Web Appendix:

Investor Behavior under Epistemic versus Aleatory Uncertainty

Table of Contents

A. EARS Reliability and Factor Analysis

Table S1 provides reliability scores (Cronbach's alpha) of the epistemic and aleatory subscales for Studies 1-4, and Table S2 provides the same information for all supplemental studies that used the EARS (Studies S2-S4). For each study we responses on the EARS to a principal axis factor analysis (varimax rotation), and also conducted parallel analyses for each study to determine the number of factors to retain (Horn, 1965). Parallel analysis involves calculating eigenvalues from randomly-generated correlation matrices (1,000 correlation matrices per study, in our case), and then retaining factors where the observed eigenvalues are greater than the mean eigenvalues constructed from the random matrices. Figure S1 plots the observed eigenvalues and parallel random eigenvalues for all studies. Using this approach we consistently retain a two-factor solution.[1] Tables S3 and S4 provide rotated factor loadings for each item of the EARS. We consistently see that one factor loads on to ratings of epistemic uncertainty, and the other factor loads on to ratings of aleatory uncertainty. Across studies, the EARS yields a two-factor model that corresponds well to our conceptual dimensions of epistemic and aleatory uncertainty.

[1] For Studies 4A and S3 we observe a third eigenvalue just above the threshold determined by the parallel analysis. For these studies we retain a two-factor solution when using a more conservative procedure to avoid over-retaining factors by taking eigenvalues at the 95% percentile of the distribution from the parallel analysis (Glorfield, 1995).

Table S1. EARS reliability scores for Studies 1-4C

	Cronbach's α		
	Epistemic Subscale	Aleatory Subscale	Correlation
Study 1	0.804	0.796	0.436
Study 2	0.755	0.657	0.127
Study 3	0.683	0.723	–0.214
Study 4A	0.771	0.700	–0.058
Study 4B	0.842	0.734	0.039
Study 4C	0.900	0.841	–0.304

Notes: The column labeled "correlation" provides the Pearson's product-moment correlation between the Epistemic and Aleatory indices.

Table S2. EARS reliability scores for Studies S2-S4

	Cronbach's α		
	Epistemic Subscale	Aleatory Subscale	Correlation
Study S2	0.784	0.713	–0.113
Study S3	0.786	0.767	–0.145
Study S4	0.709	0.810	–0.151

Notes: The column labeled "correlation" provides the Pearson's product-moment correlation between the Epistemic and Aleatory indices.

Table S3. EARS rotated factor loadings for Studies 1-4C

	Study 1		Study 2		Study 3		Study 4A		Study 4B		Study 4C	
Item	1	2	1	2	1	2	1	2	1	2	1	2
E1	**0.745**	0.196	**0.654**	0.073	**0.656**	–0.159	**0.682**	–0.107	**0.767**	–0.006	**0.824**	–0.165
E2	**0.682**	0.220	**0.691**	0.008	**0.515**	0.012	**0.693**	0.034	**0.751**	0.046	**0.823**	–0.128
E3	**0.714**	0.189	**0.690**	0.089	**0.620**	–0.146	**0.708**	–0.021	**0.810**	0.014	**0.864**	–0.140
A1	0.378	**0.627**	0.194	**0.591**	–0.045	**0.576**	0.017	**0.616**	0.020	**0.774**	–0.083	**0.755**
A2	0.191	**0.529**	–0.010	**0.494**	–0.153	**0.489**	–0.033	**0.568**	0.122	**0.735**	–0.153	**0.723**
A3	0.161	**0.695**	0.010	**0.667**	–0.155	**0.674**	–0.065	**0.703**	–0.070	**0.784**	–0.234	**0.795**

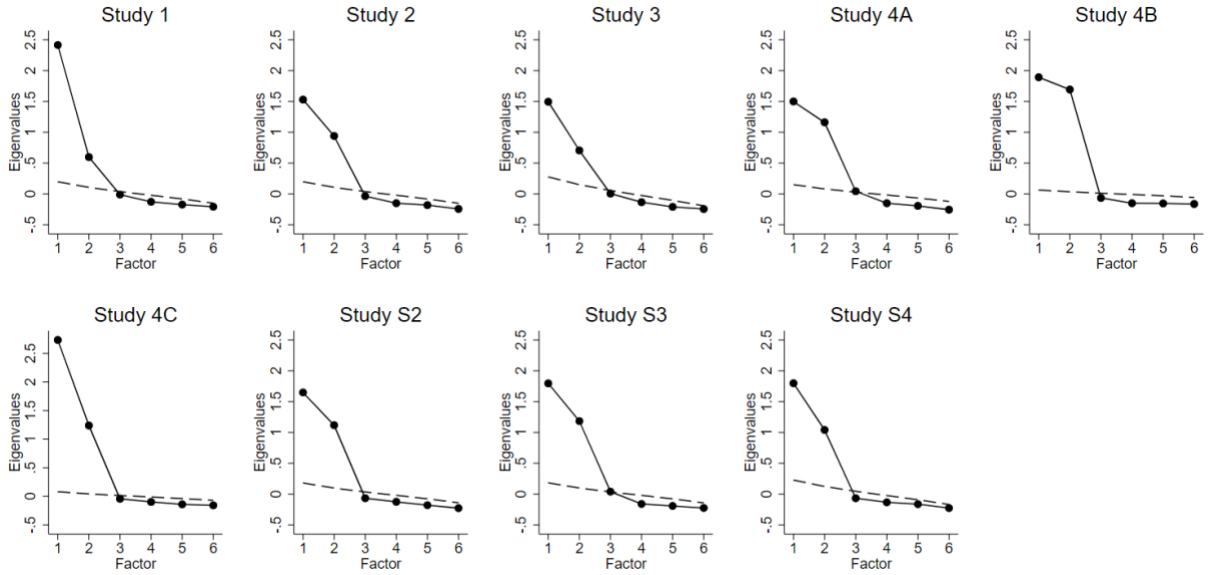
Notes: Factor loadings above 0.40 are shown in boldface.

Table S4. EARS rotated factor loadings for Studies S2-S4

	Study S2		Study S3		Study S4	
Item	1	2	1	2	1	2
E1	**0.723**	–0.138	**0.746**	–0.103	**0.617**	–0.091
E2	**0.656**	–0.040	**0.677**	–0.078	**0.582**	–0.045
E3	**0.740**	0.002	**0.704**	–0.039	**0.680**	–0.106
A1	–0.027	**0.664**	–0.061	**0.689**	–0.082	**0.742**
A2	0.023	**0.542**	–0.005	**0.639**	–0.032	**0.676**
A3	–0.139	**0.701**	–0.134	**0.740**	–0.089	**0.783**

Notes: Factor loadings above 0.40 are shown in boldface.

Figure S1. EARS scree plots for Studies 1-4 and Studies S2-S4



Notes: scree plots based on the observed eigenvalues for each study (solid lines) and parallel random eigenvalues based on 1,000 random matrices (dashed lines; Horn, 1965).

B. Study 1: Analysis of Trading Frequency

We conducted an exploratory analysis of trading frequency behavior and fee paid to a financial advisor. We suspected that perceptions of greater epistemic uncertainty would be associated with higher trading frequency since informed investors may have felt they had more frequent opportunities to earn excess returns through market timing. However, it is also possible that perceptions of greater aleatory uncertainty could be associated with higher trading frequency as investors may see more random fluctuations around the predictable value of stocks. To examine this, we first conducted an OLS regression on the number of changes investors made to their portfolio. As displayed in model 1 of Table S5, we found that both epistemic and aleatory uncertainty ratings were significantly and positively associated with greater trading frequency. This pattern holds when including additional controls (model 2). We surmise that epistemicness is associated with shorter holding periods because greater inherent knowability (i.e., higher perceived epistemicness) gives rise to more trading opportunities. Although we did not predict or expect that aleatory uncertainty would also be related to trading frequency, one plausible interpretation is that investors who view fluctuations in market prices as more random (i.e., as not reflecting underlying fundamentals) attempt to capitalize on these fluctuations by trading more often. For instance, if a stock price drops and an investor believes this dip represents purely stochastic movements around a stock's "true price" then the investor may also expect the stock to rebound.

We also examined the subset of investors (49% of our sample) who had a financial advisor. Among this group we tested whether beliefs of epistemic uncertainty were positively associated with the relative amount paid to financial advisors. We conducted a fractional logit

model (where responses can take any value between 0 and 1) with fees paid to the financial advisor as our dependent variable (fees were calculated as a percentage of the investor's assets under management). As displayed in model 3, ratings of epistemic uncertainty are significantly and positively associated with the amount paid to financial advisors, whereas the association with aleatory uncertainty is not statistically significant. This pattern also holds at when including additional controls (model 4).

Table S5. Study 1 regression estimates of stock market uncertainty beliefs on trading frequency and fee to advisor

	DV: Trading Frequency		DV: Fee to Advisor	
	(1)	(2)	(3)	(4)
Epistemicness	0.292*** (0.059)	0.240*** (0.062)	0.052** (0.015)	0.030* (0.015)
Aleatoriness	0.222** (0.067)	0.198** (0.069)	0.020 (0.024)	0.011 (0.022)
Risk Perception (DOSPERT)		0.051 (0.054)		0.031 (0.017)
Net investment value		0.096 (0.059)		0.020 (0.014)
Other assets		–0.067 (0.062)		0.009 (0.016)
Number of stocks held		0.006 (0.003)		0.001 (0.001)
Financial Literacy		–0.218 (0.131)		–0.065* (0.030)
Observations	354	354	175	175

Notes: For trading frequency, estimates represent OLS coefficients (robust standard errors in parentheses). For fee to advisor, responses are scaled as a percentage of the investor's assets under management (from 0 to 1) and estimates represent the average marginal effect from a fractional logit model. Epistemicness and aleatoriness are coded on 7-point scales; Risk Perception is coded on a 7-point scale (1 = not at all risky, 7 = extremely risky); Net investment value and other assets coded on a 7-point scale (1 = $0 to $1,000, 2 = $1,000 to $50,000, 3 = $50,000 to $100,000, 4 = $100,000 to $250,000, 5 = $250,000 to $500,000, 6 = $500,000 to $1,000,000, and 7 = $1,000,000 or more); Number of stock held was coded as the number of stocks held (winsorized at 100 stocks); Financial literacy as the number of questions answered correctly (0 to 3). $^{\dagger}p < 0.10$, $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$.

C. Equity Research Firm Analysis

100 companies selected from the S&P500:

SBAC	SBA Communications
CF	CF Industries Holdings Inc
WMB	Williams Cos.
ECL	Ecolab Inc.
VFC	V.F. Corp.
WFC	Wells Fargo
AEP	American Electric Power
GOOGL	Alphabet Inc Class A
HPQ	HP Inc.
ANTM	Anthem Inc.
RHI	Robert Half International
WCG	WellCare
EXC	Exelon Corp.
CINF	Cincinnati Financial
MGM	MGM Resorts International
SWK	Stanley Black & Decker
PVH	PVH Corp.
UHS	Universal Health Services, Inc.
HOG	Harley-Davidson
VLO	Valero Energy
TEL	TE Connectivity Ltd.
DE	Deere & Co.
OXY	Occidental Petroleum
XRAY	Dentsply Sirona
UTX	United Technologies
CMA	Comerica Inc.
NWL	Newell Brands
GPN	Global Payments Inc.
HP	Helmerich & Payne
ADI	Analog Devices, Inc.
FLIR	FLIR Systems
AON	Aon plc
FRC	First Republic Bank
GRMN	Garmin Ltd.
AGN	Allergan, Plc

CERN	Cerner
WY	Weyerhaeuser
AJG	Arthur J. Gallagher & Co.
RE	Everest Re Group Ltd.
AMD	Advanced Micro Devices Inc
DRE	Duke Realty Corp
MKC	McCormick & Co.
CNC	Centene Corporation
FRT	Federal Realty Investment Trust
GD	General Dynamics
UAA	Under Armour Class A
AKAM	Akamai Technologies Inc
GPS	Gap Inc.
ADSK	Autodesk Inc.
TRIP	TripAdvisor
PH	Parker-Hannifin
FIS	Fidelity National Information Services
UPS	United Parcel Service
NCLH	Norwegian Cruise Line
T	AT&T Inc.
SYK	Stryker Corp.
ROP	Roper Technologies
FE	FirstEnergy Corp
HSIC	Henry Schein
COG	Cabot Oil & Gas
HD	Home Depot
NUE	Nucor Corp.
MDT	Medtronic plc
ARNC	Arconic Inc.
MSCI	MSCI Inc
KSS	Kohl's Corp.
FB	Facebook, Inc.
APA	Apache Corporation
FL	Foot Locker Inc
CMI	Cummins Inc.
LIN	Linde plc
GE	General Electric
FFIV	F5 Networks

WMT	Walmart
PLD	Prologis
CTAS	Cintas Corporation
DWDP	DowDuPont
RF	Regions Financial Corp.
TPR	Tapestry, Inc.
WRK	WestRock
BAC	Bank of America Corp
SIVB	SVB Financial
SWKS	Skyworks Solutions
CMS	CMS Energy
CTL	CenturyLink Inc
ALGN	Align Technology
PXD	Pioneer Natural Resources
HAS	Hasbro Inc.
WU	Western Union Co
AVY	Avery Dennison Corp
AFL	AFLAC Inc
IR	Ingersoll-Rand PLC
AMAT	Applied Materials Inc.
CAH	Cardinal Health Inc.
RMD	ResMed
EQIX	Equinix
CPB	Campbell Soup
FMC	FMC Corporation
KR	Kroger Co.
HCP	HCP Inc.

Top Ranked Analysts Firms in Institutional Investor's 2018 Rankings:

Bank of America Merrill Lynch
Barclays
Bernstein
BMO Capital Markets
Citi
Cornerstone Macro
Cowen and Co.
Credit Suisse
Deutsche Bank
Empirical Research Partners
Evercore ISI
Goldman Sachs
J.P. Morgan
Jefferies
Keefe, Bruyette & Woods
KeyBanc Capital Markets
Leerink Partners
MoffettNathanson
Morgan Stanley
Raymond James
RBC
Renaissance Macro Research
Robert W. Baird & Co.
Strategas Research Partners
UBS
Vertical Research Partners
Wells Fargo Securities
Wolfe Research

D. Study 2 Mediation Analysis with Uncertainty as a Control Variable

We replicated the mediation analysis as described in Study 2 while adding uncertainty level (i.e., confidence interval width) as a control variable to all models in the path analysis. First, looking at WTP for financial advice, we find that statistically controlling for epistemicness and aleatoriness reduces the effect of chart format by 28.5%, $b = 0.38$, 95% CI = [0.03, 0.74], $p = 0.037$. This decomposes into a 36.4% indirect effect due to perceptions of epistemicness, $b = 0.48$, 95% CI = [0.22, 0.81], $p = 0.001$, and a nonsignificant –7.9% indirect effect due to perceptions of aleatoriness, $b = –0.10$, 95% CI = [–0.27, 0.02], $p = 0.153$. Next, looking at diversification, we find that statistically controlling for epistemicness and aleatoriness reduces the effect of chart format by 89.7%, $b = –12{,}345.93$, 95% CI = [–19,944.68, –6,955.16], $p < 0.001$. This decomposes into a 71.5% indirect effect due to perceptions of aleatoriness, $b = –9{,}834.83$, 95% CI = [–16,193.74, –5,340.06], $p < 0.001$, and a 18.2% indirect effect due to perceptions of epistemicness, $b = –2{,}511.10$, 95% CI = [–5,851.13, –568.72], $p = 0.049$.

E. Study 4 Regression Estimates of Investment Decisions with Interacted Controls

Table S6

	Study 4A	Study 4B	Study 4C
Risk Preference	0.943*** (0.199)	0.072 (0.373)	1.20*** (0.244)
Epistemicness	–0.079 (0.087)	0.307** (0.118)	0.072 (0.064)
Aleatoriness	0.053 (0.098)	–0.368** (0.120)	0.063 (0.077)
Epistemicness x Risk Preference	–0.001 (0.077)	–0.067 (0.049)	–0.112† (0.060)
Aleatoriness x Risk Preference	0.247** (0.090)	0.135* (0.054)	0.170* (0.068)
Controls	Yes	Yes	Yes
Participants	549	361	291
Observations	549	2,873	1,744

Notes: Estimates represent log odds coefficients from logistic regression (robust standard errors in parentheses). The outcome variable in all models in whether participants choose the uncertain investment decision (0 = reject, 1 = accept). Risk preference is measured on a 4-point scale (1 = strongly risk averse, 4 = risk seeking; mean-centered), and epistemicness and aleatoriness on 7-point scales (both mean centered). Study 4A includes the following controls: participant gender (0 = female, 1 = male), age (in years; mean centered), total investment assets (US dollars; mean-centered), whether participants predicted the market to go up or down in the following six months (0 = down, 1 = up), and likelihood their prediction is correct (0 to 1; mean-centered), and general investment knowledge (1 = low, 5 = high; mean-centered). Studies 4B and 4C include all the previously listed controls plus company specific knowledge (1 = very low, 7 = very high; mean-centered). Study 4C also asks an additional measure of confidence on a 7-point scale (1 = not at all confident, 7 = extremely confident; mean-centered). Company fixed effects are included in Study 4B and time period fixed effects are included in Study 4C. All controls are interacted with risk preference. $^{\dagger}p < 0.10$, $*p < 0.05$, $**p < .01$, $***p < .001$.

F. Study S1: Validation of Uncertainty Measure

The purpose of this study was the validate the methodology we used to measure level of uncertainty in Study 2. If chart format (absolute versus relative price returns) only influences nature of uncertainty, then participants' confidence intervals over future prices (i.e., our measure of uncertainty level) should not be reliably affected by chart format. However, confidence intervals *should* be influenced by objective factors associated with greater uncertainty, such as the volatility of price returns. Here, we conduct a 2 (chart format) x 2 (chart volatility) between-participant design. We expected that participants would give wider confidence intervals (i.e., report greater uncertainty) when prices reflected greater volatility, but that confidence intervals would not meaningfully vary as a function of chart format. Our preregistration plan, along with data, code, and materials for this study can be found at https://researchbox.org/ 180.

Method

We recruited 406 participants (13% male, mean age = 24 years, range: 18–56 years) from Prolific Academic to complete a short survey in exchange for £0.40.

Participants were randomly assigned to evaluate four stocks, displayed in either a relative price chart (designed to promote impressions of aleatoriness) or an absolute price chart (designed to promote impressions of epistemicness). We also randomly assigned participants to view a chart with either high or low volatility stocks to experimentally manipulate level of subjective uncertainty. Charts in the low volatility condition were the same as in Study 2. These charts showed the monthly movement of Facebook and Target stock with 1 month price estimates. We generated high volatility charts by doubling the size of each monthly stock movement.

Participants were then asked to respond to an 80% confidence interval question adopted from Soll and Klayman (2004), which was the same as in Study 2. Participants provided an 80% confidence interval on the value of $1,000 invested over 1 month for, separately, Facebook and Target stocks. Participants could not provide negative confidence intervals (i.e., they could not proceed if their low estimate was greater than their high estimate). As in Study 1, we dropped participants that provided confidence interval ranges more than $2,500, in line with our preregistered exclusion criteria. We chose a maximum range of $2,500 as it represented approximately 15 times the standard deviation of monthly movement shown in the charts for both stocks. Applying this criterion resulted in the exclusion of 8 participants.

Results and Discussion

We examine confidence intervals given for each stock (Facebook and Target) separately. First, looking at responses to Facebook stock prices, we examined confidence interval widths using a 2 (chart format) × 2 (chart volatility) analysis of variance. As expected, we find a reliable main effect for chart volatility, such that participants gave wider confidence intervals when viewing high volatility stocks (M = 315.92, SD = 336.97) than when viewing low volatility stocks (M = 229.21, SD =180.41), $F(1, 394) = 9.59$, $p = 0.002$. Importantly, we also do not find a significant main effect of chart format on level of uncertainty, $F(1, 394) = 0.59$, $p = 0.444$. Confidence intervals were not reliably wider after viewing a relative chart (M = 287.56, SD = 262.20) than after viewing an absolute chart (M = 257.00, SD = 282.36). There was also no significant interaction between chart format and chart volatility on level of uncertainty, $F(1, 394) = 0.11$, $p = 0.736$.

Next, we examine responses to Target stock prices, using the same analysis. Similar to before, we find a reliable main effect of chart volatility such that participants reported wider confidence intervals when viewing high volatility stocks (M = 307.36, SD = 337.84) than when viewing low volatility stocks (M = 228.51, SD = 201.77), $F(1, 394) = 6.98$, $p = 0.009$. Importantly, we again do not find a reliable main effect for chart format, $F(1, 394) = 2.25$, $p = 0.134$. Confidence intervals were not reliably wider when after viewing a relative chart (M = 242.52, SD = 267.06) than after viewing an absolute chart (M = 293.07, SD = 291.14). There was also no significant interaction between chart format and chart volatility on level of uncertainty, $F(1, 394) = 0.00$, $p = 0.958$.

The results of Study S1 suggest that confidence interval width is a valid measure of subjective level of uncertainty. Confidence intervals grew in size when participants viewed price charts with more (objective) uncertainty, in the form of greater price volatility. This was true both when the charts were presented as absolute and relative prices, and we did not find a reliable difference in responses between the two charts.

G. Study S2: Replication of Study 2 WTP Results

In Study S2 we focus on the relationship between assessments of epistemicness and willingness to pay for financial advice. We predicted that participants will pay more for an analyst's advice concerning a new stock when prior predictions of trending stocks were presented in absolute rather than relative prices, and that this effect would be statistically mediated by assessments of epistemicness (but not necessarily aleatoriness) of stock forecasting accuracy. We also control for perceived level of uncertainty to address the possibility that chart format also impacts degree of uncertainty. In this study we develop stimuli with a single stock and employ amateur investors as participants. Our preregistration plan, along with data, code, and materials for this study can be found at https://researchbox.org/180.

Method

We recruited 407 participants (49% male, mean age = 31 years, range: 18–65 years) from an online labor market (Prolific Academic)[2] to participate in a brief study for £0.40 each. Participants read that they would make an investment decision after viewing stock recommendations from a professional stock analyst. Participants were also told that stock prices shown in the study came from real companies whose identities had been concealed. We avoided using real stock names in order to reduce variation in behavior due to differences in stock familiarity (Song and Schwarz 2008) or company-specific understanding (Long, Fernbach, and De Langhe 2018).

[2] All studies run on Prolific Academic recruited participants only from the United Kingdom and United States.

We next showed participants a chart of an analyst's past performance in predicting a stock price (generated from simulated data). Participants were randomly assigned to view predicted and realized outcomes either in terms of absolute prices (*absolute price chart*) or as the percentage change in the stock price relative to the previous period (*relative price chart*). Data points in both charts represent quarterly intervals from 2003 to 2020, and participants were told that the analyst made forecasts exactly three months in advance.

After viewing the stock chart, we asked participants to imagine having $1,000 to invest between the company displayed in the price chart (Stock A) and another company (Stock B). Next, we asked them to indicate their maximum willingness to pay (WTP) to see price forecasts for Stocks A and B from a different analyst, from a list of 11 prices ranging from $0 to $400 (logarithmically spaced). We coded WTP responses as taking a value between 0 and 10 based on the maximum price selected. Note that we elicited willingness to pay for a *new analyst* to help ensure that WTP is driven by perceived knowability of future stock prices and not by the perceived skill of the original analyst.

We then asked participants to rate epistemicness and aleatoriness of the task of forecasting the price of the stock over three months, using the 6-item EARS. Participants also rated their level of uncertainty associated with the stock depicted in the price chart, by providing their 90% confidence interval over the next month's average return for the stock (cf. Soll and Klayman, 2004).[3] We randomized for each participant the order of the EARS and the confidence interval elicitation.

[3] We calculated confidence interval width by taking the absolute difference between each participant's high and low estimate. We note that for 9.8% of trials, participants provided a negative confidence interval (i.e., their low estimate

Finally, participants completed a comprehension check. In particular, we presented them with the original stock chart again and asked them to indicate by how much the analyst had missed their first quarter forecast. We gave participants two response options: 1 percentage point or 10 percentage points (the latter being the correct response). Finally, participants indicated their sex and age and were debriefed.

Results and Discussion

We report all test statistics and *p*-values using robust standard errors.

Comprehension check. The majority of participants correctly interpreted that the analyst missed the first forecast by 10 percentage points when the charts were presented in absolute prices (89% responding correctly) and in relative prices (83% responding correctly), $z = 1.84$, $p = .065$. We retain all participants in the analysis reported below because this is what we specified in our preregistration analysis plan; restricting the analysis to participants who correctly answered all comprehension check questions does not change the direction or statistical significance of our findings.

Manipulation check. As expected, participants rated the stock as entailing greater epistemicness when viewing absolute prices ($M = 4.79$, $SD = 1.24$) than relative prices ($M = 4.01$, $SD = 1.17$), $t(405) = 6.54$, $p < 0.001$, $d = 0.65$. Participants also rated the stock as entailing greater aleatoriness when viewing relative prices ($M = 4.86$, $SD = 1.04$) than absolute prices ($M = 4.54$, $SD = 1.30$), $t(405) = 2.72$, $p = 0.007$, $d = 0.27$. We also examined whether chart format

was larger than their high estimate). By taking the absolute difference we interpret negative confidence intervals as participants providing their honest estimates but mixing up the high and low response options. Our results do not meaningfully change if we instead exclude negative confidence intervals from the analysis.

had any meaningful effect on subjective level of uncertainty (i.e., confidence intervals). Confidence interval widths were not reliably larger when outcomes were presented as relative prices (M = 1.18, SD = 10.52) than as absolute prices (M = 1.25, SD = 14.13), $t(405) = 0.06$, p = 0.953, d = 0.01. Thus, our manipulation appears to have reliably shifted perceptions of the nature of uncertainty while not meaningfully altering perceptions of level or amount of uncertainty.

Willingness to pay. As predicted, willingness to pay was higher when outcomes were presented as absolute prices (M = 5.07, SD = 2.58) than relative prices (M = 4.51, SD = 2.61), $t(405) = 2.19$, p = 0.029, d = 0.22. The median response in the absolute chart condition corresponded to a willingness to pay of $25, whereas the median response in the relative chart condition corresponded to a willingness to pay of $13. As a robustness check we regressed willingness to pay onto chart format and confidence interval width, and found that chart format continued to predict willingness to pay, b = 0.56, 95% CI = [0.06, 1.07], p = 0.029, whereas level of uncertainty (i.e., confidence interval width) did not reliably predict willingness to pay, b = 0.00, 95% CI = [–0.03, 0.04], p = 0.785.

Mediation analysis. We next examined whether the treatment effect of chart format on willingness to pay was statistically explained by differences in perceived nature of uncertainty across conditions. We tested this using a path model with WTP as the dependent variable, chart format as the independent variable (0 = *relative price chart*, 1 = *absolute price chart*), and ratings of epistemicness, and aleatoriness as separate mediator variables. We estimated all indirect effects using bias-corrected bootstrapped confidence intervals based on 10,000 resamples. As predicted, we found a statistically reliable indirect effect through ratings of

epistemicness, $b = 0.61$, 95% CI = [0.37, 0.90], $p < 0.001$. We find a weaker indirect effect through ratings of aleatoriness, $b = –0.09$, 95% CI = [–0.22, –0.02], $p = 0.060$.

H. Study S3: Replication of Study 2 WTP Results

This study uses a similar intervention to that in Study 2 and S2, but using a within-participants design. We predicted that participants would report a greater willingness to pay for stock advice after viewing an absolute price chart than after viewing a relative price chart, and that this effect would be statistically mediated by assessments of epistemicness (but not necessarily aleatoriness) of future stock prices. Our preregistration plan, along with data, code, and materials for this study can be found at https://researchbox.org/180.

Method

We recruited 201 participants (61% male, mean age = 36 years, range: 18–84 years) from an online labor market (Prolific Academic)[4] to participate in a brief study for £0.60 each. We told participants that they would read stock recommendations from two professional stock analysts, Richard and Phillip, and would subsequently be asked to make investment decisions. Participants were also informed that they would learn stock prices from real companies whose identities had been concealed by using generic labels (e.g., Stock A). We avoided using real stock names so that there would not be variation in behaviors due to differences in stock familiarity (Song and Schwarz 2008) or company-specific understanding (Long, Fernbach, and De Langhe 2018). In order to promote roughly equivalent risk perceptions, we explicitly told participants that each stock carried a similar level of risk.

We next asked participants to evaluate recommendations from the two stock analysts, and displayed a chart of each analyst's past performance in one of two formats, generated from the

[4] All studies run on Prolific Academic recruited participants only from the United Kingdom and United States.

same simulated data. Approximately half of participants first saw forecasts and outcomes presented in terms of absolute prices (*absolute price chart*) followed by the same forecasts and outcomes presented in terms of percentage change in the stock price relative to the previous period (*relative price chart*). The other half of participants viewed the two graphs in the opposite order (we observed no significant order effects so we combined order conditions in all analyses reported below). Thus, all participants viewed the same prediction and performance data twice, presented in two different formats, in randomized order. In both charts data points represent quarterly intervals from 2000 to 2017. Participants were told that each analyst made forecasts exactly three months in advance and had the best track record of any analyst at predicting the company shown in the chart. Furthermore, we scaled the absolute and relative price charts so that the visual magnitude (i.e., vertical length) of analyst errors was equivalent across presentation formats.

Following the presentation of each stock chart, all participants completed two question blocks in randomized order. One block measured subjective nature of uncertainty by asking participants to rate the epistemicness and aleatoriness, using the 6-item EARS applied to "the task of forecasting the price of Stock A over three months." The other block measured participants' willingness to pay (WTP) to receive a forecast from the same analyst concerning two new stocks. For example, in one version participants read:

> Now, imagine you have $1,000 that you must invest in one of two other stocks, Stock B or Stock C (the real names of these stocks have also been hidden). Richard, the expert stock analyst, can forecast the price of Stock B and Stock C to the same degree of accuracy as Stock A, as shown above. Please indicate if you would be willing to pay the amounts below to see Richard's forecast for these stocks if you were making this investment in real life.

Participants next indicated whether or not they would be willing to pay to see the analyst's forecast from a price list of 16 choices that ranged from "$0.01" to "$1,000 or more" in approximately logarithmic increments. For each of the 16 prices, participants indicated whether they would or would not be willing to pay that amount. Unlike in Studies 2 and S2, in which we coded WTP responses according to likert scale points, here we coded responses as the largest value that participants indicated that they would be willing to pay, $0 if they were not willing to pay any amount, and $1,000 if they were willing to pay $1,000 or more. We use this coding scheme because this is what we specified in our preregistration analysis plan. We also omitted data from 22% of participants whose responses violated dominance (e.g., a participant stating they are willing to pay $15, but not $10), again as specified in our preregistration plan.

At the end of the study, participants completed a comprehension check and answered some basic demographic questions. The comprehension check questions were included to make sure that the participants correctly interpreted the information presented in the charts in both conditions. We showed the participants the same charts they had viewed earlier, and for each chart we asked them whether points on the chart represented: (a) the stock price or (b) the percentage change in the stock price. We also asked the participants when the stock analyst had made each forecast: (a) three months in advance or (b) all of the forecasts were made before 2000.

Results and Discussion

Since our study uses a repeated-measures design, we report all test statistics and *p*-values using robust standard errors clustered by participants.

Comprehension check. A large majority of participants appear to have properly understood the task materials. The majority of participants (82%) viewing the absolute price chart correctly responded that each point on the graph represents a stock price, and the same percentage of participants in the relative price chart condition answered the comprehension question correctly (82%), $z = 0.00$, $p = 1.00$. Furthermore, 88% of the participants in the relative price chart condition and 83% of the respondents in the absolute price chart condition correctly responded that forecasts were made three months in advance, $z = 1.40$, $p = 0.162$. We retain all 201 participants in the analysis reported below because this is what we specified in our preregistration analysis plan; restricting the analysis to participants who correctly answered all comprehension check questions does not change the direction or statistical significance of our findings.

Manipulation check. We predicted that participants would view stock market uncertainty as higher in epistemicness in the absolute price condition and as higher in aleatoriness in the relative price condition. As expected, participants rated stock market uncertainty as higher in epistemicness when outcomes were presented as absolute prices ($M = 5.12$, $SD = 1.05$) than relative prices ($M = 4.66$, $SD = 1.24$), $t(200) = 5.34$, $p < 0.001$, $d = 0.40$. By contrast, participants rated stock market uncertainty as higher in aleatoriness when outcomes were presented as relative prices ($M = 4.98$, $SD = 1.14$) than absolute prices ($M = 4.49$, $SD = 1.32$), $t(200) = 5.62$, $p < 0.001$, $d = 0.40$.

Willingness to pay. Consistent with our model, participants expressed greater willingness to pay for stock advice when outcomes were presented as absolute prices ($M =$ \$158.91, $SD =$ \$266.00) than when outcomes were presented as relative prices ($M =$ \$86.56, SD

= $181.74), $t(162) = 3.90$, $p < 0.001$, $d = 0.32$. To get a sense of the difference in responses between the two conditions, the median stated WTP was $50 when viewing an absolute price chart and $25 when viewing the relative price chart. Because we measured WTP using a roughly logarithmic scale we also conducted two additional (preregistered) robustness checks by transforming the data. First, we log-transformed WTP and again found that participants expressed greater willingness to pay for advice when the analyst's performance was presented in absolute rather than relative prices, $t(162) = 4.69$, $p < 0.001$. We also performed an inverse hyperbolic sine transformation of WTP, and again found a similar pattern, $t(162) = 5.47$, $p < 0.001$.

Mediation analysis. We next examined whether higher WTP for financial advice in the relative price condition, compared to the absolute price condition, could be statistically explained by differences in perceptions of epistemicness and aleatoriness. We tested this using a path model with WTP as the dependent variable, condition (0 = *relative price chart*, 1 = *absolute price chart*) as the independent variable, and ratings of epistemicness and aleatoriness as separate mediator variables. We then estimated indirect effects for epistemicness and aleatoriness by calculating bias-corrected bootstrapped confidence intervals based on 10,000 resamples. When using raw WTP, we found a statistically reliable indirect effect through ratings of epistemicness (as predicted), $b = 42.18$, 95% CI = [22.78, 66.88], $p < 0.001$, and a marginally significant effect in the opposite direction (that we did not predict) through ratings of aleatoriness, $b = –14.42$, 95% CI = [–35.57, –1.06], $p = 0.086$. When using the log and inverse hyperbolic sine transformations of WTP, we again found a statistically reliable indirect effect through perceptions of epistemicness $b_{log} = 0.39$, 95% CI = [0.18, 0.66], $p = 0.001$; $b_{ihs} = 0.37$, 95% CI =

[0.22, 0.58], $p < 0.001$. Moreover, both times we did not find a reliable indirect effect through perceptions of aleatoriness, $b_{log} = 0.01$, 95% CI = [–0.13, 0.18], $p = 0.897$; $b_{ihs} = –0.02$, 95% CI = [–0.14, 0.09], $p = 0.689$. Thus, our results confirmed our major prediction that participants would be willing to pay more for financial advice when a stock chart was presented in a format that conveyed perceptions of greater epistemicness.

I. Study S4: Replication of Study 2 Diversification Results

This study tests the prediction that heightened perceptions of aleatoriness (but not necessarily epistemicness) should increase the tendency to engage in naïve diversification. Because Study S4 focuses on the role of perceived aleatoriness rather than epistemicness, performance of an analyst's forecasts is no longer relevant. Thus, we modified our stock chart manipulation by omitting forecast data. Our preregistration plan, along with data, code, and materials for this study can be found at https://researchbox.org/180.

Method

We recruited 269 participants (62% male, mean age = 34 years, range: 18–77 years) from Prolific Academic to complete a short survey in exchange for £0.30 plus the possibility of receiving additional bonus money. Participants were randomly assigned to evaluate four stocks displayed in either a *relative price chart* (n = 134) or an *absolute price chart* (n = 135). The charts depicted the actual prices of Apple, Home Depot, Walmart, and Netflix over the previous five years, but the stock names were replaced with the generic labels Stock A, B, C, and D. Unlike our previous studies, the charts only displayed stock prices (and not analyst forecasts) over time.

After presenting participants with a stock chart in either absolute or relative price format, we asked them to allocate $100 however they saw fit across the four stocks, which would be invested over the ensuing six months. We told participants that one randomly-selected respondent would receive the realized value of their investment portfolio at the end of six months. On a separate page, participants also rated the "task of forecasting the prices of the four stocks listed above six months in the future" using the 6-item EARS.

Results and Discussion

We report all test statistics and *p*-values using robust standard errors.

Manipulation check. As predicted, participants rated the task as higher in aleatoriness when outcomes were presented as relative prices ($M = 5.10$, $SD = 1.21$) than as absolute prices ($M = 4.59$, $SD = 1.37$), $t(267) = 3.26$, $p = 0.001$, $d = 0.40$. Since analyst forecasts were not presented alongside stock prices, we did not make predictions about how epistemicness ratings would be affected by our price chart condition. Indeed, perceptions of epistemicness did not reliably differ when outcomes were presented as relative prices ($M = 4.30$, $SD = 1.17$) compared to absolute prices ($M = 4.31$, $SD = 1.14$), $t(267) = 0.12$, $p = .901$, $d = 0.02$.

Diversification. We operationalized diversification as the variance in the amount invested across all four stocks (i.e., average squared deviation from $25, or a 25% allocation for each stock). We then reverse-coded this measure so that higher numbers reflected greater diversification, and smaller numbers reflected greater concentration (values could range between 0 and 1,875). As predicted, participants' allocations were more diversified when outcomes were presented as relative prices ($M = 1{,}418.50$, $SD = 579.01$) than when outcomes were presented as absolute prices ($M = 1{,}105.64$, $SD = 631.56$), $t(267) = 4.24$, $p < 0.001$, $d = 0.52$.

Mediation analysis. We next examined whether the relative-absolute difference in diversification could be statistically explained by increased perceptions of aleatoriness and epistemicness. We tested this using a path model with WTP as the dependent variable, condition (0 = *absolute price chart*, 1 = *relative price chart*) as the independent variable, and ratings of epistemicness and aleatoriness as separate mediator variables. We then estimated indirect effects for epistemicness and aleatoriness by calculating bias-corrected bootstrapped confidence

intervals based on 10,000 resamples. As predicted, we found a reliable indirect effect through perceptions of aleatoriness, $b = 73.15$, 95% CI = [27.44, 139.48], $p = 0.006$. Meanwhile, we found no reliable indirect effect through perceptions of epistemicness, $b = –0.77$, 95% CI = [–21.01, 12.24], $p = 0.901$. Thus, our results confirmed the prediction that participants that heightened perceptions of aleatoriness uniquely predicts the tendency to engage in naïve diversification.