes...

- Stated expectations $\Rightarrow$ 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

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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*)

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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 ϕ

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

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 and 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

Usual approach to beliefs channel

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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:

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

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

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..."

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

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$\rightarrow$ 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

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

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- Key: $\hat{r}_{t-1}$ feels relatively salient and certain and the investor doesn't discount it.

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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

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

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?

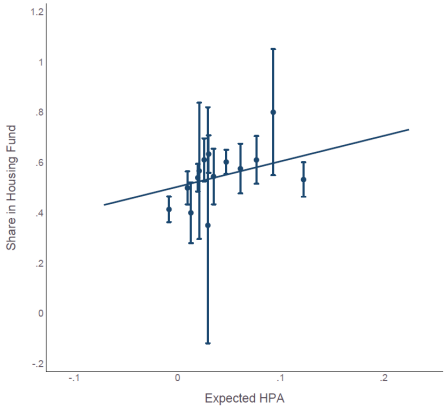
- Without real stakes, how externally valid is this measure?
- Armona Fuster Zafar (2018) allow some respondents chance at receiving gross return of their own constructed fund
- See also "proper scoring rules" literature
  (Shuford, Albert, and Massengill 1966, Savage 1971, Armantier et al. 2015)
- Results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

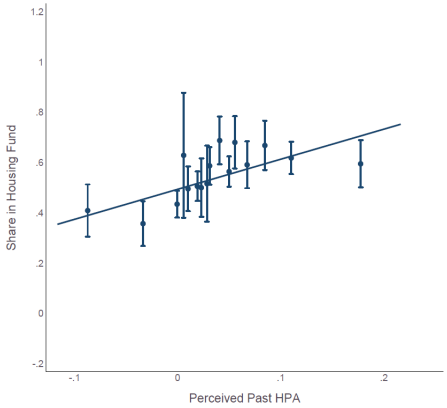
Other Survey Measures of Investment

- 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)

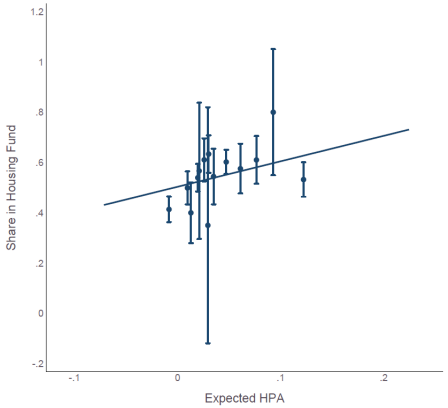
$\rightarrow$ Theoretical prediction: ceteris paribus, higher beliefs $\Rightarrow \uparrow$ Pr(invest)

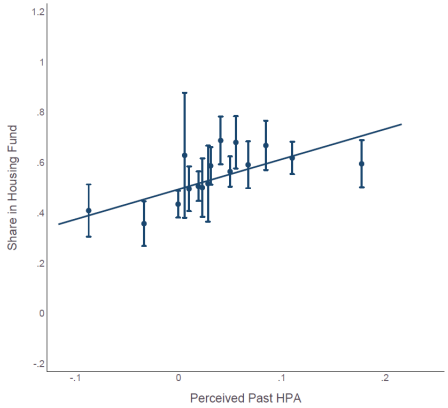
Perceived past returns better predict investment than do stated forecasts





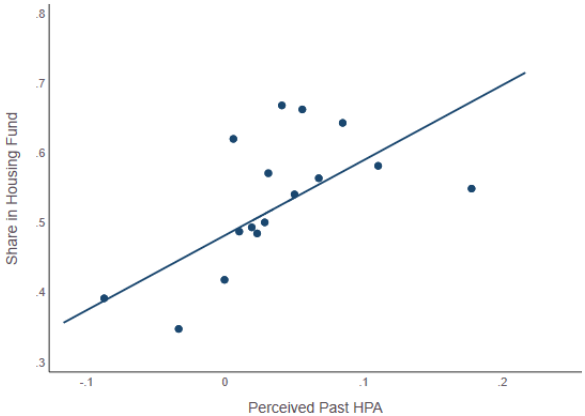
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- Slopes for expected HPA and perceived past HPA about the same
- Statistical relationship between investment and past HPA stronger

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 (α)
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.

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Alternative story:

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- 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.

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- 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.

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  - **(a)** own return forecasts or
  - **(b)** their memory of past home-price growth

  more when making investment decisions

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- 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