



**Rational or behavioral investors?
Investment in information and
portfolio performance**

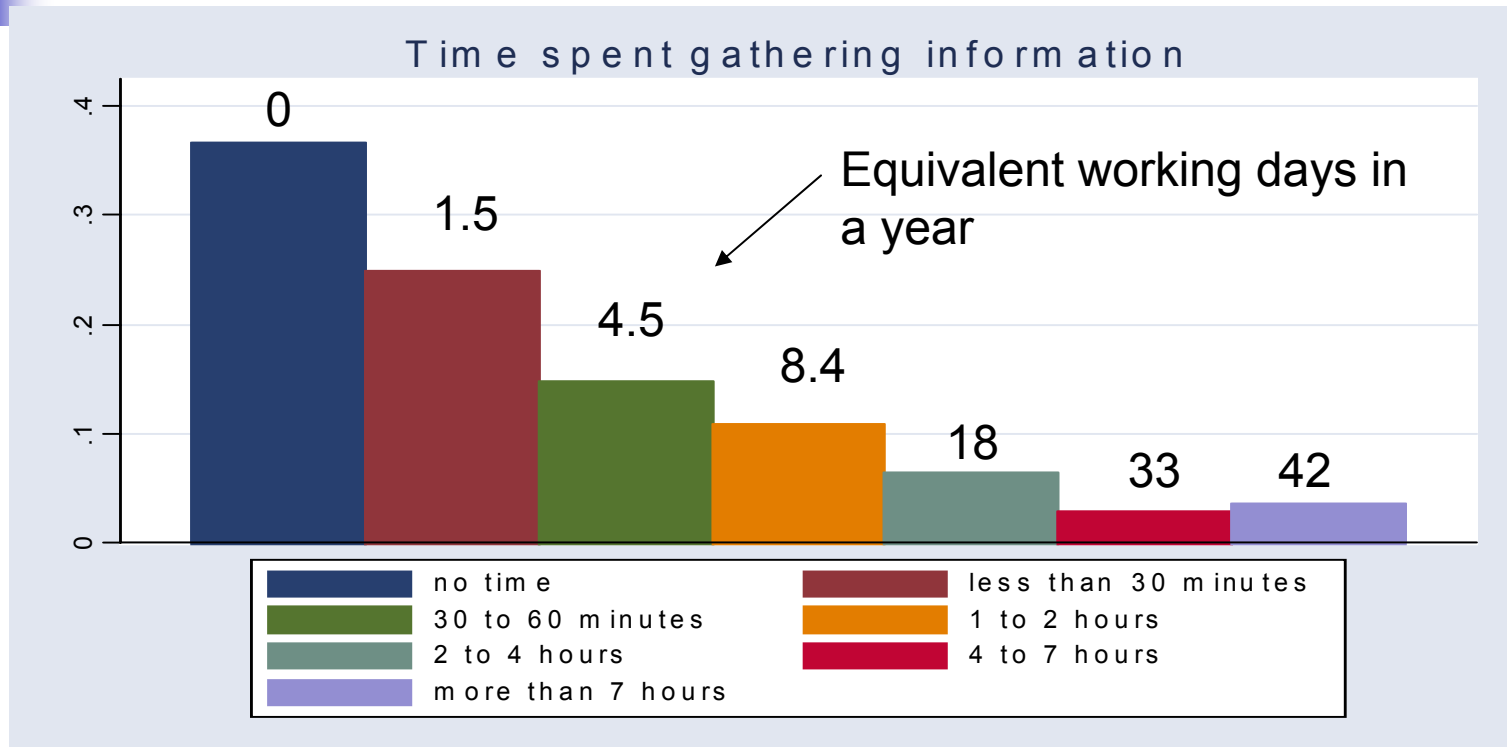
**Luigi Guiso and Tullio Jappelli
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Outline

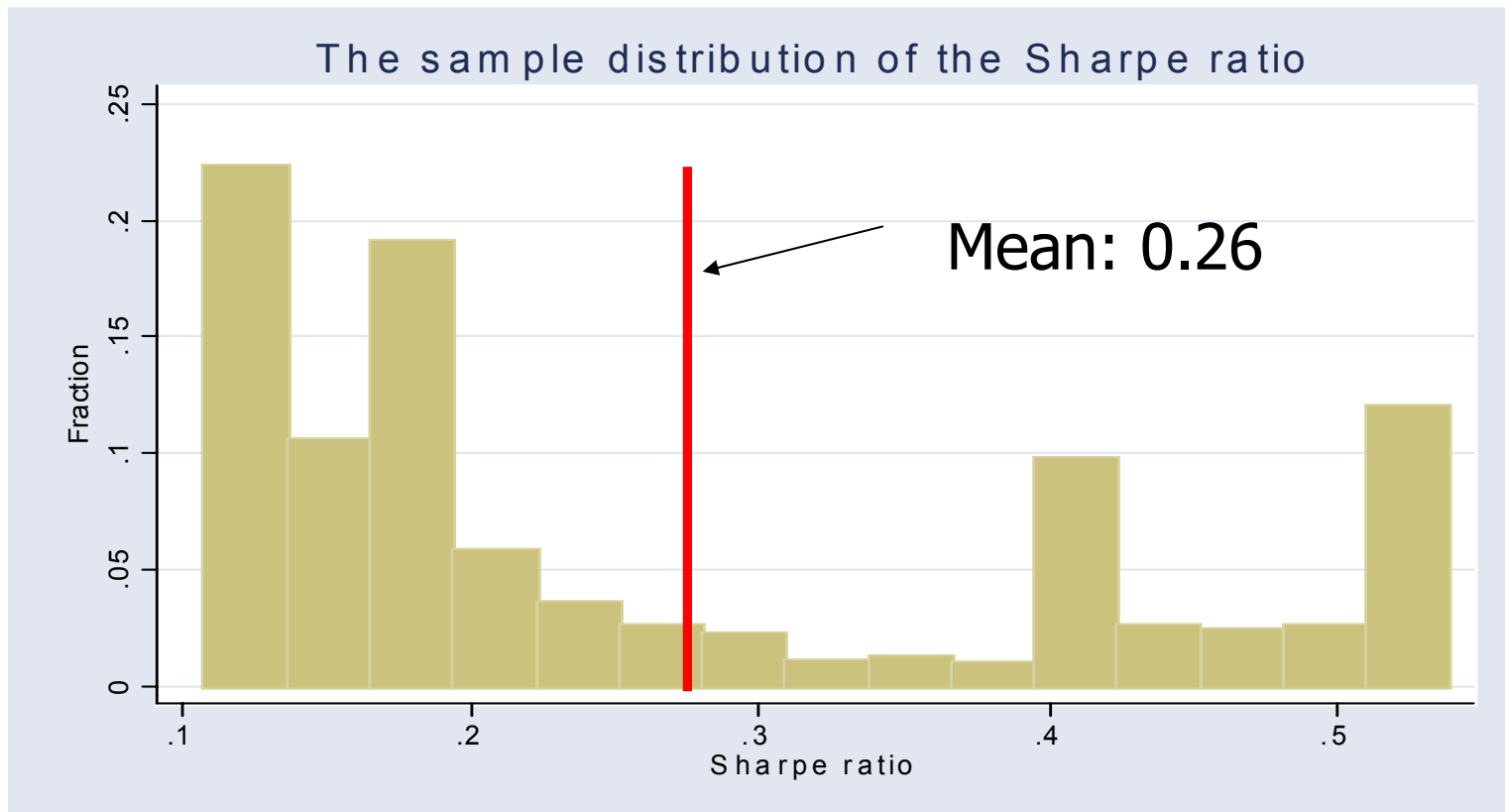
- Contrast models with rational and overconfident investors.
- The **UPS: Unicredit-Pioneer Survey of Investors' behavior** (1834 clients).
- Financial information and portfolio performance: positive association in models with rational investors, negative in models with overconfidence.
- Additional implications: financial information and trading, delegation, diversification.

Fact 1: Heterogeneity in investment in financial information



"How much time do you spend, on average each week, to collect information on how to invest your wealth and manage your investments?"

Fact 2: Heterogeneity in portfolio performance





Relation between information and portfolio performance

- Why does performance vary across investors?
- Standard portfolio theory: All investors have the same Sharpe ratio.

- Why does investment in information differ? Is heterogeneity in performance related to heterogeneity in information?

- **Contrast implications of rational and behavioral models.**



Models with rational agents

- Investors spend **money and time to acquire information** about the stock market (e.g., stocks pay-offs).
- Those who are likely to benefit more from information, acquire more information.
- Since information is valuable, those who invest more in information achieve also higher return per unit of risk (higher Sharpe ratio).



Cross-sectional implications of RM

- **Investment in information** increases with wealth and risk tolerance + any variable that boosts stock investment. It falls with marginal costs of information.
- **The Sharpe ratio** is an increasing function of investment in information (Peress, 2004).
- Controlling for information, the Sharpe ratio is not affected by risk tolerance.



Models with overconfident investors

- Investors are rational, except on how they value information. They are **overconfident** about the precision of their knowledge (Odean, 1998).
- Ample evidence in psychology, and experimental calibration of subjective probabilities. Linked to self-attribution bias, illusion of knowledge, optimism, illusion of control (Barber and Odean).
- **Depends on tasks** (people are more overconfident when doing difficult tasks), men more than women.
- Limited evidence for Europeans (tend to be less optimistic than Americans).
- Difficult issue: how should we measure overconfidence?



Cross-sectional implications of BM

- **Investment in information** increases with wealth and risk tolerance. It also increases with overconfidence. But overconfidence is unobservable, so hard to distinguish from RM along this dimension.
- Investors rely too much on their own information, **purchase too much information and trade too much.**
- The **Sharpe ratio falls with information.** If risk tolerance and overconfidence are correlated, risk tolerance may affect negatively the Sharpe ratio.



Predictions of RM and BM

- **Investment in information:** depends on wealth and risk tolerance in both models (overconfidence in the BM).
- **Sharpe ratio:** positive effect of information in RM, negative in BM.
- **Trading:** effect of information stronger in BM.
- Verify these predictions using cross-sectional data on investment in information, portfolio allocations, trading, delegation.



Findings: investment in information and the Sharpe ratio

- **Investment in information** increases with wealth, risk tolerance and education. It is larger for men and other proxies for overconfidence.
- Investors who spend more resources in information have higher **portfolio returns** and higher **standard deviation**. Consistent with both R&B, if consumers optimize but...
- Information has a negative effect on the **Sharpe** ratio. The effect is more negative for the more overconfident.
- The more risk tolerant attain lower Sharpe ratios.



Findings: investment in information, trading, delegation, diversification

Those who invest more in information trade more frequently.

- The effect is stronger for groups that are more likely to be overconfident.
- Those who trade more attain lower Sharpe ratios.

Information is negatively associated with delegation of financial decisions.

- The effect is stronger for the more overconfident.
- Those who delegate less attain lower Sharpe ratio.

Information is negatively associated with diversification.

- The effect is stronger for the more overconfident.
- Those who diversify less attain a lower Sharpe ratio.



The Unicredit-Pioneer Survey

- Survey of Unicredit customers (more than 4 million accounts).
- 1,834 customers surveyed in the Fall of 2003.
- Sample is representative of eligible population of customers.
- Excludes customers less than 20 years old or over 80
- Over-samples the affluent.

- Individual and household financial wealth.
- Wealth inside and outside Unicredit (multi-banking).



The questionnaire

Collects data on

- Investment in financial information (crucial here)
- Financial portfolio composition
- Willingness to take financial risk (2 variables)
- Socioeconomic variables (age, education, income, etc)

Additional data on

- Frequency of trading
- Assets knowledge
- Client-bank relation (delegation, trust, etc.)



Measuring investment in information

- **Time spent in financial information:** ranges from “no time” to “over 7 hours per week”.
- *How much time do you usually spend, in a week, to acquire information on how to invest your savings? (think about time reading newspapers, surfing the internet, talking to your financial advisor, etc.).*



Measuring portfolio performance

- Classify assets in **4 groups** (mutual funds and managed investment accounts allocated to one or more of these classes)
 - Risk-free (short-term bonds)
 - Medium-term bonds
 - Long-term bonds
 - Stocks
- **1989-2003** Return data: compute expected portfolio return and standard deviation.
- Impute **Sharpe** ratio for each investor (**not adjusted for information or trading costs**).



What determines investment in information?

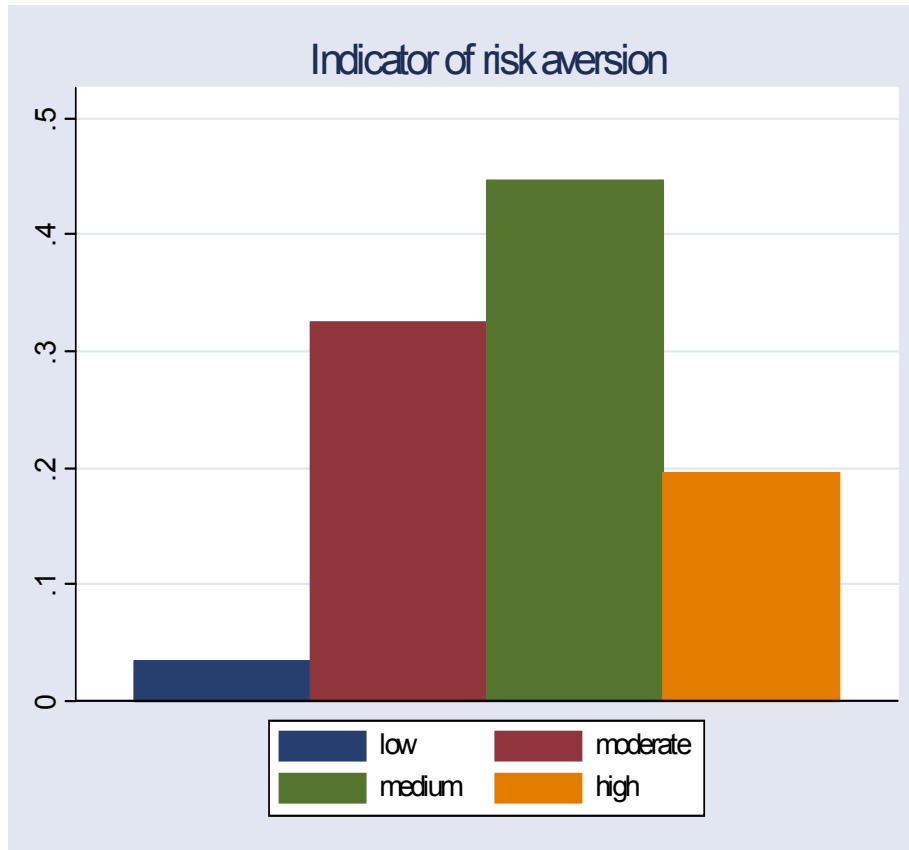
- Both models suggest that wealth and risk tolerance determine investment.
- **Cannot discriminate between R&B models.** But:
 1. Important check on data quality.
 2. Suggests **potential instruments** for IV regressions of information on Sharpe ratio.
 3. If overconfidence plays a role, proxies for degree of overconfidence should matter.



Explanatory variables

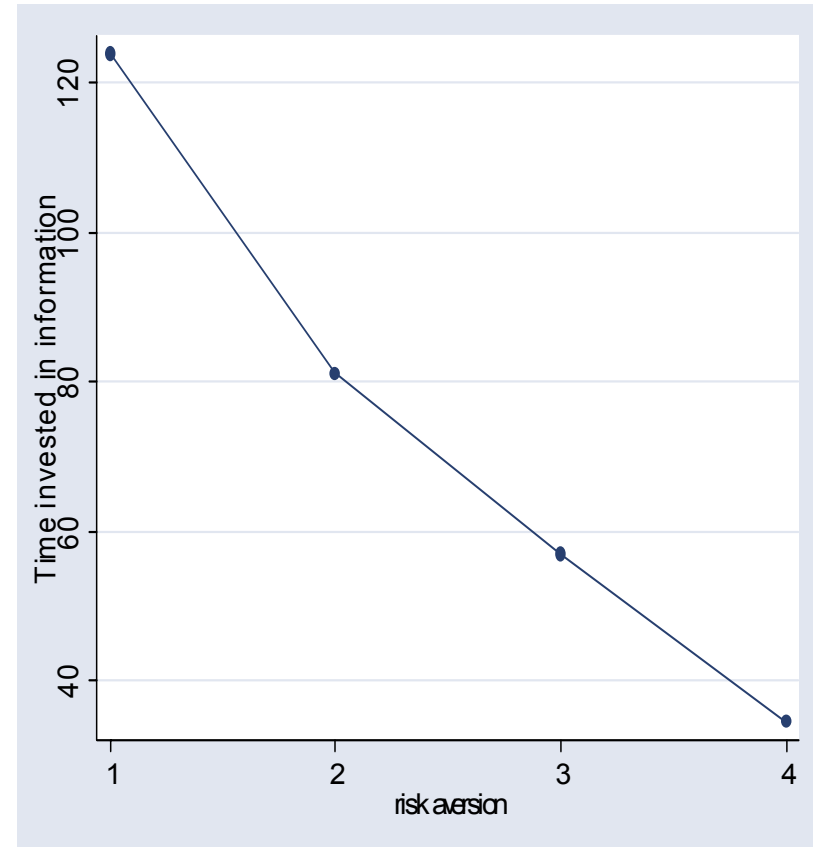
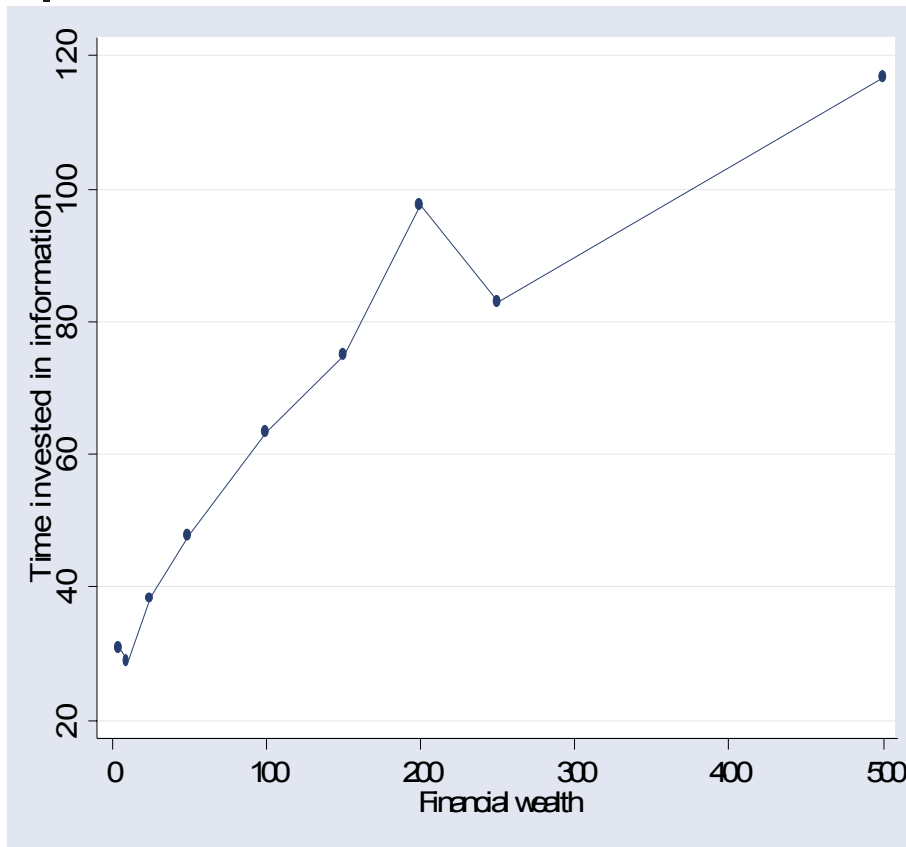
- **Individual or household financial wealth**
- **Risk tolerance:** 2 proxies.
Willingness to take financial risk (standard)
Consider risk a threat or opportunity
- **Other variables:** education (proxy for cost of collecting information), background risk, demographics.
- **Alternative proxy for information:** frequency of checking financial investment (same results).

Risk aversion



“In managing your financial investment, you think you are a person that is interested in investments that offer the possibility of: (1) a very high return, with a very high risk of losing the money; (2) a high return, and a high risk; (3) a moderate return, and a low risk; (4) a low return, and no risk.”

Investment in information, financial wealth and risk aversion



Dependent variable: investment in information

	Total sample				Stockholders only	Trimmed sample
	(1)	(2)	(3)	(4)	(5)	(6)
Financial wealth	0.619 (0.092)**	0.609 (0.092)**	0.469 (0.094)**	0.480 (0.094)**	0.339 (0.095)**	0.441 (0.099)**
Years of education	0.049 (0.006)**	0.048 (0.006)**	0.059 (0.006)**	0.064 (0.006)**	0.051 (0.007)**	0.056 (0.007)**
Very low risk aversion	0.919 (0.147)**	0.919 (0.147)**	0.966 (0.148)**		0.900 (0.165)**	0.878 (0.157)**
Low risk aversion	0.561 (0.076)**	0.559 (0.076)**	0.572 (0.077)**		0.443 (0.087)**	0.521 (0.078)**
Medium risk aversion	0.356 (0.072)**	0.359 (0.072)**	0.371 (0.072)**		0.281 (0.083)**	0.386 (0.073)**
Income risk		-0.172 (0.059)**	-0.158 (0.059)**	-0.165 (0.059)**	-0.134 (0.066)*	-0.127 (0.060)*



Information and the Sharpe ratio

- **OLS regressions**
- **Selectivity adjustment:** The Sharpe ratio is only defined for those investing in risky assets.
- **First stage probit:** information, wealth, income, education, demographic variables
- **Endogeneity:** Information might be correlated with (unobserved) ability to manage the portfolio. The more able may need to collect less information.
- **Instruments:** Background risk; Retirement dummy; Stock market experience.

The effect of information on the Sharpe ratio

	OLS		Selection adjusted		IV-Selection adjusted	
	(1)	(2)	(3)	(4)	(5)	(6)
Investment in information	-0.018 (0.002)**	-0.017 (0.003)**	-0.014 (0.003)**	-0.095 (0.025)**	-0.086 (0.024)**	-0.095 (0.033)**
Very low risk aversion					-0.057 (0.031)	-0.072 (0.032)*
Low risk aversion					-0.082 (0.015)**	-0.091 (0.016)**
Medium risk aversion					-0.049 (0.014)**	-0.050 (0.014)**
%? Sharpe ratio of an increase in information from 30 minutes to 2-4 hours	-13.5	-13.2	-12.6	-61.5	-41.5	-45.6



Does it matter how we measure the Sharpe ratio?

- **Restrict to customers with only one bank relation (1,098):** for these we know their true portfolio from administrative data with the bank.
- **Use finer asset classification (administrative data):** US equity, EU equity, Emerging markets equity, Pacific Equity, EU corporate bonds, EU long term government, EU medium term government, EU liquidity (safe asset).
- **Weekly data 1999 and 2003 :**
 - Variance- covariance matrix from historical data.
 - Expected return from internal forecasting.



Sensitivity checks and robustness

- The measured Sharpe ratio does not capture stock-picking
- Value of information is underestimated, because the stock part of the portfolio is granted the overall stock market return, not the return of the stocks chosen.
- Drop stock-pickers but results are unchanged



Previous literature suggests “objective” and “subjective” proxies for overconfidence

Education: Overconfidence is more likely to arise in more difficult task, such as finance. Investors with higher education should find difficult tasks easier, and thus might be less overconfident

Claim knowledge of stocks: How well do you think you know the characteristics of stocks?” (or other assets)
not at all / little / medium / well / very well.

Gender: overconfidence is task specific. In “masculine” tasks men are more overconfident than women.

Sample splits by overconfidence

	High education	Low education	Low knowledge of stocks	High knowledge of stocks	Women	Men
	(1)	(2)	(3)	(4)	(5)	(6)
Investment in information	-0.013 (0.003)**	-0.020 (0.007)**	-0.003 (0.007)	-0.013 (0.003)**	-0.008 (0.006)	-0.015 (0.003)**
Observations	973	392	482	883	376	989
%? Sharpe ratio of an increase in information from 30 minutes to 2-4 hours	-10.6	-18.6	-5.9	-10.8	-8.2	-15.7



Where is the negative correlation between information and Sharpe ratio coming from?

	Excess return			Standard deviation		
	(1)	(2)	(3)	(4)	(5)	(6)
Investment in information	0.135 (0.008)**	0.125 (0.008)**	0.112 (0.008)**	0.999 (0.068)**	0.936 (0.070)**	0.813 (0.070)**



Investment in information and trading

- We use data on **how often investors make financial transactions:** from “never trades” to “buys or sells every day”.
- Does investment in information affect trading?
- Does overconfidence affect trading?



Trading and investment in information

	Total sample		
	(1)	(2)	(3)
Investment in information	0.281 (0.017)**	0.272 (0.018)**	0.261 (0.018)**
Very low risk aversion			0.510 (0.160)**
Low risk aversion			0.205 (0.084)*
Medium risk aversion			0.033 (0.080)
Observations	1421	1421	1421



Trading and investment in information: sample splits

- The effect of information on trading is stronger in groups with:
 - Low education
 - Low knowledge of stocks
 - Males
- Trading affects negatively the Sharpe ratio.



Extensions: Information and delegation

- **Information affects willingness to consult financial advisors and delegate decisions to them.**
 - Direct information reduces the need to delegation.
 - If advisors have more information (or less subject to psychological biases): those who delegate less – the more overconfident - attain a lower Sharpe ratio

- **We test two implications of behavioral model:**
 1. Delegation falls with information collection, the more so the more one is overconfident.
 2. The Sharpe ratio is positively correlated with delegation.



Extensions: Information and delegation

- Delegation depends also on **how much investors trust financial advisors.**
- The survey has data on delegation and trust:
 - Investors report how much they are **willing to delegate** (1 to 4)
 - **How much they trust** the intermediary (1 to 5)

We can test the two implications.

The effect of information on delegation

	Total sample		Low knowledge of stocks	High knowledge of stocks	Women	Men
	(1)	(2)	(3)	(4)	(5)	(6)
Investment in information	-0.058 (0.017)**	-0.070 (0.023)**	-0.054 (0.018)**	-0.026 (0.037)	-0.031 (0.039)	-0.062 (0.021)**
High trust in advisor	1.052 (0.073)**	1.202 (0.105)**	1.031 (0.074)**	0.864 (0.108)**	0.964 (0.138)**	1.070 (0.089)**
Medium trust in advisor	0.588 (0.097)**	1.003 (0.142)**	0.575 (0.097)**	0.200 (0.139)	0.639 (0.188)**	0.556 (0.115)**
Financial wealth	0.445 (0.100)**	0.343 (0.118)**	0.381 (0.103)**	0.908 (0.313)**	0.369 (0.193)	0.388 (0.122)**
Very low risk aversion	-0.689 (0.165)**	-0.841 (0.220)**	-0.604 (0.166)**	-0.253 (0.290)	-0.160 (0.317)	-0.785 (0.198)**
Low risk aversion	-0.355 (0.078)**	-0.360 (0.125)**	-0.268 (0.080)**	-0.238 (0.113)*	-0.023 (0.146)	-0.376 (0.097)**
Medium risk aversion	-0.225 (0.073)**	-0.287 (0.121)*	-0.182 (0.074)*	-0.136 (0.098)	-0.146 (0.132)	-0.210 (0.090)*



Summary of results

- Investors accumulate information in ways consistent with utility maximization.
- Those who collect more information obtain higher returns, but **take too much risk**, and end up with less efficient portfolios.
- Those who collect more information **delegate less** and own **less diversified portfolios**.
- Evidence consistent with models where **investors misinterpret financial information** due to cognitive limitations.



Implications

- Overconfidence is costly to society. Overconfident traders do not share risk optimally, expend too many resources on information acquisition, and trade too much. These are deadweight losses.
- More generally, the paper shows the importance of taking investors' behaviour into account when designing financial instruments, and of improving financial education.