Pricing Information: Experimental Evidence

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Research Questions

Information plays a crucial role in decision making. However, information is often imprecise, and so it might be difficult to evaluate the value of information.

For example, how much one should pay for an earnings forecast of an equity analyst?

This project addresses two questions:

1. How accurately do people price (imprecise) information?
2. Which factors mostly affect the process of pricing information?

Theory

Is signal S worth buying? Compare:
$\underset{\alpha}{max}\{\mathbb{E}[u(x(\alpha))]\}$ vs $\underset{\alpha}{max}\{\mathbb{E}[u(x(\alpha)-\pi)|S]\}$
α - decision, $x(\alpha)$ - payoff, π - price for signal S

Stages of evaluation:

1. Estimate the expected gain without the signal S
2. Estimate the informativeness of the signal S
3. Estimate the expected gain with the signal S
4. Make the decision that maximizes expected utility

Setting of the Experiment

Participants forecast a Random Walk (RW) process:

$$F_{t+1} = F_t + \epsilon_{t+1}$$

Participants can buy a signal at each step:

$$S_{t+1} = F_t + \eta_{t+1}$$

where $\eta_{t+1} = \sqrt{q}\epsilon_{t+1} + \sqrt{1-q}\xi_{t+1}$, $\xi_{t+1} \perp \epsilon_{t+1}$.
$q \in [0,1]$ controls informativeness of the signal.

Participants observe the signal's price and 20 past observations of the RW process and the signal. They should decide whether to make their forecast with or without the signal.

Sample

139 students from Higher School of Economics (Moscow) participated in the study.

- Background in Economics or Finance
- Had a Probability theory course

Participants knew that they predicted a RW process!

Participants were randomly assigned into three groups:

1. Baseline conditions
2. Knew the average payoff per prediction if choosing F_t as a predictor for F_{t+1}
3. Same as group 2, but also knew conditional correlation $corr(\epsilon_{t+1}, \eta_{t+1}) = \sqrt{q}$

Result 1: Performance

	Bench. Buy	Bench. Ignore
Part. Buy	-0.24	-2.47
Part. Ignore	-1.10	-0.56

Table 1: Decomposition of losses

Each cell shows the average difference in payoffs of the participant and the benchmark
Benchmark earned on average 3.7 (4.8) points per prediction without (with) the signals

- Participants lost on average 0.56 points per prediction (15%) on deviations from F_t
- On average 0.24 points (5%) was lost on incorrect weighting of the signals
- 0.54 (=-1.10+0.56) points (11%) was lost when ignoring undervalued signals
- 2.23 (=-2.47+0.24) points (60%) was lost when buying overvalued signals

Result 3: Dynamics

We explored the deviations from the optimal strategy:

$$Prediction_t - OS_t = \alpha + \beta_1(F_{t-1} - F_{t-2}) + \beta_2(F_{t-2} - F_{t-3}) + \beta_3(F_{t-3} - F_{t-4}) + \epsilon_t$$

where

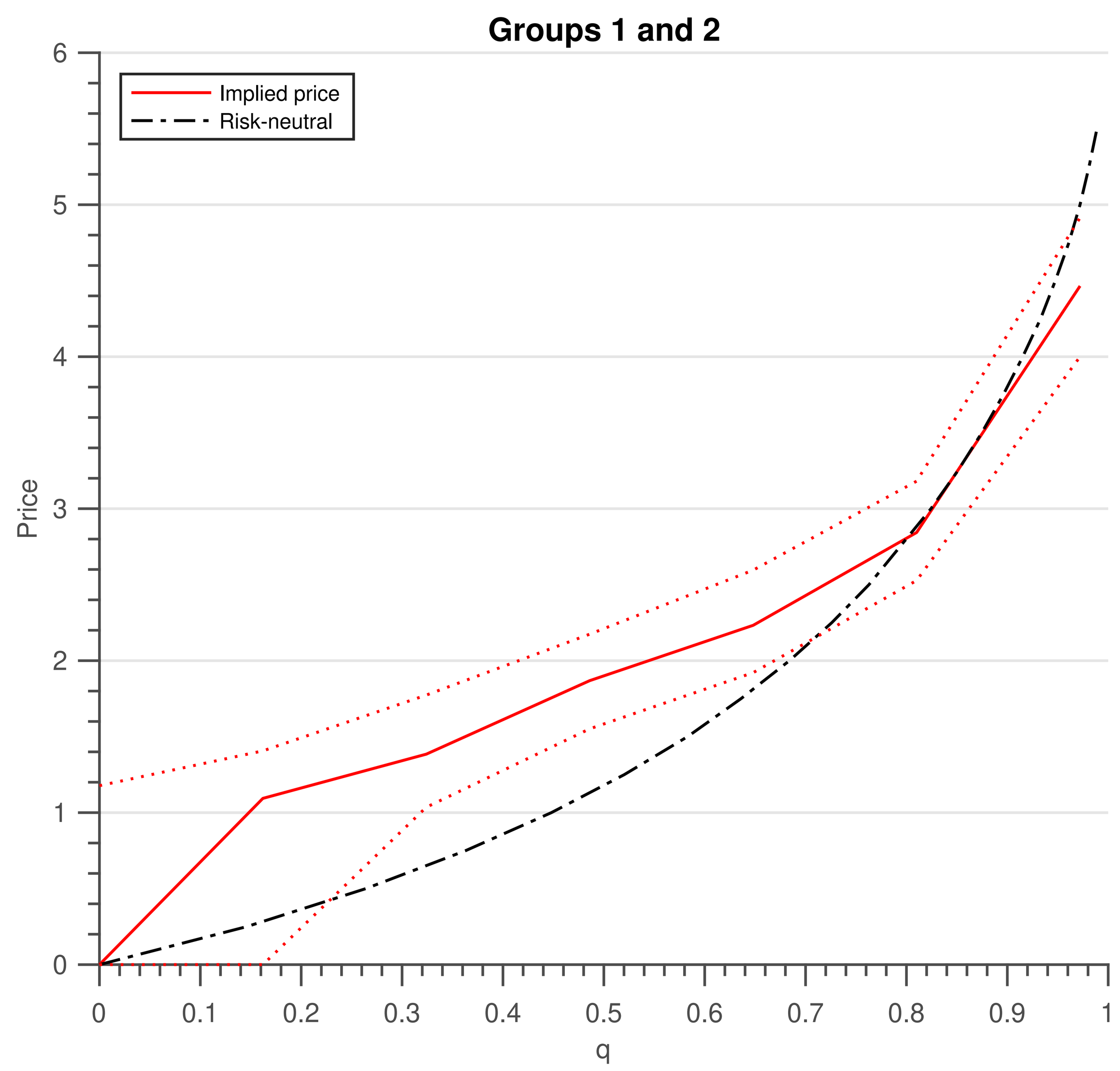
$$OS_t = \begin{cases} F_{t-1}, & \text{no signal} \\ F_{t-1} + \sqrt{\rho}\,(S_t - F_{t-1}), & \text{with signal} \end{cases}$$

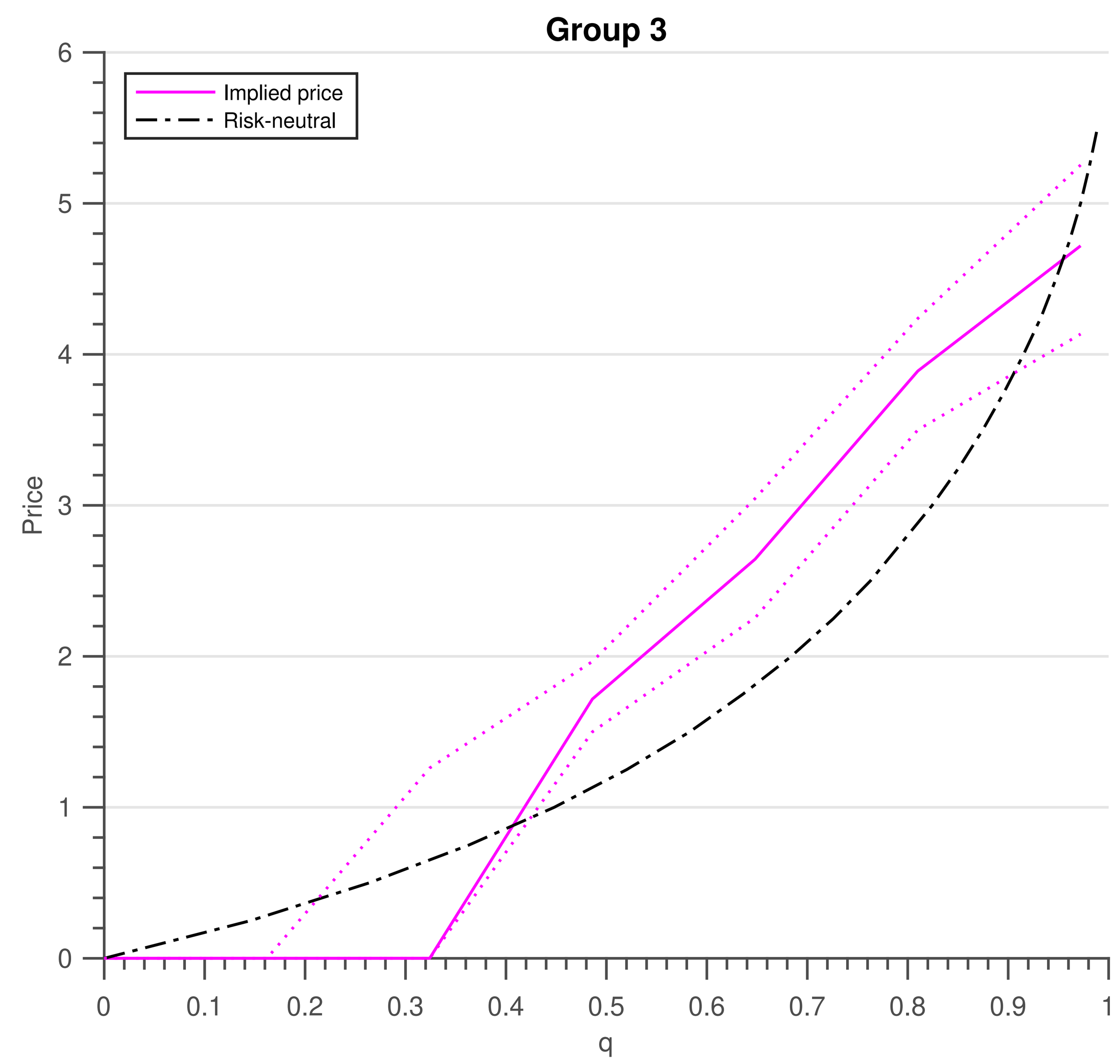
Results for predictions with and without the signal:

	α	β_1	β_2	β_3
No signal	0.943***	0.063***	-0.066***	-0.068***
With signal	0.399***	0.005	-0.001	-0.009

- Predictions without signals reveal optimism ($\alpha > 0$), "short-term" momentum ($\beta_1 > 0$), and "long-term" reversal ($\beta_2 < 0, \beta_3 < 0$)
- Predictions with signals show a noticeable reduction in these biases
- More biased participants do not price signals higher than their less biased peers

Result 2: Pricing





A risk-neutral agent who knows the informativeness of the signal is used as a benchmark (black line).

- Participants from groups 1 and 2 correctly priced signals with very low and very high informativeness, but overvalued signals with medium informativeness
- Participants from group 3 benefited from additional information about conditional correlation: they ignored low-quality signals. Yet, they also had an overvaluation region in the middle.
- This pattern is not explained by risk-aversion and "inefficient" updating

Next Steps

We recently ran a modified experiment on a sample of investors on Prolific. We are currently analyzing the collected data.

Contact Information

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