Local Returns and Beliefs about the Stock Market

Tobin Hanspal and Clemens Wagner*

January 2022

Abstract

This study documents how investors extrapolate from recent stock returns of locally headquartered firms when forming beliefs about aggregate stock market outcomes. Consistent with studies on the equity home bias, we find that the responsiveness to local information is a function of proximity. While investors may feel more comfortable interpreting local information, we find no evidence that these effects are sensitive to the informativeness of local returns for the aggregate outcome. Our findings suggest that differences in beliefs about information contained in public signals varies systematically with geography, which has been suggested as an important driver of the local bias in equity markets.

* We thank Felix Fattinger, Oliver Rehbein, and seminar participants at WU Vienna for helpful comments and discussions. Contact details: Hanspal: tobin.hanspal@wu.ac.at. WU Vienna University of Economics and Business and Vienna Graduate School of Finance (VGSF). Wagner: clemens.wagner1@wu.ac.at. WU Vienna University of Economics and Business and Vienna Graduate School of Finance (VGSF).

1. Introduction

Investors' expectations about future returns are not only central to asset pricing, but also influence key macroeconomic outcomes. Beliefs held by households are particularly relevant as households are the ultimate owners of financial assets in the economy and invariably face important choices over lifetime savings, consumption and investments. As such, beliefs about aggregate outcomes are central to many theoretical models of economic behavior and elicited across many different subject pools and samples via various survey datasets.

Unsurprisingly, a growing literature examines what influences expectation formation by linking these survey measures of beliefs to observable measures such as income, education, and experiences (e.g., Das, Kuhnen, and Nagel 2020; Kézdi and Willis 2011). Simultaneously, significant advances in explicitly modeling beliefs have focused on deviations from rational expectations, individuals' biases, and how expectations may differ systematically between different groups of people (Barberis et al. 2015, 2018; Bordalo et al. 2019). For example, the geographical distance of information has emerged as one potentially important input to expectation formation for households and financial experts alike. Empirical evidence has shown that individuals tend to overweight information that originates nearby compared to information from further away (Kuchler and Zafar 2019; Giannetti and Wang 2016; Gerken and Painter 2022). This has been shown in various contexts such as expectations about aggregate house price changes and unemployment (Kuchler and Zafar 2019; Armona, Fuster, and Zafar 2019), inflation (D'Acunto et al. 2021), and GDP growth forecasts (Dovern, Müller, and Wohlrabe 2022).

Similarly, a local focus in investment decisions has been documented as one of the most robust findings in finance: investors tend to hold under-diversified portfolios which are concentrated among firms in from their own countries and even at a more local level within-country (Coval and Moskowitz 2001). This equity home bias results in significant inefficiencies both in aggregate and for individual portfolios. Given these sets of findings, it seems plausible that the salience of local firm performance or an affinity towards familiar sources of information may be a guiding force in investors' expectations about future returns.

In this paper, we show that household beliefs about aggregate stock market outcomes are shaped by developments close to home. Using individual-level survey responses from the Survey of Consumer Expectations (SCE), we find that the level of optimism regarding stocks in the U.S. is positively related to the stock market performance of companies with headquarters in the vicinity of the respondents (henceforth also referred to as "local firms" for brevity). For this purpose, we construct stock indices of local firms at the commuting zone-level and state-level and link the respective recent annual returns with survey participants' beliefs about future stock market outcomes. Extrapolation from recent local returns is remarkably stable across various demographic groups of survey respondents and is invariant to different states of the economy. The main results are also not explained by unobserved respondent-

fixed effects, such as general attitudes towards the stock market, personality traits, or different interpretations of the survey questions.

Our empirical analysis begins by following Kuchler and Zafar (2019) and using the most recent responses of each household for a cross-sectional analysis controlling for time-fixed effects. We then extend the analysis to take advantage of the rolling panel structure of the SCE data. Typically, respondents take the survey up to twelve times over the course of one year and then drop out of the survey. The panel component of the data allows us to analyze changes in beliefs and to control for unobserved respondent fixed-effects.

Rational updating of beliefs about a macroeconomic outcome, which, by definition, is the same for everyone, should not be affected by the geographical origin of publicly available information. Our findings, therefore, imply that individuals either cannot access all public information equally or have difficulties assessing the available information in an unbiased manner. Our results showing that respondents' beliefs are swayed by local information are not explained by access to private information or an optimal use of potentially limited information. We show that beliefs do not predict the aggregate stock market outcome well and that households' extrapolation from past local stock returns is independent of their informativeness for the aggregate outcome. Using several different approaches, we find no evidence that the impact of local information on beliefs is higher in areas where local firm performance has been a good predictor of the aggregate outcome.

We then examine if the magnitude of our main findings is positively related to the size of local firms, e.g., the average market capitalization. We find that indeed there is a strong correlation between individuals' forecasts and larger local firms, suggesting that salience plays an important role in determining the pieces of information from which individuals extrapolate. Taken together, our main results suggest that local stock returns affect households' beliefs about the aggregate stock market for mainly two reasons. First, households' access to information is biased towards the local environment. Intuitively, this is because local information is much more easily available and more salient than information originating from geographically distant parts of the economy. Second, individuals overestimate how representative their information set is for the aggregate outcome and, therefore, overreact to local stock returns. The idea of a representativeness heuristic as an economical short-cut to make judgments in complex tasks is supported by a large body of evidence in psychology (Tversky and Kahneman 1974; Griffin and Tversky 1992) and has motivated recent efforts in modelling the process of expectation formation of financial market participants (Barberis et al. 2015; Bordalo et al. 2019).

Overestimating the representativeness of locally biased information could be key to explain several stylized facts about households' financial portfolios. When households think about the stock market, they probably do not have the whole universe of traded firms in mind but only a small subset of listed companies which oversamples local firms. Households may therefore underestimate the true scope of

the stock market and underestimate the benefits associated with holding a well-diversified portfolio. Such a distorted perception of the stock market may contribute to the equity home bias (Coval and Moskowitz 1999) and inadequate diversification in equity portfolios of households (Blume and Friend 1975).

We then turn to explore how beliefs about the aggregate stock market outcome are also shaped by recent aggregate returns in addition to local ones. In line with the idea that investors believe that the market is shifting between trending and mean-reverting regimes (Barberis, Shleifer, and Vishny 1998), the correlation of beliefs and recent past returns of the stock market switches from positive to negative with the stock market crash at the beginning of the COVID-19 pandemic. Average sentiment reached its highest point in our sample period from 2013-2021 in early 2020, exactly when recent annual stock returns have been very low. Until the end of 2019, however, beliefs tended to be more optimistic (pessimistic) when recent aggregate annual returns had been high (low). By contrast, the connection between recent local annual returns and beliefs shows no indication of such a regime change: households always extrapolate from local firm performance in the same direction during our sample period. Clearly, households attribute a different quality to local information compared to macroeconomic data – particularly during times of economic turmoil.

For a subset of SCE respondents, some information on their financial investments is available, which allows us to analyze how stock market participation interacts with their belief formation process about future stock market outcomes. First, we find evidence that respondents act in accordance with their beliefs. Higher levels of optimism regarding the aggregate stock market are positively related with the percentage of financial investments allocated to stocks. Furthermore, we find that the impact of local returns on beliefs is stronger among households that participate in equity markets. Put differently, individuals that pay closer attention to the stock market are more prone to base their beliefs on local firms' recent stock returns. While we do not observe the composition of their investments in equities, we know from prior literature that households tend to overweight local firms in their stock portfolio (Coval and Moskowitz 1999, 2001; Ivkovic and Weisbenner 2005; Seasholes and Zhu 2010). Such a geographically biased portfolio would render local returns more salient and therefore more likely to be used as input for the representativeness heuristic. Ultimately, a distorted perception of the stock market can both a cause for, or a result from such a home bias, potentially creating a reinforcing vicious cycle. So even if there is a rational reason initially to predominantly invest in local firms, the resulting home bias in the stock portfolio may exacerbate the distortion in the perception of the aggregate market.

A potential concern for our interpretation of the results that local returns affect beliefs, is that causality may also go in the opposite direction, i.e., beliefs affect local returns. Household that are optimistic about the stock market might invest in stocks of local firms and thereby bid up prices, resulting in higher realized local stock returns. While this mechanism seems plausible and would also have some interesting implications, we find it unlikely to be a substantial driver of our results. First, our results are robust to

estimations that control for respondent fixed-effects or use changes in beliefs within one year as outcome. There is substantial evidence that households tend to trade quite infrequently and exhibit substantial inertia in adjusting their portfolios (Campbell 2006; Bilias, Georgarakos, and Haliassos 2010). Prior research also shows that households do not adjust their stock holdings immediately in line with stated changes in beliefs (Giglio et al. 2021a). Second, retail investors are unlikely to be the marginal investors that determine the stock prices of big firms with large institutional ownership. We find that in precisely those areas that are home to the biggest firms, the connection between local returns and beliefs is strongest, suggesting that reverse causality is unlikely to be a concern for our empirical analysis. Finally, we show that the impact of local stock returns is specific to the domain of stock market beliefs. We find no significant connection to beliefs about other macroeconomic outcomes, such as unemployment or interest rates.

In the full sample of survey responses, we also document several panel conditioning effects, which we carefully address in our regression estimations. Panel conditioning occurs when repeated survey participation systematically affects subsequent answers of respondents.[1] In this context, we find that beliefs *increasingly* correlate with local returns as survey tenure increases. This may be because respondents seek out additional information between interviews (Toepoel, Das, and van Soest 2009). In our case, participants may start to pay closer attention to stock market developments. Alternatively, panel conditioning could also be advantageous for the quality of responses (Struminskaya 2016). Later responses may better represent true beliefs, because respondents have had more time to reflect on the question. While the former interpretation represents a potential limitation for the external validity of results, our findings should at least be representative for individuals that increase their interest in the stock market and yield insights about the different roles of local information and macroeconomic data during that process.

Our paper relates to several strands of literature. We relate to a growing literature in finance focusing on how individuals, households, and professional investors form beliefs about macroeconomic outcomes. This literature generally spans cross-sectional and repeated surveys to lab and field experiments. While focusing on aggregate stock market returns, recent work has shown that investors rely on past realized (and paper) returns (Andersen et al. 2021), where positive and negative returns may result in an asymmetric effect on expectations (Kuhnen 2015). These findings relate to reinforcement learning (Kaustia and Knüpfer 2008; Choi et al. 2009; Malmendier and Nagel 2011, 2016), and the influence of investors' individual and macroeconomic experiences (Andersen, Hanspal, and Nielsen 2019; Malmendier and Nagel 2011, 2016). Other recent literature relates individuals' beliefs to economic behavior and outcomes. Andersen et al. (2021) show that individuals with optimistic beliefs allocate a larger fraction of their portfolio to risky assets, complementing the findings in Ameriks et al. (2020) and Giglio et al. (2021a; Giglio et al. 2021b), who also find a positive effect of beliefs on the risk

[1] Kim and Binder (2020) also document panel conditioning in the SCE for inflation expectations.

taking using administrative data and survey responses for Vanguard account holders. Relatedly, Kuhnen and Miu (2017), Ben-David et al. (2018), and Das, Kuhnen, and Nagel (2020), all find that individuals with lower socioeconomic status are more pessimistic about macroeconomic conditions and stock returns and, thus, less likely to invest in stocks. Closely related to our study is recent work by Laudenbach et al. (2021), who show that retail investors reduce risk taking in response to local firm bankruptcies through pessimistic expectations about aggregate stock returns. Our results add to this literature by showing that the local environment affects investor's beliefs about aggregate outcomes, in our case, expectations on the aggregate stock market.

Our work is also related to the literature on the home equity bias, which suggests that investors tend to tilt their portfolios to the publicly listed firms in their local areas. Grinblatt and Keloharju (2001) document that Finnish households hold a significantly larger share of companies that are located within 100 km. Ivkovic and Weisbenner (2005) find that the average share of local investments is around 30% for U.S. households. Other papers documenting such local home bias are Athanasoulis and van Wincoop (2001), Coval and Moskowitz (2001), Huberman (2001), and Sialm, Sun, and Zheng (2020), most of which argue that the reason for this geographic proximity preference are information asymmetries. We add to this literature by showing that investors may hold local portfolios whose returns influence their expectations of the aggregate stock market.

2. Measuring Stock Market Beliefs and Local Stock Returns

2.1. Data, Main Variables & Summary Statistics

For our empirical analysis we combine three main sources of data. First, the Survey of Consumer Expectations (SCE), conducted by the New York Fed since June 2013, provides information on beliefs about the stock market from a representative sample of U.S. households as well as rich demographic information, including the respondents' location at the commuting zone-level. Second, we use the CRSP daily stock database to obtain stock returns for the universe of listed firms with headquarters in the U.S and returns of the U.S. stock markets. Third, we use data made available by Bai, Fairhurst, and Serfling (2020) who provide an accurate history of headquarter locations for firms in the U.S. based on SEC filings. We construct stock indices from CRSP data for each commuting zone which we then link to household responses in the SCE. To place headquarter locations in the corresponding commuting zones, we first link zip codes provided in the data by Bai, Fairhurst, and Serfling (2020) with Federal Information Processing Standards (FIPS) codes using the R package 'zipcodeR' (version 0.3.3), which we then link to commuting zone IDs (as defined in 2000) via the cross-walk file provided by the Economic Research Service of the U.S. Department of Agriculture. These headquarter locations are then merged with the CRSP stock file via CUSIP codes. Based on these data we compute local stock index returns at the commuting zone level. To mitigate the impact of extreme outliers, we winsorize local returns at the top and bottom 1-percentiles.

The survey sample consists of more than 15,000 individuals (after dropping observations with important missing data) located in almost 300 different commuting zones across all 50 U.S. states and Washington D.C. Most respondents participate multiple times, typically every month over the course of one year (median tenure: 8 survey waves). The main outcome variable we use for our analysis are beliefs on the future performance of the aggregate stock market. The survey elicits respondents' subjective probabilities whether stock prices in the U.S., on average, will be higher in one year. A subset of survey respondents (ca. 4,500) also participates in the Finance Questionnaire of the SCE, which elicits additional information on investments, including the share of financial wealth allocated to different asset classes. This data allows us to group respondents based on their ownership of stocks and validate whether investment decisions are consistent with stated beliefs.

Table 1: Summary Statistics

This table reports summary statistics for the sample of the SCE. Panel A shows relative frequencies of respondent characteristics for the full sample and for the subsample of respondents in the Finance Questionnaire. Categories of employment status and race do not add up to 100% since multiple selections are possible. Panel B contains information on the structure of the survey as well as on stock market beliefs, local returns and market returns. Survey tenure refers to the number of survey waves each respondent has participated in.

Panel A		Full Sample		Finance Questionnaire	
		N	% of Tot.	N	% of Tot.
Observations		107,676		36,969	
Participants		15,224		4,516	
Survey Months		95		72	
Commuting Zones		299		267	
States (plus DC)		51		51	
Demographics					
Age	Below 40	4,537	30%	1,682	37%
	40-60	4,520	30%	1,379	31%
	Above 60	6,167	41%	1,455	32%
HH-Income	Below $50k	5,237	34%	1,297	29%
	$50k-$100k	4,573	30%	1,712	38%
	Above $100k	5,414	36%	1,507	33%
Education	High School	1,767	12%	399	9%
	Some College	5,128	34%	1,316	29%
	College	8,329	55%	2,801	62%
Numeracy	Low	4,449	29%	993	22%
	High	10,775	71%	3,523	78%
Male		7,810	51%	2,510	56%
Married		9,894	65%	3,017	67%
Employment	Working	11,181	73%	3,406	75%
	Unemployed	2,508	16%	579	13%
	Retired	3,619	24%	1,208	27%
Race	White	12,689	83%	3,866	86%
	Black	1,528	10%	377	8%
	Latino	1,290	8%	331	7%
Stocks		-	-	2,348	52%

Panel B	Mean	SD	25th percentile	Median	75th percentile
Participants per Month	1,133.4	103.4	1,096	1,144	1,174
Survey Tenure	7.2	4.4	3	8	12

Stock Market Beliefs					
All	43.28	23.23	25	50	60
First-Differences	-0.90	20.76	-10	0	10
12th – 1st Response	-7.65	25.39	-25	-5	10
Local Stock Returns					
All	17.82%	25.23%	4.93%	16.55%	27.95%
I(Local Return>0)	83%	38%	1	1	1
Market Returns					
All	13.29%	11.63%	5.91%	14.38%	19.85%
I(Market Return>0)	87%	33%	1	1	1

2.2. Elicited Beliefs and Panel Conditioning Effects

The SCE elicits respondents' beliefs about the stock market using the following question:

> "What do you think is the percent chance that 12 months from now, on average, stock prices in the U.S. stock market will be higher than they are now?" (emphases in the original)

We observe a couple of striking patterns in stated subjective probabilities and how they evolve over respondents' survey tenure (i.e. the number of survey waves in which a respondent has participated). First, the average percent chance that stock prices will be higher in one year as stated by the respondents is 43%, and reaches the 50%-mark in only two months of the sample period (April & May 2020). These subjective probabilities are very low compared to the actual realizations of U.S. stock market returns between 2013 and 2021: in the sample of survey responses, subsequent one-year returns of the stock market were positive 87% of the time. Taking elicited beliefs at face value would suggest that respondents are extremely pessimistic or badly informed about the base-rate probability of the outcome in question. Alternatively, stated beliefs may be distorted due to cognitive biases or difficulties in parsing the survey question correctly. One potential reason for the low estimates is that individuals are often downward biased when making probabilistic inferences from samples about properties of the population (Phillips and Edwards 1966). A different explanation for these low estimates is that respondents may interpret the question in a different way than we as econometricians do. Their answers may reflect beliefs about whether stocks will be "higher than expected" or have "above average returns" in the subsequent 12 months. While this deviates from the literal phrasing of the question, it seems plausible that respondents focus on the intent of question (Gigerenzer 1996), which appears to be to elicit their opinion about the performance of the aggregate stock market ("What do you think…"), rather than quiz them about the base-rate probability of the outcome. Stated probabilities are then as if normalized by some perceived base-rate probability. In the subsequent empirical analysis, we address the potential heterogeneity resulting from different interpretations of the survey question, which may confound cross-sectional regressions, by showing that our main results are also robust to estimations based on within-respondent variation.

Second, we also document considerable panel conditioning effects. Panel conditioning occurs when repeated survey participation systematically affects subsequent answers of respondents. We find that

subjective probabilities stated in initial responses are significantly higher than the ones stated after subjects have participated in the survey multiple times. The timeseries average of 12th responses shown in Figure 1 is almost always lower than the average of 1st responses. This pattern is not driven by outliers: the change in the distribution of stated probabilities occurs across the entire spectrum of responses, as shown in the left panel of Figure 2. The distribution of respondents' change in beliefs between initial and ultimate response skews left (Figure 2, right panel), with an average change of -7.65 (median: -5). In Figure 3, we plot the coefficients from regressing stock market beliefs on survey tenure dummies and find that a steep drop in stated subjective probabilities occurs during the first 4 to 5 survey waves. After that, average beliefs seem to stabilize.

While the causes behind this decline in subjective probabilities as survey tenure increases remain unclear, these patterns have important implications for our empirical analysis. The typical reasons behind panel conditioning effects can be broadly grouped into three categories: (i) cognitive biases, (ii) information acquisition, and (iii) informativeness of responses. The first group is akin to a "mechanical" change in responses over time. For example, some biases in probabilistic inferences may be exacerbated when subjects are asked to evaluate new information and revise their estimates sequentially (Peterson, Ducharme, and Edwards 1968). If the main source for these panel conditioning effects is of this nature, de-meaning beliefs within each survey tenure group could be sufficient to make all elicited beliefs comparable. The latter potential mechanisms behind these panel conditioning patterns could create fundamental differences between early responses and later ones that make an apples-to-apples comparison impossible. Respondents may seek out additional information between interviews (Toepoel, Das, and van Soest 2009). In our case, participants may start to pay closer attention to stock market developments and their beliefs at later stages of the survey are then better informed than at beginning. Alternatively, later responses may represent true beliefs more accurately, because respondents have had more time to reflect on the question. This type of panel conditioning would be advantageous for the quality of responses (Struminskaya 2016) and imply that the representativeness of responses is increasing in survey tenure. In both cases, earlier responses are much more "noisy" than later ones – either because they do not really reflect respondents' true beliefs or because they are uninformed.

Figure 1: Average First Responses and 12th Responses

This figure shows the timeseries averages of stock market beliefs as stated by all respondents who participate in the SCE for the first time (solid line) and by respondents who participate for the 12th time (double line).

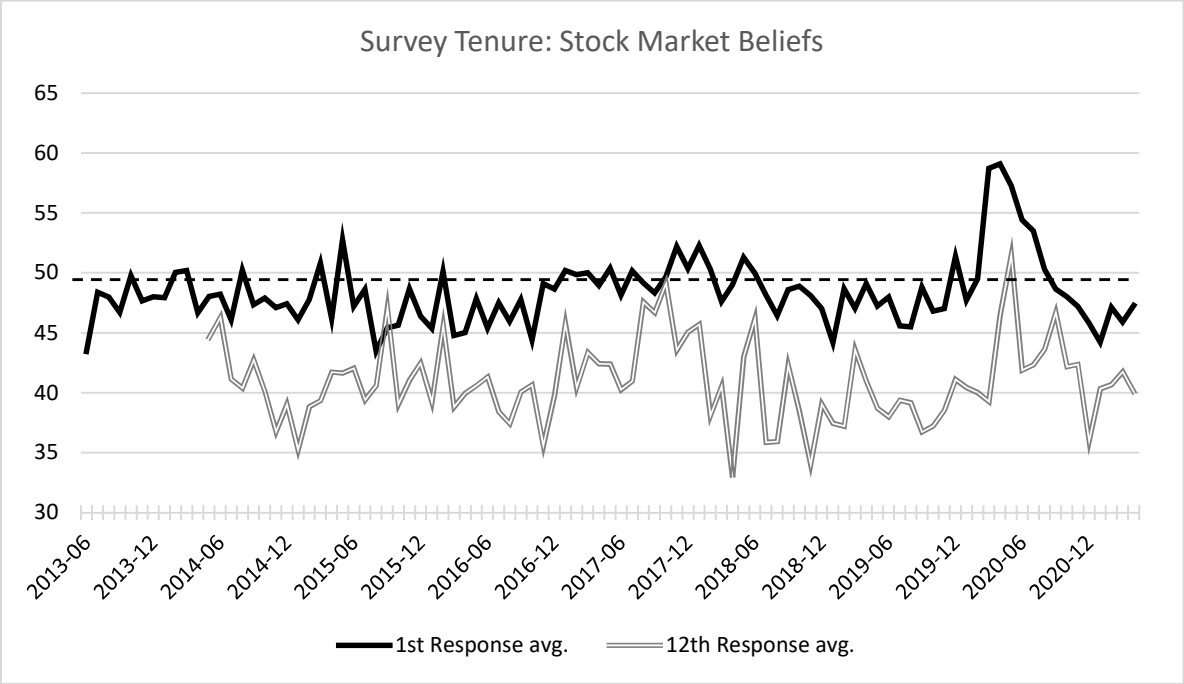
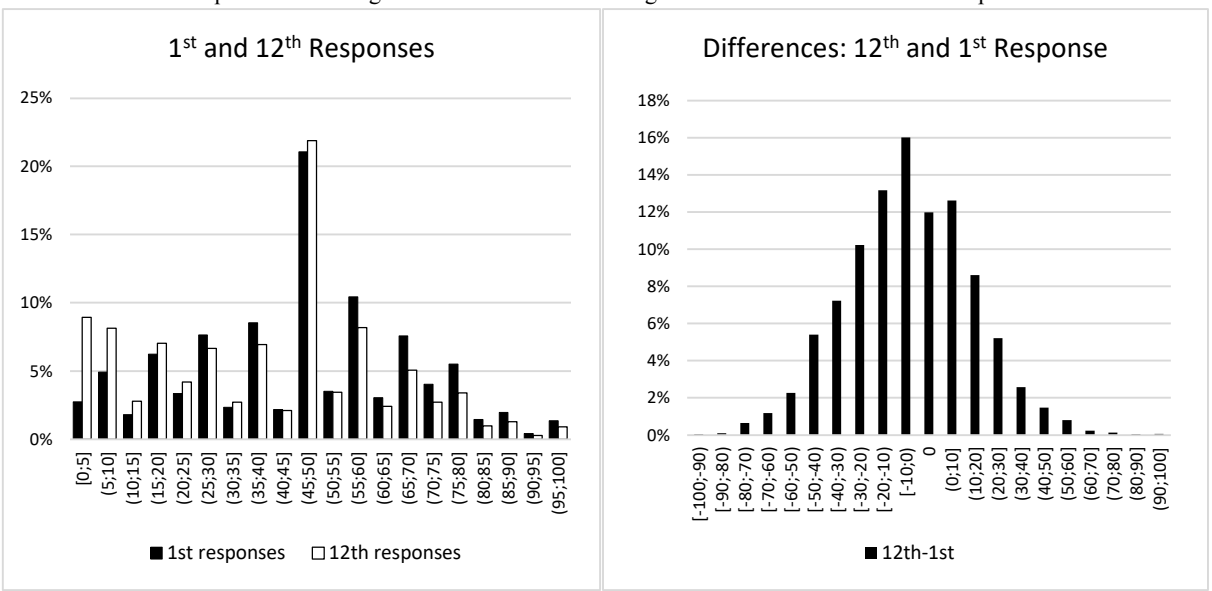


Figure 2: Distributions of First and 12th Responses and Changes in Responses

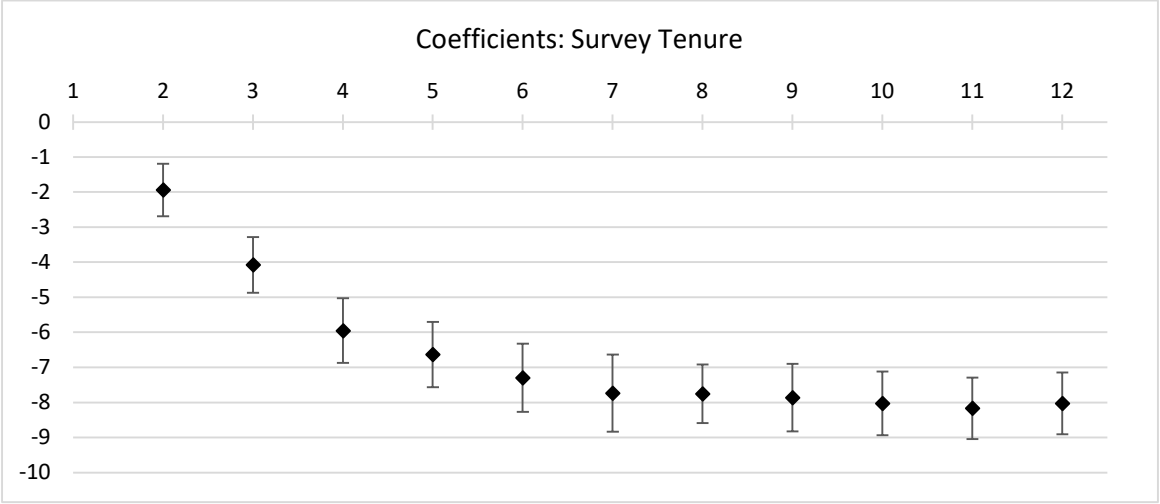
The left panel shows the relative frequencies with which 1st and 12th responses fall into certain intervals. The right panel shows the relative frequencies of changes in beliefs of a certain magnitude between the 1st and 12th response.



We also find that participants exhibit a clear tendency to assign a 50-percent chance to the event in question (i.e. choose the "middle option"). This tendency does not decrease with increasing survey tenure: around 20% of both first and 12th responses state a 50-percent chance (Figure *2*, left panel). This is consistent with the notion that individuals interpret the outcome in question as "above average" stock returns.

Figure 3: Stock Market Beliefs as Survey Tenure Increases

This figure shows estimated coefficients from regressing stock market beliefs on survey tenure dummies. Confidence intervals are at the 99% level. Standard errors are clustered at the respondent-level.



To gauge the impact of survey tenure on stock market beliefs we estimate the following regression:

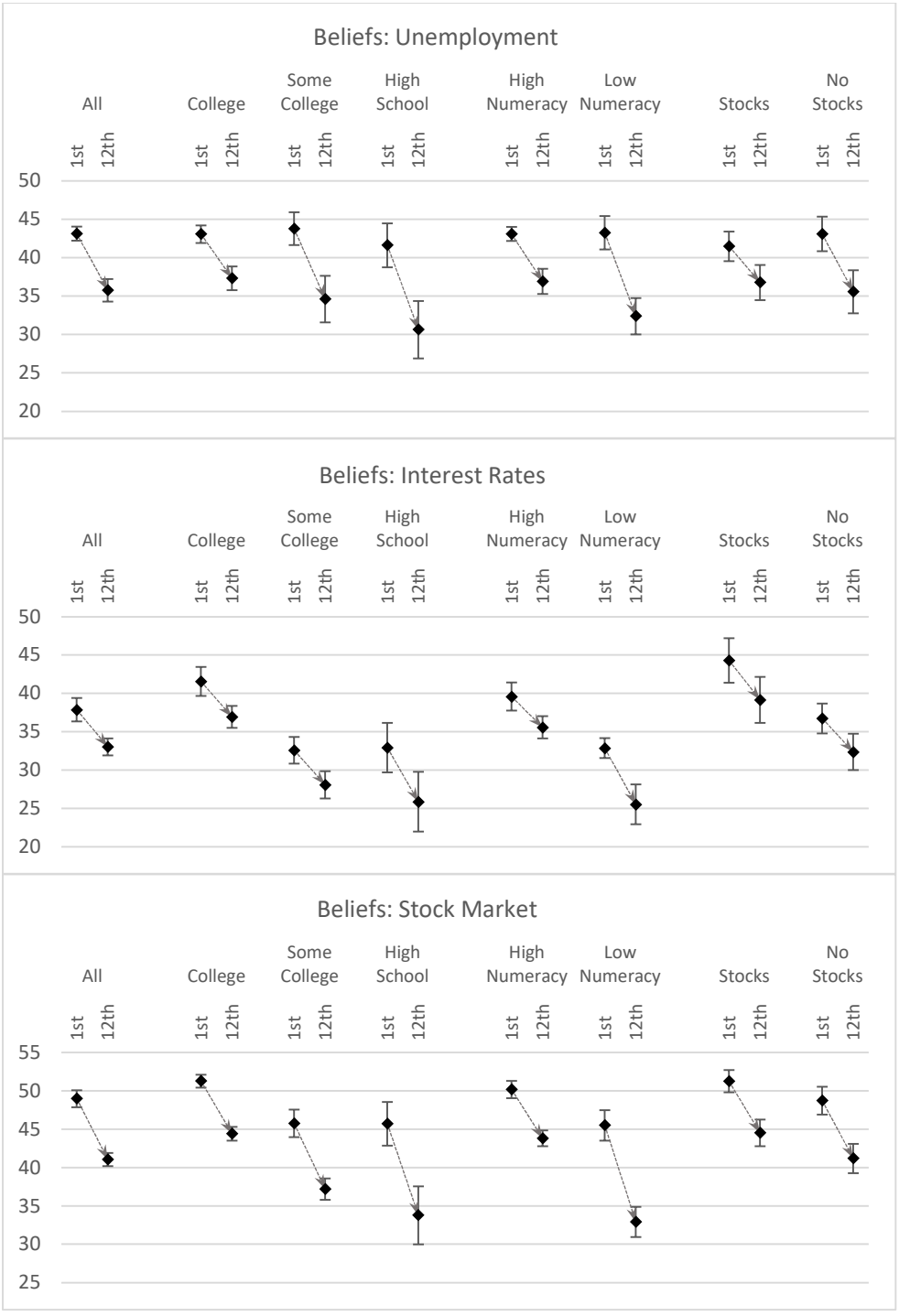
$$\text{Stock Market Belief}_{it} = \beta\ \text{Survey Tenure}_{it} + \delta\ X_{it} + \mu_{\tau} + \varepsilon_{it} \quad (1)$$

Stock Market Belief is the elicited subjective probability of whether stock prices in the U.S. will be higher in 12 months as stated by respondent i. Survey Tenure is a vector of dummies indicating the number of waves in which the respondent has participated until time t. The vector of respondent specific controls X_{it} includes categories of age, household income, education, and numeracy. Time-fixed effects are included for each survey-month (τ) and standard errors are clustered at the respondent-level. Figure 3 plots the estimated β coefficents and 99% confidence intervals for different levels of survey tenure. The patterns of the coefficients on survey tenure are almost identical in estimations without respondent-specific controls or time-fixed effects. On average, stock market beliefs drop off significantly between first and sixth responses and then level off. Therefore, we also present our main results based on responses only from participants with survey tenure of six or higher.

Finally, we show that these panel conditioning effects in beliefs about the stock market are very similar in different contexts, such as beliefs about trends in aggregate unemployment and future interest rates. In the SCE Questionnaire, these beliefs about future aggregate outcomes are elicited through three consecutive questions following the same format, as described at the beginning of this section. Figure 4 plots changes in average stated subjective probabilities between first and last responses, that unemployment (top), interest rates (middle), or stock prices (bottom), will be higher in one year. In all three domains, we observe similar patterns of stated probabilities declining with increasing survey tenure. Interestingly, these changes in beliefs do not seem to be related to changes in optimism or pessimism about the overall economy: while lower probabilities that stock prices will be higher, might reflect a more pessimistic outlook, lower probabilities that unemployment will be higher, imply that respondents are becoming more optimistic about the economy.

Figure 4: Panel Conditioning Effects in Different Domains and Demographic Subgroups

This figure shows changes in averages of stated probabilities that unemployment (top), interest rates (middle), and stock prices (bottom), will be higher in one year, between first and 12th responses. Error bars correspond to confidence intervals at the 99%-level.



To investigate whether these panel conditioning effects are a function of respondent characteristics we also show how these averages evolve in different subgroups based on education, numeracy, or stock market participation. While downward adjustments in beliefs of less sophisiticated individuals are slightly larger, the panel conditioning effects are substantial and statistically significant in all subgroups of survey participants.

In our empirical analysis we carefully address panel conditioning effects described in this section by grouping responses based on different levels of survey tenure, ensuring that stated beliefs are comparable across and within respondents. While panel conditioning effects may indicate some limitations to their external validity, our findings are at least representative for individuals that increase their interest in the stock market and yield insights about the different roles of local information and macroeconomic data during the belief formation process.

2.3. Consistency of Respondents' Beliefs and Financial Investments

In this section we investigate whether elicited beliefs are consistent with respondents' actions. We show that higher stated probabilities of positive stock market developments are associated with a higher propensity to invest in stocks. For a subset of respondents, the SCE's Finance Questionnaire elicits information on the allocation of financial wealth to different asset classes. Since there is no variation in the data within respondents, we take the most recent observation of each survey participant. We regress the portfolio allocation to stocks on stock market beliefs and find significant positive correlations both at the extensive margin and intensive margin of stock investments (Table 2). We also find similar results in the subset of stock investors (column (5)). This should alleviate common concerns that survey responses are unrelated to actual investment decisions and contain only little valid information about households' true belief formation process.

Table 2: Consistency between Stock Market Beliefs and Financial Investments

This table shows regression estimates of regressing Portfolio Allocation to Stocks on Stock Market Beliefs, based on respondents' most recent information. The dependent variable is the share of financial investments allocated to stocks. In columns (1)-(2), the dependent variable is an indicator whether the PF-allocation to stocks is greater than zero, whereas in columns (3)-(5) it is the percentage allocation. Stock Market Belief is the percent chance that, on average, stock prices in the U.S. will be higher in one year (standardized to sd=1). In column (5), only individuals who have a non-zero allocation to stocks are included in the sample. Demographics include indicators for categories of household income, age, education, and numeracy. Standard errors are clustered at the state level. Time-fixed effects are included for each survey-month. Significance levels: $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Dependent Var.:	Portfolio Allocation to Stocks				
	Ext. Margin		Intensive Margin		
	(1)	(2)	(3)	(4)	(5)
Stock Market Belief	0.053***	0.033***	4.109***	2.954***	3.048***
	(0.006)	(0.006)	(0.509)	(0.521)	(0.756)
Controls:					
Demographics	No	Yes	No	Yes	Yes
Fixed Effects:					
Survey-Month	No	Yes	No	Yes	Yes
Subsample: PF-Allocation to Stocks >0	No	No	No	No	Yes
Observations	4,457	4,457	4,457	4,457	2,104
R^2	0.01	0.07	0.02	0.08	0.07
Within R^2	-	0.06	-	0.06	0.04

3. Do Local Returns Affect Beliefs about Aggregate Outcomes?

To estimate the effect of local returns on beleifs about the aggregate stock market, we start by analysing differences in the cross-section of respondents' beliefs and experiences and investigate to what extent our results are affected by panel conditioning effects (see Section 0). We then extend the analysis to fully leverage the panel structure of the data and identify the effect using within-respondent variation.

3.1. Beliefs and Local Returns in the Cross-Section

To investigate the question whether individuals base their beliefs about future stock market outcomes on recent local stock returns we estimate the following regression equation.

$$\text{Stock Market Belief}_{it} = \beta\ \text{Local Ret Past Year}_{it}^{a} + \gamma\ \text{Mkt Ret Past Year}_{t} + \delta\ X_{it} + \varphi_{n} + \mu_{\tau} + \varepsilon_{it} \quad (2)$$

Stock Market Belief is the elicited subjective probability of whether stock prices in the U.S. will be higher in 12 months as stated by respondent i. Local returns are from firms that are headquartered in the vicinity of the survey participant ($a \in \{\text{commuting zone},\ \text{state}\}$), while market returns are from all firms listed in the United States. Local and market returns are both calculated as value weighted total returns over the previous year until the most recent trading day (t). The vector of respondent specific controls X_{it} includes categories of age, household income, education, and numeracy. Time-fixed effects are included for each survey-month (τ) as well as dummies for the number of waves in which the respondent has participated (n). Standard errors are clustered at the state-level. Our main focus in equation (1) is on the regression coefficient β which estimates the sensitivity of stock market beliefs with respect to prior year local stock returns. The null hypothesis is that beliefs do not vary systematically with the performance of local firms, which is public information available to all survey participants.

Table 3 presents regression estimates of the parameters of interest from equation (1), based on either all observations or, following the approach by Kuchler and Zafar (2019), only the most recent observation of each survey participant. Our results show that beliefs about whether stock prices in the U.S., on aggregate, will be higher in one year correlate significantly with recent stock returns of locally headquartered firms. This holds true both at the commuting zone and at the state level showing that individuals extrapolate from local returns to form their beliefs about the aggregate stock market. In columns (1) and (4) we present unconditional estimates of β without any controls or fixed effects. In all other models we control for respondents' household income, age, education, and numeracy by including indicators for the categories provided in the SCE data. Dummies for each survey month as well as recent returns of the aggregate stock market control for unobserved common time varying factors that may confound the analysis. These estimates precisely identify the effect of local stock returns on beliefs about the outcome of the aggregate market that is not explained by various demographic information, time-fixed effects, or variation in the performance of the stock market within a given month. All results presented in this section are robust to using other measures of local and aggregate stock market

performance, such as capital gains excluding dividends or equal-weighted average returns. Results are also not sensitive to using more granular demographic variables instead of categories.

Table 3: Cross-Sectional Variation – Past Local Stock Returns and Stock Market Beliefs

This table shows regression estimates of equation (1). The dependent variable refers to the percent chance that, on average, stock prices in the U.S. will be higher in one year, as stated by respondents, standardized to sd=1. Local Stock Return Past Year refers to the average total return of all listed firms with headquarters in the respondent's commuting zone (columns (1)-(3)) or state (columns (4)-(6)), value-weighted by market capitalization and standardized to sd=1. Market Portfolio Return Past Year refers to the value-weighted average total return of all U.S. stocks. Demographics include indicators for categories of household income, age, education, and numeracy. Survey Tenure refers to the number of waves in which the respondent has participated. Estimates in columns (3) and (6) are based on each respondent's most recent observation. Time-fixed effects are included for each survey-month. Standard errors are clustered at the state level. Significance levels: $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Dependent Var.:	Stock Market Belief					
	Commuting Zone			State		
	(1)	(2)	(3)	(4)	(5)	(6)
Local Stock Return Past Year	0.016***	0.018*	0.021*	0.025***	0.019**	0.023**
	(0.005)	(0.011)	(0.011)	(0.006)	(0.007)	(0.011)
Survey Tenure:	All	>6	Last	All	>6	Last
Controls:						
Market Return Past Year	No	Yes	Yes	No	Yes	Yes
Demographics	No	Yes	Yes	No	Yes	Yes
Fixed Effects:						
Survey Tenure	No	Yes	Yes	No	Yes	Yes
Survey-Month	No	Yes	Yes	No	Yes	Yes
Observations	107,674	40,382	14,929	107,492	40,306	14,900
R^2	0.00	0.06	0.07	0.00	0.06	0.07
Within R^2	-	0.05	0.04	-	0.05	0.04

Our findings reject the null that households process all publicly available information in an unbiased manner and point to the alternative hypothesis that households overweight local information in their belief formation. The magnitude of the effect is modest, but largely consistent with estimates of the impact of local information on beliefs and behaviour in related literature (Kuchler and Zafar 2019; Laudenbach et al. 2021; Giannetti and Wang 2016). A one-standard deviation increase in local returns is associated with an increase in stated probabilities of around 0.02 standard deviations, or half a percentage point.

In columns (2) and (5) of Table 3, we use only observations from respondents who have already participated in the survey at least six times, which are less noisy than initial responses. We investigate how survey tenure affects the relationship between local returns and stated beliefs in the following section.

3.2. Survey Tenure as Moderating Variable

We investigate whether repeated participation in the SCE moderates the impact of local returns on beliefs and present how estimates for the effect vary with different levels of survey tenure in Table 5.

For this purpose, we perform the regression of equation (1) using only certain subsets of responses. We start by excluding the first observations of each respondent, then the first three, the first six, and so forth. Results are presented for local returns at the commuting zone-level (Panel A) and at the state-level (Panel B).

Estimated coefficients for returns at the commuting zone-level and at the state-level as well as R-squared values increase monotonically as we move the focus of the analysis to later responses by dropping more and more early observations from each respondent. In untabulated tests we find that results are not sensitive to whether dummies for survey tenure are included or not, suggesting that "mechanical" panel conditioning effects do not affect our results in any meaningful way. This suggests that individuals' responses become more *informative* or more *informed* over time. An increase in the *informativeness* of survey responses occurs if respondents get a better grasp of the question. In turn, their answers reflect their beliefs more accurately. Responses may become more *informed* over time, on the other hand, if participants pay closer attention to local stock returns between survey waves. While we cannot distinguish between these explanations empirically, the different explanations are important for the interpretation of our results. If the quality of responses increases with survey tenure, restricting the subsample

Table 4: Regression Analysis with Subsamples Based on Survey Tenure

The dependent variable refers to the percent chance that, on average, stock prices in the U.S. will be higher in one year, as stated by respondents (standardized to sd=1). Survey Tenure refers to the n-th participation in the survey of each individual. Local Stock Return Past Year refers to the average total return of all listed firms with headquarters in the respondent's commuting zone (Panel A) or state (Panel B), value-weighted by market capitalization. Market Portfolio Return Past Year refers to the value-weighted average total return of all U.S. stocks. Demographics include indicators for categories of household income, age, education, and numeracy. Standard errors are clustered at the state level. Time-fixed effects are included for each survey-month. Significance levels: $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Panel A		Commuting Zone						
Dependent Variable:		Stock Market Belief						
	Survey Tenure	All	>1st	>3rd	>6th	>9th	>11th	≤6th
		(1)	(2)	(3)	(4)	(5)	(6)	(7)
Local Stock Return Past Year		0.005	0.005	0.008	0.018*	0.027**	0.047***	-0.003
		(0.007)	(0.007)	(0.009)	(0.011)	(0.013)	(0.016)	(0.007)
Controls:								
Market Return Past Year		Yes			Yes			Yes
Demographics		Yes			Yes			Yes
Fixed Effects:								
Survey Tenure		Yes			Yes			Yes
Survey-Month		Yes			Yes			Yes
Observations		107,673	93,864	70,226	40,841	17,040	4,485	68,195
R^2		0.06	0.05	0.06	0.06	0.06	0.08	0.04
Within R^2		0.04	0.04	0.04	0.05	0.05	0.06	0.03
Panel B		State						

Dependent Variable:	Stock Market Belief						
Survey Tenure	All	>1st	>3rd	>6th	>9th	>11th	≤6th
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Local Stock Return Past Year	0.019**	0.020**	0.026**	0.035**	0.033*	0.042*	0.009
	(0.007)	(0.008)	(0.010)	(0.012)	(0.017)	(0.022)	(0.008)
Controls:							
Market Return Past Year	Yes			Yes			Yes
Demographics	Yes			Yes			Yes
Fixed Effects:							
Survey Tenure	Yes			Yes			Yes
Survey-Month	Yes			Yes			Yes
Observations	107,491	92,569	69,279	40,306	16,819	4,425	67,185
R^2	0.06	0.06	0.06	0.06	0.06	0.08	0.05
Within R^2	0.04	0.04	0.05	0.05	0.05	0.06	0.03

to responses from more experienced participants enhances the external validity of the estimated effect. If, on the other hand, repeated participation in the survey induces respondents to seek out additional information, these later responses are not representative for the average household who has never participated in such a survey. However, even in the latter case, the estimated effects give important insights into what kind of information individuals seek out when they increase their interest in the stock market. This has important implications for designing effective financial literacy schemes aimed at educating individuals about the benefits of stock market participation, which need to ensure that they do not induce worse outcomes.

3.3. Identifying the Effect Using Within-Respondent Variation

In this section, we extend the analysis to fully leverage the panel structure of the data and focus on within-respondent variation. This allows us to analyse whether beliefs change in response to local stock return information. We estimate the following two regression equations:

$$\text{Stock Market Belief}_{it} = \beta\ \text{Local Ret Past Year}_{it} + \gamma\ \text{Mkt Ret Past Year}_{t} + \varphi_n + \mu_\tau + \omega_i + \varepsilon_{it} \quad (3)$$

$$\text{Stock Market Belief}_{it}^{12^{th}-1^{st}} = \beta\ \text{Local Ret Past Year}_{it} + \gamma\ \text{Mkt Ret Past Year}_{t} + \delta\ X_{it} + \mu_\tau + \varepsilon_{it} \quad (4)$$

Equation (3) extends equation (2) by adding respondent-fixed effects (ω_i). Focussing on within-respondent variation also abstracts from latent household-fixed factors that may confound the analysis. To estimate equation (4) we regress the difference between the 12th and first repsonses as dependent variable on prior year local returns, prior year market returns, and respondent specific characteristics measured at the time of the 12th response (t). Similar to respondent fixed-effect estimations, this model also controls for different interpretations of the survey question about stock market beliefs by putting

the focus on respondents' changes in beliefs. If there is substantial heterogeneity in how respondents understand the question, changes in beliefs may be more informative than levels.

We find that beliefs are responsive to stock returns of firms headquartered in respondents' commuting zones. By contrast, the effect disappears for average returns at the state-level. This suggests that the sensitivity of the belief formation process to different types of information is also determined by spatial proximity. This is largely in line with prior studies on the equity home bias showing that investors' portfolio weights are often declining with geographical distance of firms' headquarter locations (Grinblatt and Keloharju 2001; Coval and Moskowitz 2001).

Table 5: Within-Respondent Variation – Past Local Stock Returns and Stock Market Beliefs

This table shows regression estimates of equations (2) and (3). The dependent variable refers to the percent chance that, on average, stock prices in the U.S. will be higher in one year, as stated by respondents, standardized to sd=1. Estimates are obtained either by using levels of the dependent variable (columns (1), (2) & (4), (5)), or the difference between the 12th and 1st response (columns (3) & (6)). Local Stock Return Past Year refers to the average total return of all listed firms with headquarters in the respondent's commuting zone (columns (1)-(3)) or state (columns (4)-(6)), value-weighted by market capitalization and standardized to sd=1. Market Portfolio Return Past Year refers to the value-weighted average total return of all U.S. stocks. Demographics include indicators for categories of household income, age, education, and numeracy. Survey Tenure refers to the number of waves in which the respondent has participated. Time-fixed effects are included for each survey-month. Standard errors are clustered at the state level. Significance levels: $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Dependent Var.:	Stock Market Belief					
	Levels		12^{th}-1^{st}	Levels		12^{th}-1^{st}
	Commuting Zone			State		
	(1)	(2)	(3)	(4)	(5)	(6)
Local Stock Return Past Year	0.015**	0.020***	0.054***	0.007	0.008	0.020
	(0.004)	(0.005)	(0.018)	(0.010)	(0.010)	(0.023)
Controls:						
Market Portfolio Return Past Year	Yes	Yes	Yes	Yes	Yes	Yes
Demographics	-	-	Yes	-	-	Yes
Fixed Effects:						
Survey Tenure	Yes	Yes	-	Yes	Yes	-
Survey-Month	No	Yes	Yes	No	Yes	Yes
Respondent	Yes	Yes	-	Yes	Yes	-
Observations	107,673	107,673	4,273	107,491	107,491	4,265
R^2	0.59	0.60	0.05	0.59	0.60	0.05
Within R^2	0.00	0.00	0.01	0.00	0.00	0.01

4. Informativeness of Past Local Returns

In this section we investigate whether the connection between local stock returns and beliefs about the aggregate stock market is sensitive with respect to the informativeness of these local returns for the aggregate outcome. The results presented in the previous section show that respondents' weighting of information or access to information is a function of geographical proximity, which raises some additional interesting questions: Do individuals extrapolate from local information naively or do they weight the potentially limited information optimally? Put differently, are the weights that respondents put on local returns also determined by how informative these returns are for the outcome they are asked to predict? To investigate these questions, we explore the possibility that local returns in some areas may be leading indicators for the aggregate stock market. We analyze to which extent geographical regions may serve as such "bellwethers" and then test the hypothesis that respondents are more inclined to extrapolate from recent past local returns in areas where these returns have been a better predictor for the outcome in question.

We follow the approach by Kuchler and Zafar (2019) and obtain regression estimates for each commuting zone and each state, capturing the comovement of local returns with the aggregate outcome, and group individuals into terciles based on these coefficients. For this purpose, we estimate the analogue of regression equation (1), but with the actual realizations of the outcome for which subjective probabilities are elicited in the survey as dependent variable. That is, we regress an indicator variable that takes the value 1 if the value-weighted average total return of all U.S. stocks over the next year is positive, and 0 otherwise, on prior-year local returns, prior-year market returns and survey-month dummies.

Results presented in Table 6 show that the impact of local returns is not stronger in areas where these returns have "high comovement" with the aggregate outcome. If anything, high-minus-low coefficients tend to be negative, suggesting that extrapolation from local returns is more prevalent when this information is *less* informative. This pattern emerges with respect to the informativeness of local returns both at the commuting zone level (columns (1)-(3) and at the state level (columns (4)-(6)).

Table 6: Does Extrapolation Depend on the Informativeness of Local Returns?

The dependent variable refers to the percent chance that, on average, stock prices in the U.S. will be higher in one year, as stated by respondents, standardized to sd=1. Estimates are obtained either by using levels (columns (1)-(2) & (4)-(5)), or the difference between the 12th and 1st response (columns (3) & (6)). Local Stock Return Past Year is the average total return of all listed firms with headquarters in the respondent's commuting zone (columns (1)-(3)) or state (Columns (4)-(6), value-weighted by market capitalization and standardized to sd=1. Market Return Past Year refers to the value-weighted average total return of all U.S. stocks. Demographics include indicators for categories of household income, age, education, and numeracy. Respondents are grouped into terciles based on the coefficient on past local stock returns in a regression of the aggregate outcome (a dummy variable indicating whether the value-weighted U.S. stock martket portfolio return over the subsequent year is greater than zero) on prior local stock returns. Standard errors are clustered at the state level. Significance levels: *p < 0.10, **p < 0.05, ***p <0.01.

Dependent Var.:	Stock Market Belief			
	Levels	12^{th}-1^{st}	Levels	12^{th}-1^{st}

	Commuting Zone			State		
	(1)	(2)	(3)	(4)	(5)	(6)
Local Stock Ret. Past Year x Low Comovement with Aggregate Outcome	0.012	0.016*	0.026	0.030**	0.019	0.054**
	(0.018)	(0.009)	(0.029)	(0.014)	(0.019)	(0.025)
Local Stock Ret. Past Year x Mid Comovement with Aggregate Outcome	0.023	0.025***	0.107***	0.053***	-0.004	0.035
	(0.016)	(0.007)	(0.023)	(0.018)	(0.010)	(0.031)
Local Stock Ret. Past Year x High Comovement with Aggregate Outcome	0.015	0.021**	0.019	-0.002	0.018	-0.092*
	(0.025)	(0.011)	(0.044)	(0.028)	(0.017)	(0.052)
High vs. Low Comovement	0.003	0.006	-0.007	-0.032	-0.000	-0.146**
	(0.029)	(0.015)	(0.057)	(0.031)	(0.025)	(0.058)
Survey Tenure:	>6	All	12	>6	All	12
Controls:						
Demographics	Yes	-	Yes	Yes	-	Yes
Market Return Past Year	Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects:						
Survey-Month	Yes	Yes	Yes	Yes	Yes	Yes
Respondent	No	Yes	-	No	Yes	-
Observations	40,308	107,490	4,265	40,306	107,482	4,265
R^2	0.04	0.59	0.06	0.05	0.59	0.05
Within R^2	0.04	0.00	0.02	0.04	0.00	0.02

5. Heterogeneous Effects of Past Local Returns on Beliefs

In this section we analyse whether the propensity to extrapolate from past local returns varies across different groups of respondents. We investigate the possibility that respondent demographics, local firm characteristics, or other information related to local firms may be important determinants of how recent local returns influence the belief formation process. We extend our baseline model described by equation (2) and interact past local stock returns with different variables, estimating separate regressions for each one. In Table 7 we summarize the signs of the coefficients of the interaction terms and their significance levels. The coefficients on recent local returns remain positive and overall do no change meaningfully when adding any of these variables as controls to the base-line model.

Table 7: Heterogeneity in the Propensity to Extrapolate from Local Stock Returns

This table summarizes the results from tests investigating heterogeneity in the effect of past local returns on stock market beliefs. The column labeled 'Sign' presents the sign and significance of the coefficients of the interaction between 'Local Return Past Year' at the commuting zone-level and the respective variables described in the first column. All interactions are estimated in separate regressions, except for the two interactions with indicators for 'Race'. All regressions are based on equation (2) and performed on observations with survey tenure > 6. Standard errors are clustered at the state level. Significance levels: *p < 0.10, **p < 0.05, ***p <0.01.

Interaction: Local Return Past Year x …		Sign	Data Source
Respondent			
Age		–**	SCE
Gender	Male	–	SCE
Marital Status	Married	–	SCE
Household Income	Decile (Top=10, Bottom=1)	–	SCE
Work Status	Unemployed	+	SCE
Education	College	+	SCE

Race	Hispanic, Latino, or Spanish	+	SCE
	Black or African American	+**	SCE
Numeracy	High	+	SCE
Stocks	Share of Financial Portfolio (%)	–*	SCE Finance Questionnaire
Local Firms			
Avg. Market Capitalization		+***	CRSP
Local Return Past Year > 0		+	CRSP
Dispersion of Local Returns Past Year (SD)		–**	CRSP
Avg. Aggregate Event Volume (AEV)		+	Ravenpack
Avg. Composite Sentiment Score (CSS)		+	Ravenpack

The propensity to extrapolate from local stock returns does not vary much with variables related to socio-economic status, such as household income, employment status, education, gender, or marital status. The only exception is that beliefs of respondents identifying as 'Black or African American' correlates more with past local returns compared to those of respondents associated with other racial groups. Prior literature has shown that attitudes towards the stock market differ substantially between groups with different ethnic backgrounds. We find that there are also some differences in the way individuals who identify as Black use local information to form expectations about the aggregate stock market.

Younger people tend to rely more on recent local returns than older ones in their belief formation process. This is consistent with Malmendier and Nagel (2011) who show that recent experiences tend to be more important for younger individuals in shaping beliefs, since these recent impressions make up a larger share of their lifetime experiences.

Kuchler and Zafar (2019) find that beliefs about future house price developments are more sensitive to recent experiences among individuals with lower levels of education and low scores of numeracy. By contrast, we find no evidence that respondents who went to college or respondents who do well in questions which assess the level of numeracy differ from less sophisticated respondents in the way they use local information in forming beliefs about the stock market. However, we find some evidence that people who have larger shares of their financial wealth invested in stocks extrapolate less from past local returns. While we do not observe the composition of their portfolios, this could indicate that investor sophistication might play a role in the tendency to extrapolate from local returns.

We find that individuals situated in areas, in which locally headquartered firms are on average larger, extrapolate more from past local returns compared to respondents in areas with smaller firms. Big firms likely play a more prominent role in local economies – even if they often operate nationally. Residents are more likely to work for a big firm or at least know someone who does, and local news media is more likely to report on them. These factors may contribute to the fact that the recent performance of bigger firms is more salient at the local level and ultimately more present in the minds of respondents than the performance of smaller firms. At the same time, individuals may also have a tendency to view big firms

as representative for the overall stock market and therefore put more weight on recent returns of larger firms. While these differences may be related to the salience and availability of information, we do not find evidence that the frequency with which significant events occurred recently, or the sentiment of reports related to local firms have a significant impact on the propensity to extrapolate from past local returns.

Respondents extrapolate less from local firm performance when returns are more dispersed. This could be related to heightened uncertainty regarding the information contained in these returns. In this case, individuals may perceive local returns as an ambiguous signal and therefore choose to ignore it. Alternatively, it could be that individuals do not pay attention to all local firms, but only a few. If people extrapolate from recent returns of single firms rather than some weighted average of local firms, our empirical strategy is more likely to pick up on this mechanism if local returns are more aligned. A large variance in local firm performance would result in dispersed beliefs at the local level which appear unrelated to the weighted average of local stock returns.

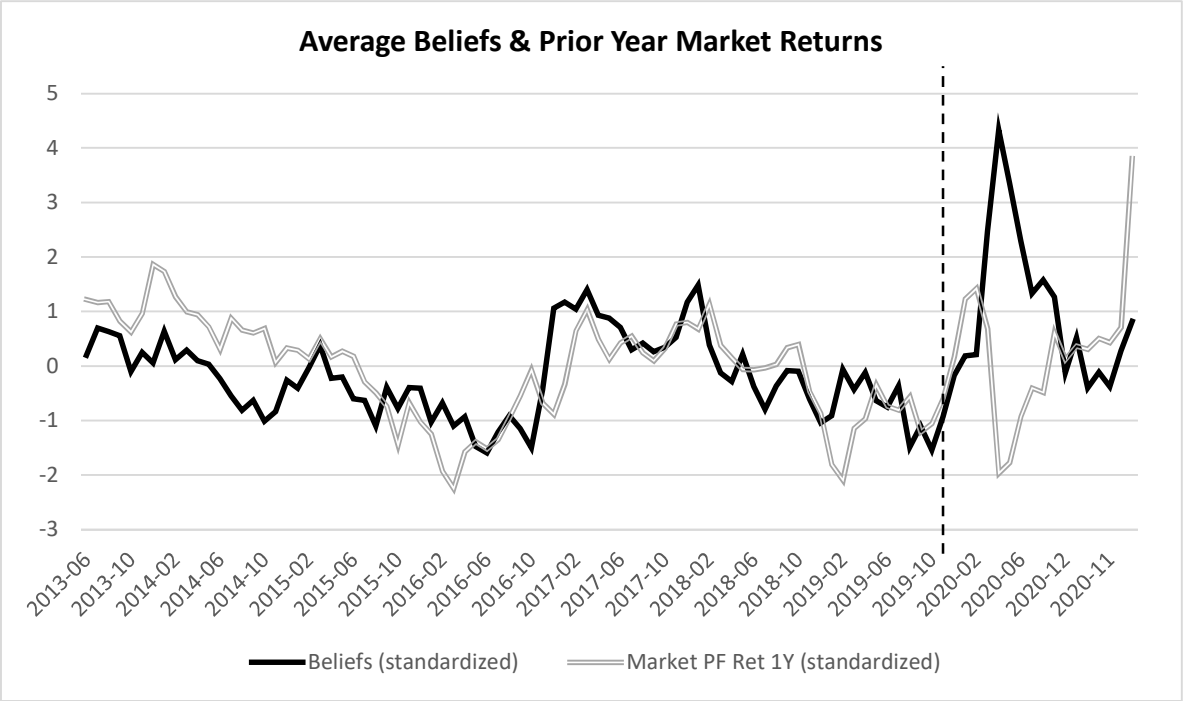
6. Extrapolation from Past Local and Aggregate Returns

We now turn to the question whether individuals also extrapolate from the recent performance of the overall stock market when forming beliefs about stock prices in one year. We also investigate the roles of local information and macroeconomic data in the belief formation process and how they change over time and under different circumstances.

6.1. Changing Regimes: Extrapolation and Mean Reversion

Figure 5 provides a first look at the connection between beliefs and prior-year market returns. Plotting average beliefs about the stock market outcome as stated by respondents and returns of the value weighted CRSP-Portfolio reveals a distinct change in the correlation between these variables at the start of 2020. On average, individuals tend to extrapolate from past market returns until the end of 2019. By contrast, the increase in apparent optimism coinciding with the on-set of the COVID-19 pandemic and the stock market crash during this time is more in line with a belief in mean-reversion of stock returns. This pattern is largely consistent with notion that investors believe that the market is switching between 'trending' and 'mean-reverting' regimes, as suggested by Barberis, Shleifer, and Vishny (1998).

Figure 5: Timeseries Average of Stock Market Beliefs and Past Market Returns
The solid line shows the timeseries average of beliefs in each month, ie. the percent chance that stock prices in the U.S. will be higher in one year, as stated by SCE respondents. The double line shows the timeseries of annual returns of the U.S. stock market (CRSP value-weighted total return). Both series are standardized to mean = 0 and standard deviation = 1.



In Table 8 we present the estimates for the coefficients for local returns and market returns over the past year from our main models described by equations (2)-(4) for the full sample period, as well as for samples split into pre- and post-2020. In the pooled estimation over the full sample period coefficients on past market returns are not statistically significant. Splitting the sample into observation before and after January 1st 2020, the estimated coefficients on recent market returns reflect the pattern shown in Figure 5: in the period until the end of 2019, beliefs about future stock market outcomes are positively correlated with past market returns; after the start of 2020, however, the correlation turns significantly negative. Interestingly, there does not seem to be a similar shift in extrapolation from local returns between these periods, as the coefficients on past local returns are positive throughout the sample period.

Table 8:

This table shows regression estimates of equation (X). The dependent variable refers to the percent chance that, on average, stock prices in the U.S. will be higher in one year, as stated by respondents. Estimates are obtained either by using levels of the dependent variable (columns (1), (2), (4), and (5)), or the difference between the 12th and 1st response (columns (3) & (6)). Local Stock Return Past Year refers to the average total return of all listed firms with headquarters in the respondent's commuting zone, value-weighted by market capitalization. Market Return Past Year refers to the value-weighted average total return of all U.S. stocks. Pre-2020 and Post-2020 indicate whether the survey response took place before or after Jan 1, 2020. Demographics include indicators for categories of household income, age, education, and numeracy. Standard errors are double-clustered at the state and year-month level. Time-fixed effects are included for each year-month. Significance levels: *p < 0.10, **p < 0.05, ***p <0.01

Dependent Var.:	Stock Market Belief					
	Levels		12th-1st	Levels		12th-1st
	(1)	(2)	(3)	(4)	(5)	(6)
Local Stock Return Past Year	0.019*	0.020***	0.056***			
	(0.011)	(0.005)	(0.018)			
… x Pre-2020				0.019	0.014**	0.031
				(0.015)	(0.006)	(0.024)
… x Post-2020				0.020	0.033***	0.086***
				(0.014)	(0.010)	(0.031)
Market Return Past Year	-0.010	-0.001	-0.015			

	(0.012)	(0.009)	(0.064)			
… x Pre-2020				0.047**	0.041***	0.100
				(0.019)	(0.013)	(0.084)
… x Post-2020				-0.057**	-0.042***	-0.109
				(0.027)	(0.014)	(0.073)
Survey Tenure:	>6	All	12	>6	All	12
Controls:						
Demographics	Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects:						
Survey-Month	Yes	Yes	Yes	Yes	Yes	Yes
Respondent	No	Yes	-	No	Yes	-
Observations	40,308	107,490	4,265	40,308	107,490	4,265
R^2	0.04	0.60	0.05	0.04	0.60	0.05
Within R^2	0.03	0.00	0.02	0.03	0.00	0.02

6.2. Extreme Returns and Extrapolation

The marked shift in beliefs and change in extrapolation from market returns that occurred in 2020, when stock prices first experienced a sharp decline and ultimately more than recovered with exceptionally high returns, raises the question if beliefs are affected differently when recent returns have been 'extreme'. Previous studies showing that beliefs are shaped by local information have often focused on significant and singularly negative events, such as bankruptcies (Laudenbach et al. 2021) and cases of corporate scandals (Giannetti and Wang 2016). By contrast, we have thus far investigated the impact of local firm performance using the full spectrum of stock returns. In this section we zoom in on extreme returns to see whether the connection between past returns and beliefs changes when returns have been very low or very high. We group both local and market returns into deciles over the sample period and analyse whether extrapolation is different in the top or bottom decile of past returns.

We extend our baseline model described by regression equation (2) by adding an indicator for extreme returns as well as interaction terms between this indicator variable and past local returns and past market returns. We vary the definition of the indicator variable to indicate returns in the bottom or top decile and returns that are in either the top or bottom decile, ie. extreme in either direction. Following the same methodology, we also estimate these sets of regressions using indicators for very high or very low market returns.

Results summarized in Table 9 show that individuals mainly extrapolate from local returns when they are not in the top or bottom decile of yearly returns. When local returns have been extreme there is little extrapolation from local returns, but an increase in extrapolation from past market returns. When market returns have been unusually high or low, the role of local information in forming beliefs is virtually unaffected. Consistent with patterns shown in Section 226.1, we find that when realized market returns are very low, respondents tend to expect aggregate returns to mean-revert. Very high market returns appear to have no impact on the propensity to extrapolate from either local or market returns.

Table 9: Extreme Returns and Extrapolation

The dependent variable refers to the percent chance that, on average, stock prices in the U.S. will be higher in one year, as stated by respondents, standardized to sd=1. Local Ret. Past Year is the average total return of all listed firms with headquarters in the respondent's commuting zone, value-weighted by market capitalization and standardized to sd=1. Market Ret. Past Year refers to the value-weighted average total return of all U.S. stocks. Very Low (High) Local and Very Low (High) Market refer to dummies indicating whether prior year returns are in the bottom (top) decile of returns in the sample period. Demographics include indicators for categories of household income, age, education, and numeracy. Estimates are based on the subsample with survey tenure > 6. Standard errors are clustered at the state level. Significance levels: *p < 0.10, **p < 0.05, ***p <0.01.

Dependent Var.:	Stock Market Belief					
	(1)	(2)	(3)	(4)	(5)	(6)
Local Ret. Past Year	0.031**	0.035	0.060**	0.027**	0.026**	0.027**
	(0.012)	(0.021)	(0.023)	(0.013)	(0.012)	(0.012)
Local Ret. Past Year x Very Low Local	-0.083					
	(0.061)					
Local Ret. Past Year x Very High Local		-0.036				
		(0.025)				
Local Ret. Past Year x Very High or Low Local			-0.050**			
			(0.023)			
Local Ret. Past Year x Very Low Market				-0.009		
				(0.031)		
Local Ret. Past Year x Very High Market					-0.000	
					(0.029)	
Local Ret. Past Year x Very High or Low Market						-0.004
						(0.024)
Market Ret. Past Year	-0.007	-0.029	-0.034*	0.030	-0.007	0.023
	(0.016)	(0.020)	(0.019)	(0.019)	(0.022)	(0.022)
Market Ret. Past Year x Very Low Local	0.002					
	(0.028)					
Market Ret. Past Year x Very High Local		0.058**				
		(0.023)				
Market Ret. Past Year x Very High or Low Local			0.048***			
			(0.017)			
Market Ret. Past Year x Very Low Market				-0.246**		
				(0.105)		
Market Ret. Past Year x Very High Market					0.020	
					(0.037)	
Market Ret. Past Year x Very High or Low Market						-0.028
						(0.024)
Controls:						
Demographics	Yes	Yes	Yes	Yes	Yes	Yes
Fixed-Effects:						
Survey Tenure	Yes	Yes	Yes	Yes	Yes	Yes
Survey-Month	Yes	Yes	Yes	Yes	Yes	Yes
Observations	42,576	42,576	42,576	42,576	42,576	42,576
R^2	0.06	0.06	0.06	0.06	0.06	0.06
Within R^2	0.05	0.05	0.05	0.05	0.05	0.05

6.3. Uncertainty, Ambiguity, and Extrapolation

A long-standing literature has shown that uncertainty and ambiguity shape attitudes towards the stock market and investor behavior (Cao, Wang, and Zhang 2005; Brenner and Izhakian 2018; Ben-David et al. 2018). Motivated by this research, we also test whether reliance on local information in order to make forecasts about the overall stock market varies with different measures of aggregate uncertainty and ambiguity used in the literature (Brenner and Izhakian 2018; Jurado, Ludvigson, and Ng 2015; Baker, Bloom, and Davis 2016; Baker et al. 2021; Ahir, Bloom, and Furceri 2022). Moreover, we investigate whether the relative importance for belief formation of past returns of the overall stock market and local returns changes when aggregate uncertainty is high. We estimate variations of our baseline model (equation (2)), in which we add different variables capturing the level of uncertainty or ambiguity in the economy or in the stock market. In these regressions we also interact the uncertainty measures with, both, past local returns and past market returns. The coefficients on these interaction terms show to what extent extrapolation from recent returns differs with different levels of uncertainty. Table 10 summarizes signs and significance levels of these coefficients.

Table 10: Uncertainty and Extrapolation from Past Returns

This table summarizes the results from tests investigating the impact of aggregate uncertainty on the propensity to extrapolate from past local returns to form stock market beliefs. Column 'Local Ret.' presents sign and significance of the coefficients of the interaction between 'Local Return Past Year' at the commuting zone-level and the respective variables described in the first column. Column 'Mkt. Ret.' present sign and significance of the coefficients of the interaction between 'Market Return Past Year' and the respective variables described in the first column. Each row represents a separate regression. All regressions are based on equation (2) and performed on observations with survey tenure > 6. Standard errors are clustered at the state level. Significance levels: *p < 0.10, **p < 0.05, ***p <0.01.

Interaction:	Local Ret.	Mkt. Ret.	Reference/Source
Aggregate Uncertainty			
VIX	+	–***	CBOE
Volatility of Means (SP500 Index)	–	–***	Brenner and Izhakian (2018)
Volatility of Volatility (SP500 Index)	–	–***	Brenner and Izhakian (2018)
World Uncertainty Index	–	–	Ahir, Bloom, and Furceri (2022)
Macro Uncertainty 1m ahead	+	–***	Jurado, Ludvigson, and Ng (2015)
Macro Uncertainty 12m ahead	+	–***	Jurado, Ludvigson, and Ng (2015)
Financial Uncertainty 1m ahead	–	–***	Jurado, Ludvigson, and Ng (2015)
Financial Uncertainty 12m ahead	–	–***	Jurado, Ludvigson, and Ng (2015)
Policy Uncertainty 3 Components	+	–***	Baker, Bloom, and Davis (2016)
Policy Uncertainty News	+	–***	Baker, Bloom, and Davis (2016)
Twitter Economic Uncertainty	–	–*	Baker et al. (2021)
Twitter Market Uncertainty	+	–***	Baker et al. (2021)

Overall, we find that when aggregate uncertainty is higher, respondents extrapolate less from past local returns. By contrast, the importance of local information for belief formation seems to be unaffected by uncertainty at the macroeconomic level. Adding these measures of uncertainty as control variables to

our baseline model (without interaction terms) does not affect the level or significance of estimated coefficients on prior-year local return in any meaningful way (See Appendix Section A4).

7. Conclusion

This paper shows that information related to local firms is an important determinant in investors' belief formation process about the stock market. Individuals rely on past local returns when making forecasts about the aggregate stock market. These patterns are independent of whether local firm performance is a good predictor or not. One potential explanation is that information sets are naturally biased towards local information, and people overestimate the informativeness of this information for predicting aggregate outcomes. This is consistent with the notion of a representativeness heuristic: local firms may be seen as indicators for the direction of the stock market, or more broadly as a bellwether for the overall economy.

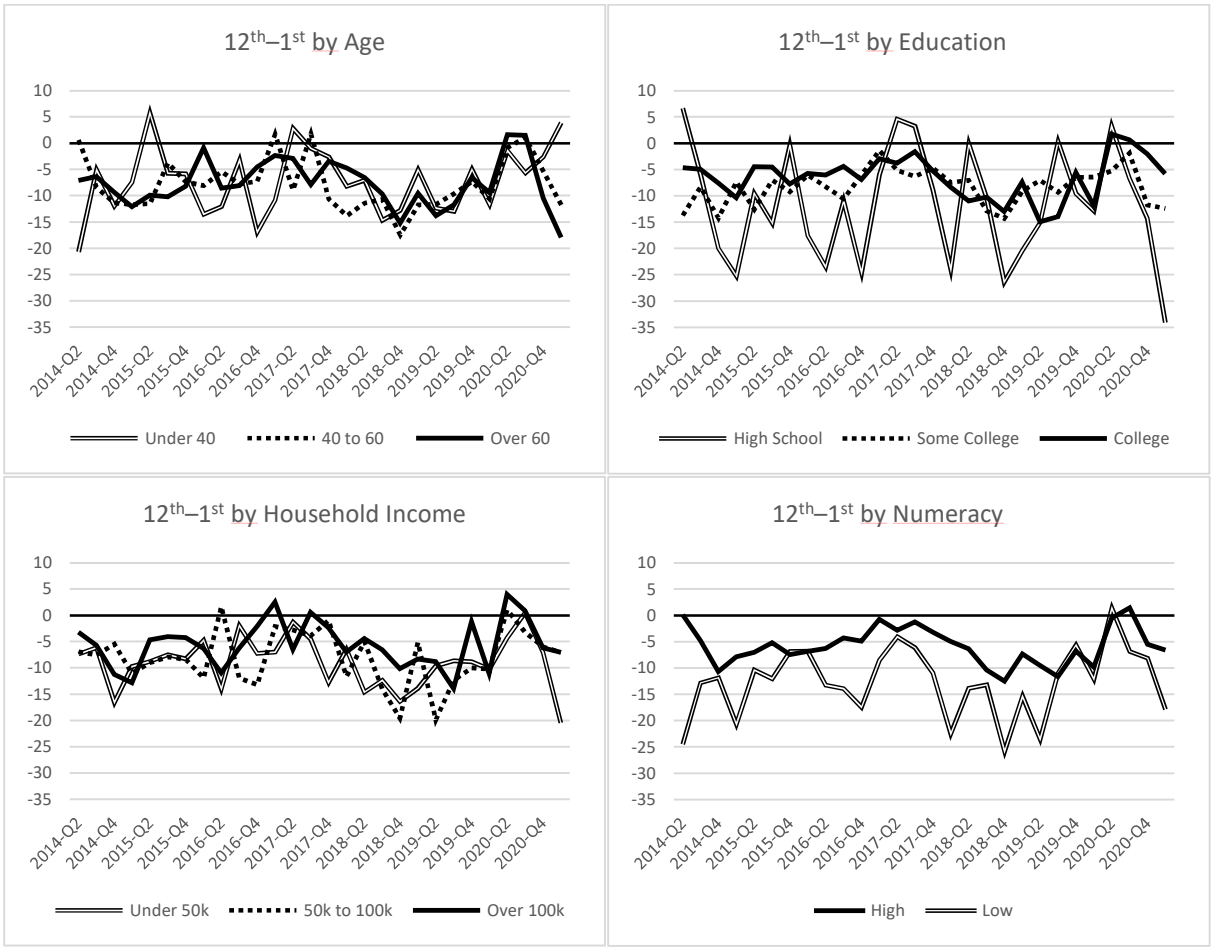
There is surprisingly little heterogeneity in this connection between local returns and stock market beliefs across groups with different socioeconomic status. Different from findings in the related literature showing that less sophisticated households tend to extrapolate more from local information, we find little evidence in the context of stock market beliefs in support of this notion.

Beliefs about the stock market are crucially shaped by information that originates close to home. In our view, this phenomenon provides new empirical guidance for the lang-standing literature on the equity home bias. Consistent with the mixed evidence on whether local investments are associated with positive excess returns, our findings suggest that individuals rely on local information irrespective of whether it is useful for predicting aggregate outcomes. Our empirical strategy relies on realized returns, which are public information. Our findings therefore also lend support to the theoretical contribution by Dumas, Lewis, and Osambela (2017) showing that disagreement about the information content of public signals is a potential driver behind the equity home bias.

While the way that individuals extrapolate from past market returns appears to shift between regimes, consistent with Barberis, Shleifer, and Vishny (1998), the role of local returns in the belief formation process is remarkably stable. Only when local returns have been unusually high or very low, individuals do not extrapolate these returns into the future. In times of heightened uncertainty, individuals tend to extrapolate less from past market returns, while reliance on realized local returns to form beliefs about the stock market remains largely unaffected.

Appendix

A1. Panel Conditioning



A2. Are Beliefs Predicting Stock Market Outcomes?

To gauge how well elicited beliefs correspond to the actual outcomes we calculate standard measures of prediction quality such as mean absolute error (MAE) and root mean squared error (RMSE). As a benchmark for the predictiveness of beliefs, we also present the performance of a random number drawn from a uniform distribution. While it is not clear how one should quantify to what extent subjective probabilities are correct or erroneous, the predictions of whether stock returns will be positive seem very poor. As shown in Table *1*, the average probability stated by respondents in the sample is 43%, whereas subsequent value weighted total stock returns of U.S. stocks were positive 87% of the time. **Error! Reference source not found.** shows that respondents are performing worse in predicting this outcome than the benchmark of drawing random numbers, both in terms of MAE and RMSE. Average prediction errors are slightly lower with respect to the outcome of local stocks instead of the aggregate outcome. By contrast, beliefs are much better in predicting whether stock returns will be above average. Both, with respect to aggregate returns and local returns, beliefs perform better than the random number benchmark. This supports the notion that respondents interpret the question of whether stocks will be "higher" in one year as "above average returns".

Table 11

This table reports standard statistics to quantify how well beliefs stated by the respondents predict the outcome. Beliefs refer to the percent chance that stocks in the U.S. will be higher in one year, as stated by the respondents (divided by 100). Outcomes are defined as indicators whether aggregate or local stock returns are greater than 0 or above their respective sample period average ('Avg.'). 'Random Number' is drawn from a uniform distribution over the [0,1] interval and yields the same results for all outcomes. Prediction "errors" are computed as differences between stated beliefs and the actual outcomes. MAE is the mean absolute error and RMSE the root mean squared error. Percentiles and medians are based on absolute errors.

	MAE	RMSE	25th Percentile	Median	75th Percentile
Beliefs vs. Aggregate Stock Return > 0	0.549	0.598	0.40	0.50	0.74
Beliefs vs. Local Stock Return > 0	0.540	0.570	0.44	0.53	0.64
Beliefs vs. Aggregate Stock Return > Avg.	0.496	0.552	0.30	0.50	0.69
Beliefs vs. Local Stock Return > Avg.	0.488	0.544	0.30	0.50	0.65
Benchmark: Random Number (Uniform)	0.500	0.578	0.25	0.50	0.75

We also analyze to what extent elicited beliefs correlate with subsequent stock market outcomes. For this purpose, we estimate the following regression equation:

$$\text{Stock Market Belief}_{it} = \beta\ \text{Stock Market Outcome}_{it+1}^{d,e} + \varepsilon_{it+1} \qquad \text{(X)}$$

The dependent variable, Stock Market Belief is the percent chance that stock prices in the U.S. will be higher in one year, as stated by respondents. $\text{Stock Market Outcome}_{it+1}^{d,e}$ represents the actual outcome, where $d \in \{\text{Aggregate},\ \text{Local}\}$ and $e \in \{\text{Pos.},\ \text{Above Avg.}\}$ as an indicator variable that takes the value 1 if the value-weighted average annual total return is positive (above average), and 0 otherwise. The

aggregate outcome is based on all U.S. stocks, the local outcome is based on listed firms with headquarters in the respondent's commuting zone.

Table 12
This table shows regression estimates of equation (X). Stock Market Belief is the percent chance that, on average, stock prices in the U.S. will be higher in one year, as stated by respondents. Aggregate and Local Outcomes are indicator variables that take the value 1 if the value-weighted average total return over the next year is positive (columns (1)-(3)) or above average ((4)-(6)), and 0 otherwise. The aggregate outcome is based on all U.S. stocks, the local outcome is based on listed firms with headquarters in the respondent's commuting zone. Survey Tenure refers to the number of waves in which the respondent has participated. Standard errors are clustered at the state level. Significance levels: $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Dependent Var.:	Stock Market Belief					
Outcome:	Stock Ret. > 0			Stock Ret. > Avg.		
	(1)	(2)	(3)	(4)	(5)	(6)
Aggregate Outcome	-0.006		-0.445	0.468**		0.094
	(0.316)		(0.384)	(0.197)		(0.219)
Local Outcome		1.014***	1.155***		0.874***	0.855***
		(0.298)	(0.356)		(0.219)	(0.248)
FE Survey Tenure	Yes	Yes	Yes	Yes	Yes	Yes
Observations	106,752	107,271	106,350	106,752	107,271	106,350
R^2	0.00	0.00	0.00	0.00	0.00	0.00

We find no significant correlation between beliefs and the aggregate outcome in question, i.e. whether stock prices will be higher in 12 months. This result is not sensitive to using nominal, or equal weighted returns for the outcome. On the other hand, beliefs appear to predict subsequent outcomes of local stocks. If we change the definition of the outcome to whether stock returns are above average, beliefs correlate with both the local and the aggregate outcome positively. This supports the notion that respondents do not interpret the question literally, but in the context of whether they are “optimistic” about the stock market. Overall, the connection between beliefs and local outcomes is very robust while the correlation with the aggregate outcome is weaker. The magnitude of the coefficients is quite small. A change in the outcome is associated with an increase in stated beliefs of around one percentage point.

A3. Informativeness of Past Returns

A potential drawback of the methodology applied in Section 4 stems from the fact that it estimates only one parameter for each commuting zone or state. This means that it does not capture potential variation over time in the informativeness of local returns. Furthermore, the estimated coefficients are based on data that may lie well in the future from the respondent's point of view. To address these concerns, we also implement a second approach to gauge the informativeness of local returns for the aggregate outcome. For this purpose, we regress the actual future outcome on local returns over rolling three-year windows using daily observations and obtain coefficients that reflect how informative local returns have been for subsequent aggregate outcomes over the past three years. Results are not sensitive to the choice of data frequency, i.e. using daily, weekly or monthly observations instead of daily data.

Table 13

This table shows regression estimates of equation (X). The dependent variable refers to the percent chance that, on average, stock prices in the U.S. will be higher in one year, as stated by the respondent. Local Stock Return Past Year refers to the average total return of all listed firms with headquarters in the respondent's commuting zone, value-weighted by market capitalization. Estimates are obtained either by using levels (columns (1)-(4)), or first differences of these two variables (columns (5) & (6)). Market Return Past Year refers to the value-weighted average total return of all U.S. stocks. Demographics include indicators for categories of household income, age, education, and numeracy. Respondents are grouped into terciles based on the coefficient on past local stock returns in a regression of a dummy variable indicating whether the value-weighted U.S. stock market return is greater than zero on prior local stock returns. In columns (1)-(3) these comovement coefficients are obtained from a regression using the full sample period, while in columns (4)-(6) comovement is estimated in rolling regressions over 3-year windows. Standard errors are clustered at the state level. Time-fixed effects are included for each year-month. Significance levels: $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Estimation of Comovement:	Full Sample Period			3-Year Rolling Windows		
Dependent Var.:	P(Stock Prices Higher in 1 Year)					
	Levels		12^{th}-1^{st}	Levels		12^{th}-1^{st}
	(1)	(2)	(3)	(4)	(5)	(6)
Local Stock Ret. Past Year x Low Comovement with I(Market Ret Next Year > 0)	0.193	3.012	10.390***	-0.264	2.044*	5.219
	(1.801)	(1.815)	(3.778)	(1.747)	(1.179)	(4.014)
Local Stock Ret. Past Year x Mid Comovement with I(Market Ret Next Year > 0)	1.675*	1.871**	7.254*	0.825	2.196**	1.862
	(0.964)	(0.904)	(3.748)	(0.959)	(0.846)	(4.014)
Local Stock Ret. Past Year x High Comovement with I(Market Ret Next Year > 0)	-0.890	2.585***	3.004	0.067	2.590***	8.983***
	(0.937)	(0.616)	(2.577)	(1.322)	(0.857)	(2.826)
Controls:						
Demographics	Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects:						
Time	Yes	Yes	Yes	Yes	Yes	Yes
Respondent	No	Yes	-	No	Yes	-
Observations	85,151	85,151	3,898	94,520	94,520	4,293
R^2	0.04	0.59	0.06	0.04	0.59	0.06
Within R^2	0.03	0.00	0.02	0.03	0.00	0.02

A4. Heterogeneity

Table 14

The dependent variable refers to the percent chance that, on average, stock prices in the U.S. will be higher in one year, as stated by respondents, standardized to sd=1. Local Return Past Year is the average total return of all listed firms with headquarters in the respondent's commuting zone, value-weighted by market capitalization and standardized to sd=1. Market Return Past Year refers to the value-weighted average total return of all U.S. stocks. Demographics include indicators for categories of household income, age, education, and numeracy, and (or) the variable that is interacted with Local Return Past Year. At the bottom of the table we report estimates for Local Return Past Year from models without the interaction terms. We restrict the sample to observations with survey tenure > 6. Standard errors are clustered at the state level. Significance levels: *p < 0.10, **p < 0.05, ***p <0.01.

Dependent Var.:	Stock Market Belief								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Local Return Past Year	0.088***	0.039***	0.034*	0.047	0.024**	0.022*	0.018	0.022	0.071*
	(0.031)	(0.013)	(0.018)	(0.031)	(0.011)	(0.012)	(0.016)	(0.019)	(0.037)
... x Age	-0.001**								
	(0.001)								
... x Male		-0.022							
		(0.018)							
... x Married			-0.012						
			(0.017)						
... x HH Income				-0.003					
				(0.004)					
... x Unemployed					0.025				
					(0.035)				
... x Ethnic. Black						0.077**			
						(0.035)			
... x Ethnic. Latino						0.010			
						(0.031)			
... x College							0.015		
							(0.012)		
... x High Numeracy								0.006	
								(0.018)	
... x Portfolio Allocation: Stocks (%)									-0.002*
									(0.001)
Local Return Past Year (Estimate without Interaction Term)	0.027**	0.027**	0.026**	0.027**	0.026**	0.027**	0.026*	0.026**	0.025
	(0.013)	(0.012)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.026)
Controls									
Demographics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Market Return Past Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fixed-Effects:									
Survey Tenure	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Survey-Month	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	42,534	42,525	42,528	42,457	42,576	42,497	42,576	42,576	2,027
R^2	0.06	0.08	0.06	0.06	0.06	0.06	0.06	0.06	0.07
Within R^2	0.05	0.07	0.05	0.05	0.05	0.05	0.05	0.05	0.06

Table 15

The dependent variable refers to the percent chance that, on average, stock prices in the U.S. will be higher in one year, as stated by respondents, standardized to sd=1. Local Return Past Year is the average total return of all listed firms with headquarters in the respondent's commuting zone, value-weighted by market capitalization and standardized to sd=1. Market Return Past Year refers to the value-weighted average total return of all U.S. stocks. Controls include indicators for categories of household income, age, education, and numeracy, and the variable which is interacted with Local Return Past Year. At the bottom of the table we report estimates for Local Return Past Year from models without the interaction terms. We restrict the sample to observations with survey tenure > 6. Standard errors are clustered at the state level. Significance levels: *p < 0.10, **p < 0.05, ***p <0.01.

Dependent Var.:	Stock Market Belief				
	(1)	(2)	(3)	(4)	(5)
Local Return Past Year	0.116***	0.025	0.055**	0.029	-0.012
	(0.027)	(0.029)	(0.021)	(0.022)	(0.241)
... x Avg. Market Capitalization	-0.157***				
	(0.048)				
... x I(Local Return Past Year >0)		-0.013			
		(0.032)			
... x Dispersion of Local Returns Past Year (SD)			-0.043**		
			(0.017)		
... x Avg. Aggr. Event Volume (AEV)				0.000	
				(0.000)	
... x Avg. Comp. Sentiment Score (CSS)					0.001
					(0.005)
Local Return Past Year (Estimate without Interaction Term)	0.026**	0.017	0.028*	0.040**	0.043**
	(0.013)	(0.013)	(0.014)	(0.018)	(0.018)
Controls	Yes	Yes	Yes	Yes	Yes
Fixed-Effects:					
Survey Tenure	Yes	Yes	Yes	Yes	Yes
Survey-Month	Yes	Yes	Yes	Yes	Yes
Observations	42,576	42,576	39,202	27,971	27,971
R2	0.06	0.06	0.06	0.06	0.06
Within R2	0.05	0.05	0.05	0.05	0.05

Table 16

The dependent variable refers to the percent chance that, on average, stock prices in the U.S. will be higher in one year, as stated by respondents, standardized to sd=1. Local Return Past Year is the average total return of all listed firms with headquarters in the respondent's commuting zone, value-weighted by market capitalization and standardized to sd=1. Market Return Past Year refers to the value-weighted average total return of all U.S. stocks. Controls include indicators for categories of household income, age, education, and numeracy, and the variable which is interacted with Local Return Past Year and Market Return Past Year. At the bottom of the table we report estimates for Local Return Past Year and Market Return Past Year from models without the interaction terms. We restrict the sample to observations with survey tenure > 6. Standard errors are clustered at the state level. Significance levels: *p < 0.10, **p < 0.05, ***p <0.01.

Dependent Var.:	Stock Market Belief											
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Local Return Past Year	0.025	0.030*	0.031	0.065***	0.017	0.009	0.075	0.158	0.019	0.021	0.032*	0.025
	(0.029)	(0.017)	(0.019)	(0.024)	(0.044)	(0.117)	(0.047)	(0.154)	(0.031)	(0.027)	(0.019)	(0.016)
… x VIX	0.000											
	(0.001)											
… x Volatility of Means		-0.139										
		(0.409)										
… x Volatility of Volatilities			-1.979									
			(6.173)									
… x World Uncert. Index				-0.002								
				(0.001)								
… x Macro Uncert. 1m					0.011							
					(0.057)							
… x Macro Uncert. 12m						0.016						
						(0.124)						
… x Financial Uncert. 1m							-0.053					
							(0.047)					
… x Financial Uncert. 12m								-0.133				
								(0.152)				
… x Policy Uncert. 3 Comp.									0.000			
									(0.000)			
… x Policy Uncert. News										0.000		
										(0.000)		
… x Twitter Economic Unc.											-0.000	
											(0.000)	
… x Twitter Market Unc.												0.000
												(0.000)
Market Return Past Year	0.128***	0.052*	0.066**	0.039	0.376***	1.024***	0.341***	1.290**	0.194***	0.152***	0.046	0.031
	(0.044)	(0.027)	(0.030)	(0.036)	(0.102)	(0.276)	(0.124)	(0.491)	(0.067)	(0.053)	(0.029)	(0.020)
… x VIX	-0.006***											
	(0.002)											
… x Volatility of Means		-1.450***										
		(0.452)										
… x Volatility of Volatilities			-18.332***									
			(6.093)									
… x World Uncert. Index				-0.002								
				(0.001)								
… x Macro Uncert. 1m					-0.460***							
					(0.127)							
… x Macro Uncert. 12m						-1.049***						
						(0.285)						
… x Financial Uncert. 1m							-0.330***					
							(0.122)					
… x Financial Uncert. 12m								-1.259**				
								(0.482)				
… x Policy Uncert. 3 Comp.									-0.001***			
									(0.000)			
… x Policy Uncert. News										-0.001***		
										(0.000)		
… x Twitter Economic Unc.											-0.000*	
											(0.000)	
… x Twitter Market Unc.												-0.000***
												(0.000)
Estimates without Interaction Terms:												
Local Return Past Year	0.026*	0.026**	0.026**	0.026**	0.024*	0.024*	0.024*	0.024*	0.026**	0.026**	0.026**	0.026**
	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
Market Return Past Year	0.029	0.002	0.010	-0.005	-0.008	-0.008	-0.008	-0.008	-0.005	-0.005	0.011	-0.013
	(0.021)	(0.018)	(0.019)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.016)	(0.015)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fixed-Effects:												
Survey Tenure	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Survey-Month	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	42,528	42,576	42,576	42,576	35,694	35,694	35,694	35,694	42,576	42,576	42,576	42,576
R^2	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Within R^2	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05

A5. Extreme Levels of VIX

Table 17: Extreme Levels of the VIX index and Extrapolation from Past Returns

This table shows regression estimates of equation (X). The dependent variable refers to the percent chance that, on average, stock prices in the U.S. will be higher in one year, as stated by respondents. Local Stock Return Past Year refers to the average total return of all listed firms with headquarters in the respondent's commuting zone, value-weighted by market capitalization. Market Return Past Year refers to the value-weighted average total return of all U.S. stocks. VIX refers to the average of the VIX index from the CBOE over the past week. Very Low (High) VIX indicates whether the level of the VIX is in the bottom (top) decile over the sample period. Demographics include indicators for categories of household income, age, education, and numeracy. Estimates are based on the subsample with survey tenure > 6. Standard errors are clustered at the state level. Significance levels: *p < 0.10, **p < 0.05, ***p <0.01

Dependent Var.:	Stock Market Belief			
	(1)	(2)	(3)	(4)
Local Return Past Year	0.025	0.027**	0.024*	0.026*
	(0.029)	(0.013)	(0.014)	(0.013)
Local Return Past Year x VIX	0.000			
	(0.001)			
Local Return Past Year x Very Low VIX		-0.012		
		(0.033)		
Local Return Past Year x Very High VIX			0.008	
			(0.023)	
Local Return Past Year x Very Low or High VIX				-0.001
				(0.031)
Aggr. Return Past Year	0.128***	-0.002	0.005	0.013
	(0.044)	(0.015)	(0.019)	(0.017)
Aggr. Return Past Year x VIX	-0.006***			
	(0.002)			
Aggr. Return Past Year x Very Low VIX		-0.054		
		(0.085)		
Aggr. Return Past Year x Very High VIX			-0.074***	
			(0.027)	
Aggr. Return Past Year x Very Low or High VIX				-0.084**
				(0.039)
Controls:				
Demographics	Yes	Yes	Yes	Yes
Fixed-Effects:				
Survey Tenure	Yes	Yes	Yes	Yes
Survey-Month	Yes	Yes	Yes	Yes
Respondent	No	No	No	No
Observations	42,528	42,528	42,528	42,528
R^2	0.06	0.06	0.06	0.06
Within R^2	0.05	0.05	0.05	0.05

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