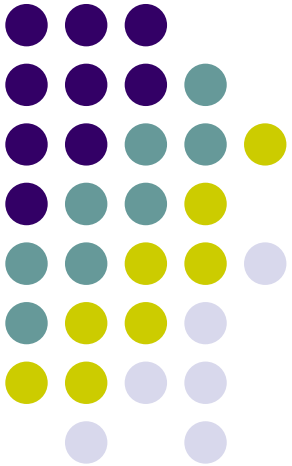
Risk Aversion

Luigi Guiso

AXA Annual Corporate Meeting



Luigi Guiso

AXA PROFESSOR OF HOUSEHOLD FINANCE

Einaudi Institute for Economics and Finance

AXA
CORPORATE MEETING
2012

A dual complex relationship: consumers

- In the **eyes of individuals** financial institutions and markets have become more complex:
  - → Many more products
  - → Many more complex financial products
  - → More difficult contracts to understand
  - → More intricate interactions

Complexity has gone up, ability to grasp and understand not as much

A dual complex relation: intermediaries

- In the **eyes of financial institutions** customers have become more complex to deal with:
  - → More demanding
  - → More volatile and behavior harder to predict
  - → More heterogeneous: in preferences, in beliefs, in needs and in endowment

Harder to fit with appropriate products

Intermediaries (and firms more generally) **capability to deal with customers is continuously challenged**

Proximate causes

- Most important: the change in availability and distribution of information induced by the ICT revolution
- Immediate implication: a change in the nature of the relation between customers and intermediaries

Focus: look at two dimensions of this change

1. **The reversal of the traditional model of asymmetric information**
2. **The increased exposure to reputation spillovers**

To Perugia: Risk aversion

Luigi Guiso

AXA PROFESSOR OF HOUSEHOLD FINANCE

Einaudi Institute for Economics and Finance

AXA CORPORATE MEETING 2012

Risk and Financial Decisions

- Risk aversion is the single most important determinant of the demand for insurance

- It is also the single most important determinant of portfolio choice

- A large part of the heterogeneity in portfolio allocations between risk and riskless assets and in demand for insurance should be explained by investors risk attitudes (assuming common priors and beliefs)

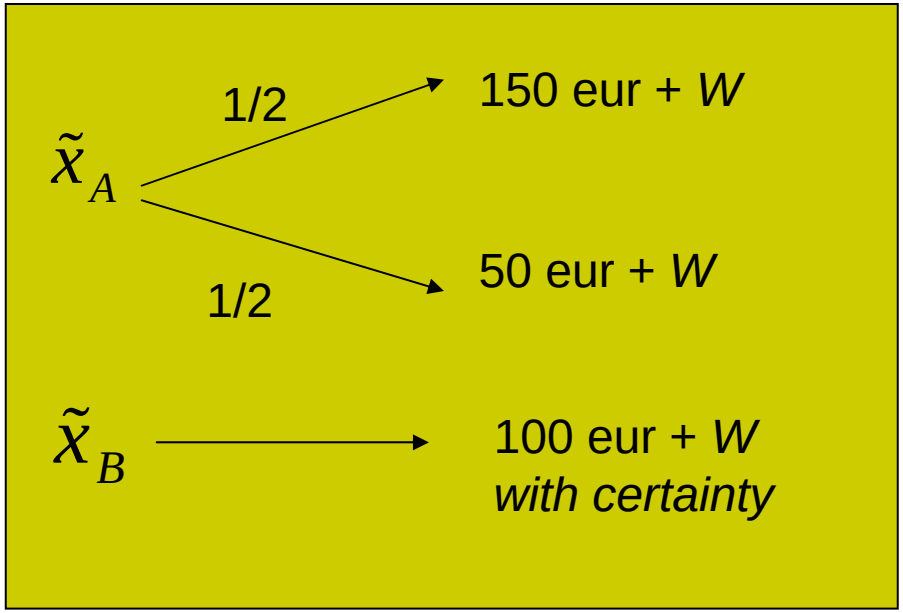
Questions

- How can we measure risk aversion?
- What determines the attitude toward risk?
  - Is it just an innate parameter?
  - Can it depend upon observable characteristics? And if so which ones
- Does it vary over time and across states?

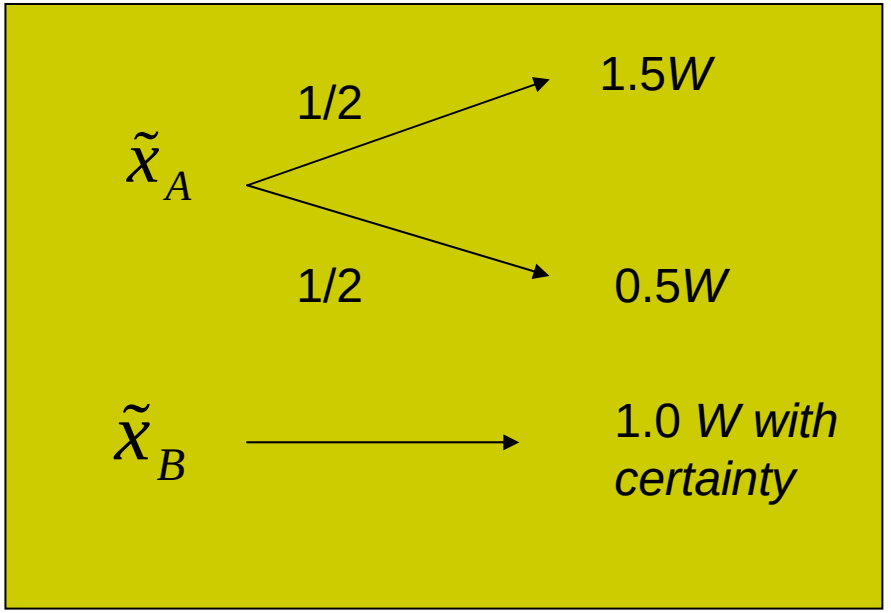
Risk aversion intuitively

Two lotteries, A and B

Additive risk (000) eur



Proportional risk



A risk averse agent prefers lottery B to A. The first lottery is risky, both lotteries have the same expected value = 100. A risk neutral is indifferent between the two, a risk lover prefers A to B.

Risk aversion: formally

If one dislikes risk he is willing to pay to avoid it. How much is called the risk premium

Additive risk

$$\Psi = -\frac{U''(W)}{U'(W)}\frac{\sigma_x^2}{2} = a(W)\frac{\sigma_x^2}{2}$$

Risk premium — Risk aversion — Risk

Amount of wealth one is willing to give up to avoid the risk

RA: euros per unit of risk

Proportional risk

$$\Psi_R = -\frac{U''(W)}{U'(W)}W\frac{\sigma_x^2}{2} = a_R(W)\frac{\sigma_x^2}{2}$$

Risk premium — Risk aversion — Risk

Fraction of wealth one is willing to give up to avoid proportional risk

RA: percentage per unit of risk

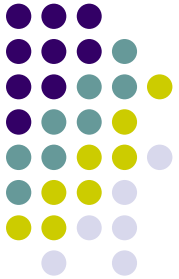
Ex: $\sigma_x^2 = 2500 \Rightarrow \sigma_x = 50$

if $\Psi_R = 12.5 \quad a_R = 0.01$

(1 eur per unit of risk)

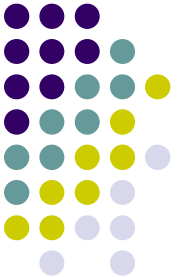
Ex: $\sigma_x^2 = 0.25 \Rightarrow \sigma_x = 0.5$

if $\Psi_R = 0{,}125 \quad a_R = 1$



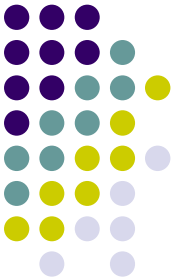
How can we measure risk aversion?

Strategies to elicit risk attitudes



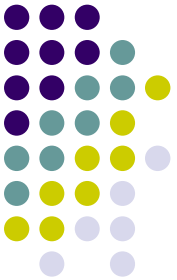
1. Several strategies to elicit individual attitudes towards risk => rely on answers to specifically designed questions. Major distinction:
2. **Qualitative indicators**: allow to sort individuals between more and less risk tolerant
3. **Quantitative**: allow to obtain a measure of how much a person is willing to pay to avoid a given risk

Qualitative Measures of Risk Attitudes



- Often used in psychology
- Also relied upon in the financial industry to elicit an investor risk tolerance and provide financial advise (MIFID)
- Zuckerman SSS (sensation-seeking) **Scale**
  - Commonly used in psychology
  - Risk seeking seen as a personality trait

Zuckerman SSS scale



- Zuckerman distinguished four subscales:

1. **Disinhibition** (Dis): measures disinhibited behavior
2. **Thrill and Adventure Seeking (TAS)**: measures the desire for risky sports or activities (e.g. mountain climbing, parachuting)
3. **Experience Seeking (ES)**: measures the desire to expand one's experience through the mind and senses and an un-conforming life style
4. **Boredom Susceptibility (BS)**: measures the aversion to sameness, lack of change, or unpredictability in activities or friends and a general restlessness when there is no novelty or change.

Zuckerman questions

- Four set of binary questions, respondents choose either A or B
- Answers differ by risk attitude
- A scale (score) is obtained by combining the answers: the higher the score the more risk tolerant
  - A. I would like to try parachute jumping.
  - B. I would never want to try jumping out of a plane, with or without a parachute.

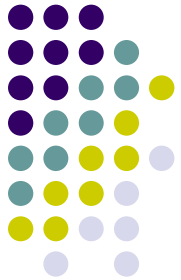
  - A. The worst social sin is to be rude.
  - B. The worst social sin is to be a bore.

  - A. Even if I had the money, I would not care to associate with flighty rich people who frequently appear in the newspapers and tabloids.
  - B. I could conceive of myself seeking pleasures around the world with the sort of people who are frequently covered in newspapers and celebrity magazines.

Zuckerman Scale

	Men (N = 133) (Std. Dev.)	Women (N = 99) (Std. Dev.)	Means Test t-stat. *(p-value)*
Total	**21.90** (6.05)	**20.12** (5.87)	**2.24** ***(0.03)***
Disinhibition	**5.23** (2.87)	**4.90** (2.97)	**0.874** ***(0.40)***
Boredom Susceptibility	**3.68** (1.97)	**3.06** (1.89)	**2.43** ***(0.02)***
Thrill and Adventure Seeking	**7.62** (2.23)	**6.61** (2.49)	**3.27** ***(0.001)***
Experience Seeking	**5.36** (2.26)	**5.54** (1.95)	**-0.55** ***(0.52)***

Qualitative Measures of Risk
View of risk: 1



Ask individuals their view about risk (Unicredit survey).

"*How would you classify risk among the following two alternatives ?*

1. Risk is an uncertain event from which one can extract a profit
2. Risk is an uncertain event from which one should seek protection.

- Most respondents (71%) answer (2), considering risk a threat rather than an opportunity

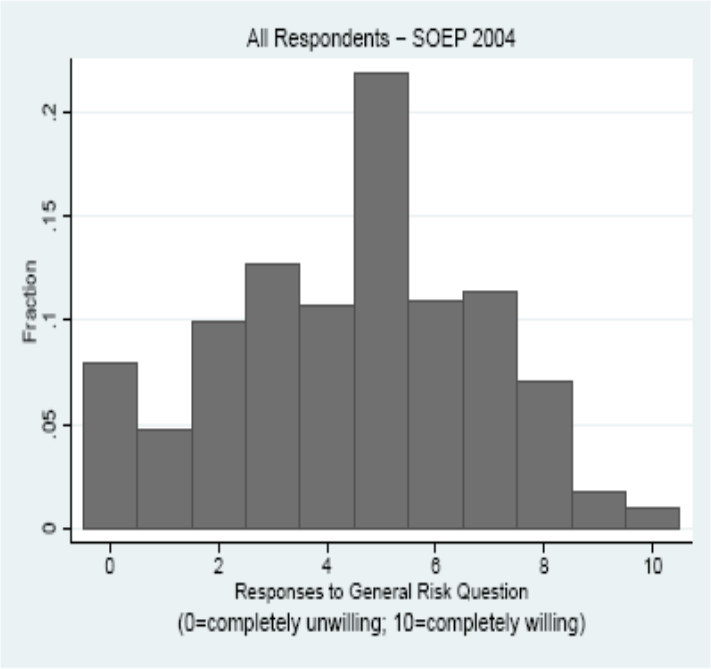
Qualitative Measures of Risk
View of risk: 2

Alternatively ask individuals how they view themselves (Socio Economic Panel Dohmen et. al., 2006)

"*Are you generally a person who is fully prepared to take risks or do you try to avoid taking risk? Please tick a box on the scale, where the value 0 means "unwilling to take risk" and the value 10 means "fully prepared to take risk"*

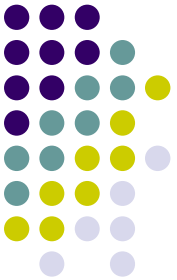
The vast majority dislikes risk

Figure 1: Willingness to Take Risks in General



Unwilling										Fully prepared
0	1	2	3	4	5	6	7	8	9	10

Qualitative Measures of Risk
Choice based self- classification

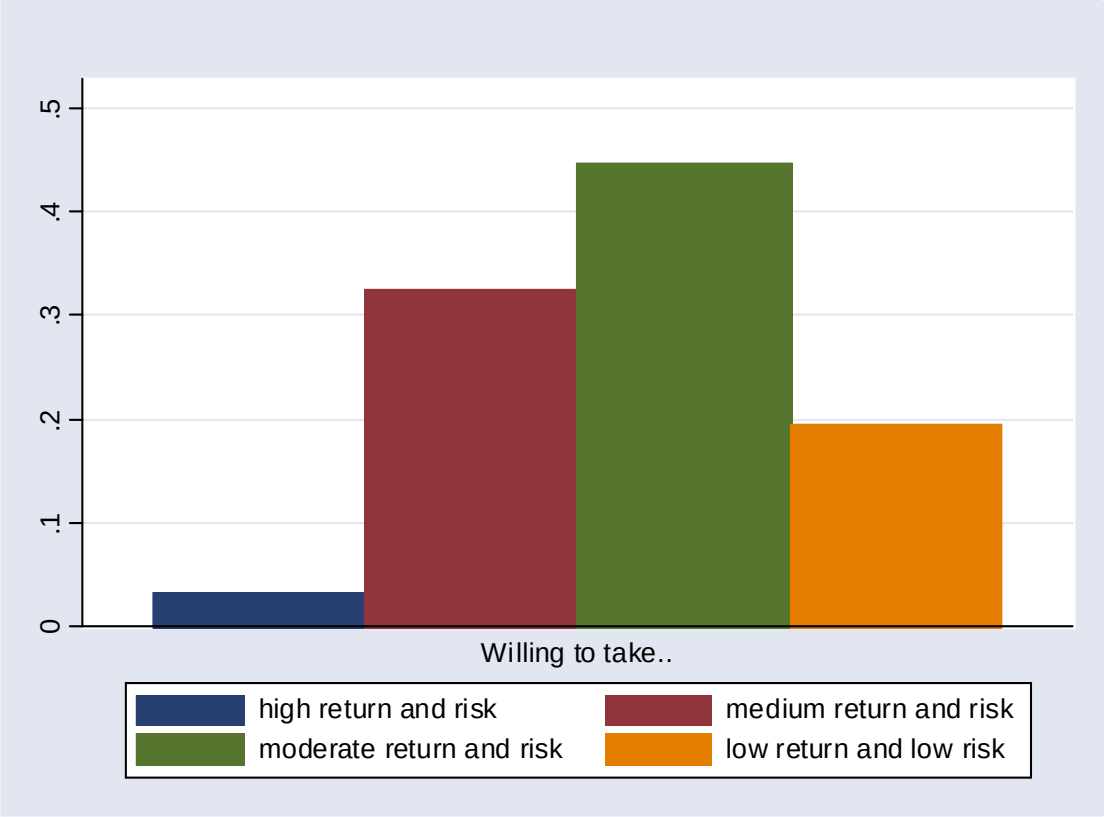


Ask individuals how much risk/return combination they prefer

- "*Which of the following statements comes closest to the amount of financial risk that you are willing to take when you make your financial investment?*

1. a very high return, with a very high risk of loosing the money
2. high return and high risk
3. moderate return and moderate risk
4. low return and no risk

Sample Distribution of Qualitative Risk Aversion

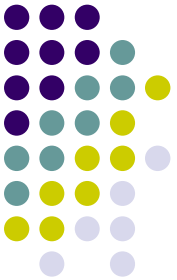


"*In managing your financial investment, you think you are a person that is interested in investments that offer the possibility of: (1) a high return, with a high risk of loosing the capital; (2) a good return, and a reasonable return; (3) a moderate return, but at the same time a good degree of safety; (4) a low return, without any risk of loosing the capital.*"

Qualitative measures: features

- Most individuals view risk as a danger; some think it is an opportunity
- Most individuals are risk averse
- These questions are simple and people understand them => easy to ask in large surveys or on line
- But: they do not distinguish between aversion to risk and risk perceptions: some may be more averse because they perceive more risk (attach higher probability to adverse events); i.e., probabilities are not held constant across respondents

Quantitative Measures of Risk Attitudes



Ask willingness to pay for a risky prospect.

Example: A firm is selling a security that over a year yields

$$\tilde{R} = \begin{cases} 50000 \text{ EUR with probability } 1/2 \\ 0 \text{ EUR with probability } 1/2 \end{cases}$$

You can buy the security. What is the maximum price you would be willing to pay? Let us say is P .

The price reveals the risk aversion of the individual:

- High P => low risk aversion
- Low P => high risk aversion

Probabilities are held constant, so approach identifies risk aversion

Problems

This approach too has its own problems

1. The question is difficult to understand => high non responses (over 50% in the SHIW)
2. People tend to understate willingness to pay=> risk aversion may be highly overstated.
3. Why should individuals reveal their true willingness to pay? One can set up mechanisms to induce individuals to tell the truth

An alternative avenue
Holt/Laury Instrument

Risky prospect

10,000 euro prob ½

0 prob ½

Sequence of safe alternatives:

100 euros
500 euros
1,500 euros
3,000 euros
4,000 euros
5,000 euros
5,500 euros
7,000 euros
9,000 euros
> 9,000 euros

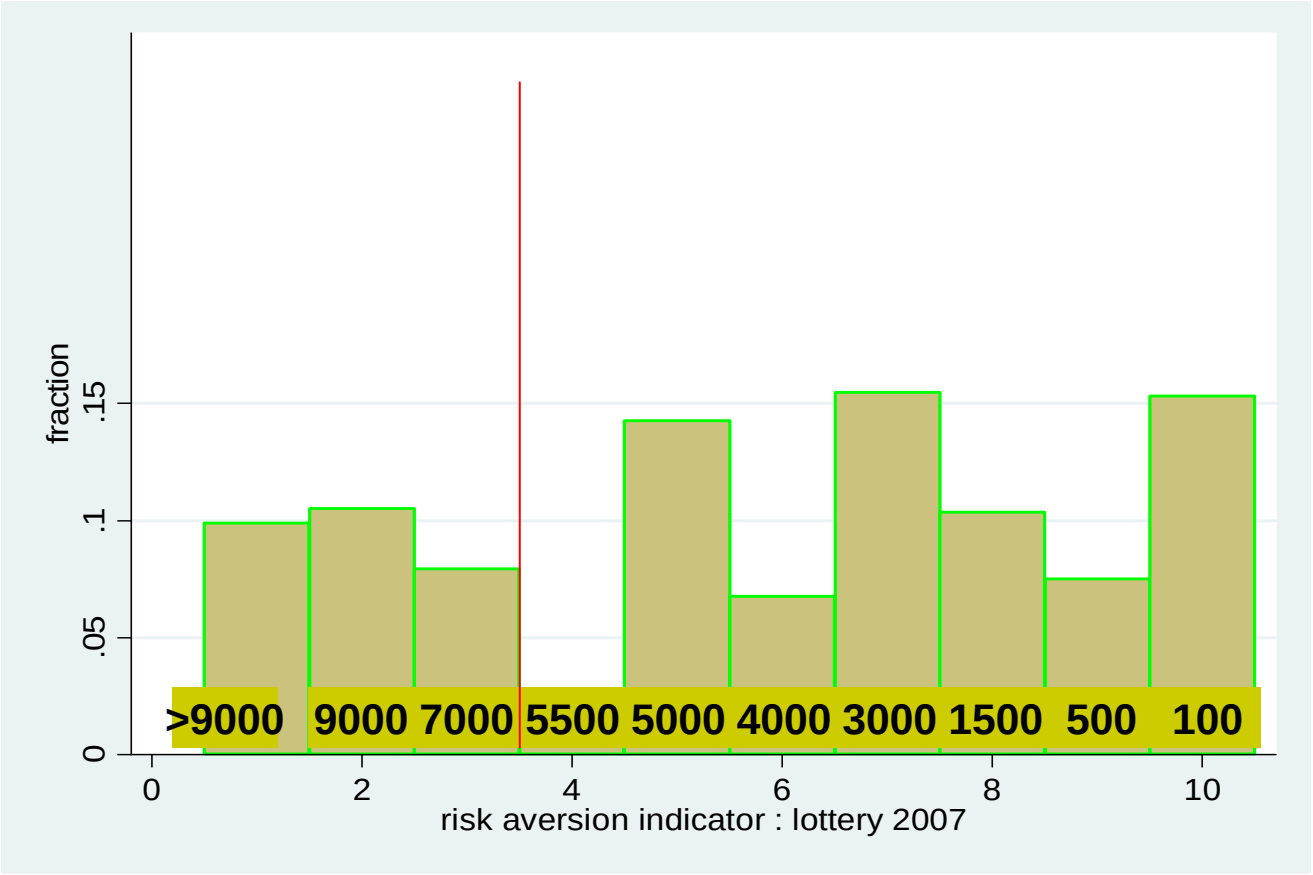
- Stop first time investor switches to safe alternative
- The higher the value of the safe alternative (**certainty equivalent)**

=> The more risk averse : similar to “Affari Tuoi”

quantitative measure, probabilities held constant

An alternative avenue: Holt/Laury (2002) Instrument

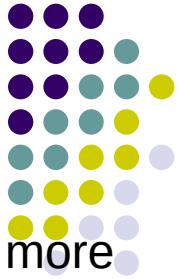
Distribution of choices in sample of Italians
(risk neutral choice decisions 5,500)



Which strategy is better?

- Several ways to elicit risk aversion: can we compare them? Dohmen et. al. do this.
  - There is considerable heterogeneity in risk attitudes however measured
  - The various measures are relatively highly correlated, even when referred to different domains. Consistent with idea that the risk attitude is an individual trait
  - Differences across individuals are partly explained by observables
  - These observables have similar effects on the various measures
  - Measures that involve money and those based on hypothetical questions give similar answers
  - These measures have predictive power on behavior under risk (portfolio choice, migration, smoking etc.)
  - The best predictor is the general qualitative question (also easy to ask)

Risk aversion and wealth



• Should the rich hold a larger share in risky assets? Should they buy more or less insurance? The answer depends on how risk aversion varies with the endowment

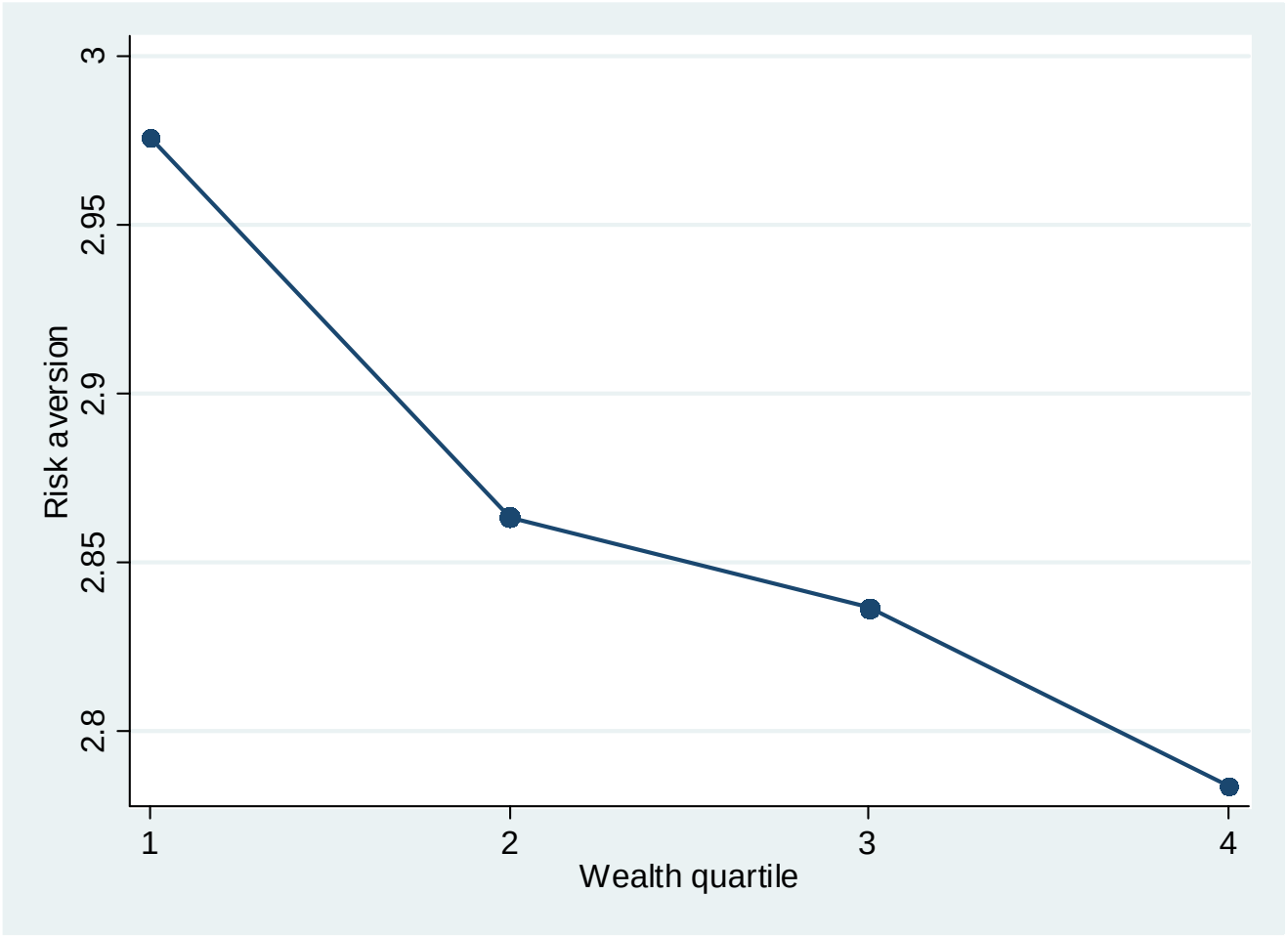
• Common sense, introspection, casual observation and a priori reasoning have all been used to draw conclusions on the nature of the relation

• **Shared opinion**:
  • Aversion to absolute risks (ARA) should decline with wealth.
  • Aversion to proportion risk , not clear, probably constant or even increasing

Evidence:
• strong evidence that aversion to absolute risks declines with wealth

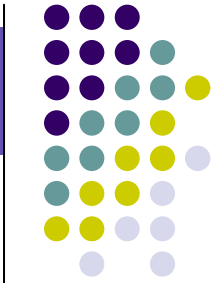
• good approximation that the wealthy and the poor are equally averse to proportional risks or the wealthy a bit less averse

Risk aversion & wealth measure



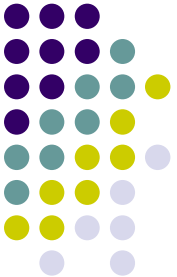
What determines attitudes towards risk ?

What determines risk aversion



- What determines the attitude toward risk?
  - Is it just an innate parameter?
  - Can it depend upon observables? And if so which ones
- If we interpret risk aversion as the willingness an individual has to bear risk, it is clear that it is not necessarily *only a genetic* characteristic of individual preferences. The environment may matter
  - Background risk (exposure to risks than cannot be insured)
  - Liquidity constraints: individuals that have a more difficult access to the credit market are less willing to bear risk
- Balanced view: depends on both

Which characteristics matter?



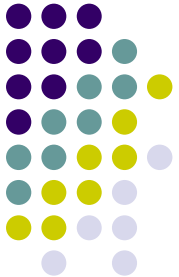
- Need to be careful: preferences affect choice! Hence any variable that can be chosen can be correlated with risk attitudes, but causality may go from risk aversion to the characteristic
- Pick up exogenous characteristics
  - Age
  - Sex
  - Features of the parents (e.g. their education)
  - Careful when measuring background risk or Liquidity constraints

A summary of evidence

- **Women** are more risk averse than men: genetic or environment? Difficult to sort out, may be both
- **Age** seems to matter: the younger are less risk averse: hard to attribute to genetic traits: should be invariant
- **Height** seems to matter: taller individuals are less risk averse. Open to interpretation
- **Place of birth** matters, but hard to find specific characteristics of the place
- **Background risk and Liquidity constraints** result in lower risk tolerance
- **Risk aversion transmits across generations**: sons of risk averse individuals are more risk averse! Education or genetics (Thomas Dohmen et. al.)

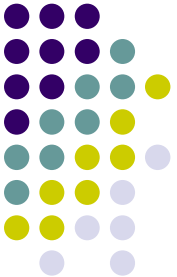
Does risk aversion vary over time and across states?

Time varying risk aversion ?



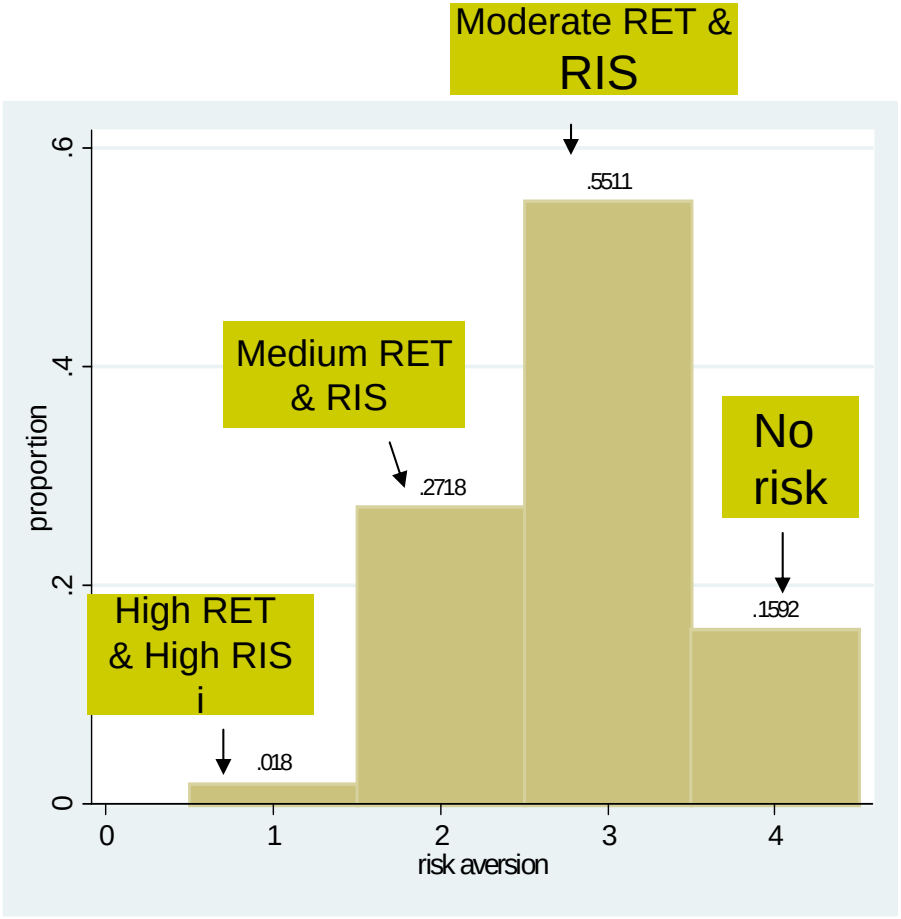
- Do preferences for risk evolve over time? Or rather is risk version a fixed attribute?
- Important to understand varying patterns of demand insurance and portfolio allocations
- Important to understand why assets prices vary so much over the cycle.

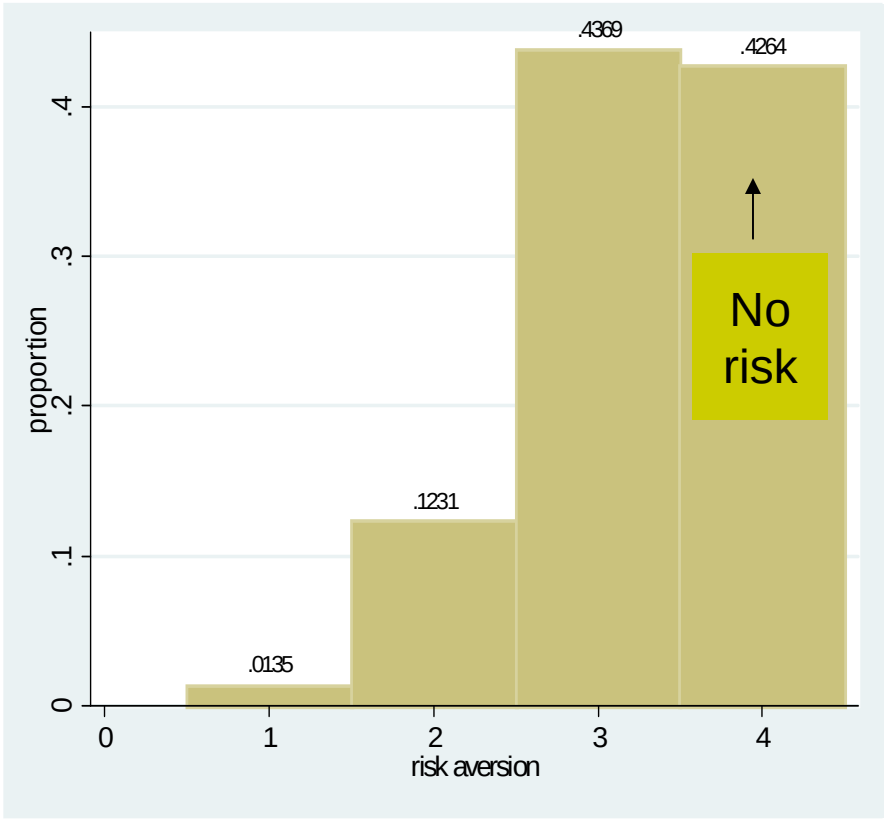
If RA Changes What Explains it?



- Changes in wealth ?
- Changes in habits?
- Changes in preferences (curvature)?
- Changes in background risk?
- Irrational fear?
- At the center of the debate on rationality of markets
- Use data on RA from a panel of Italian investors interviewed before and after the crisis

Did Risk Aversion Change? Qualitative indicator

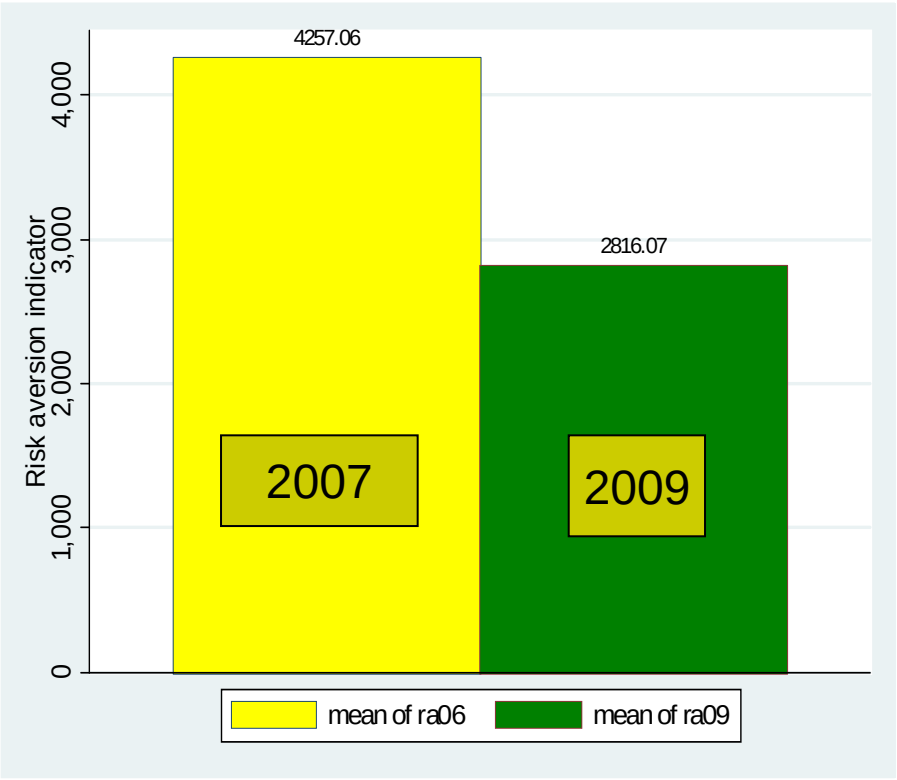




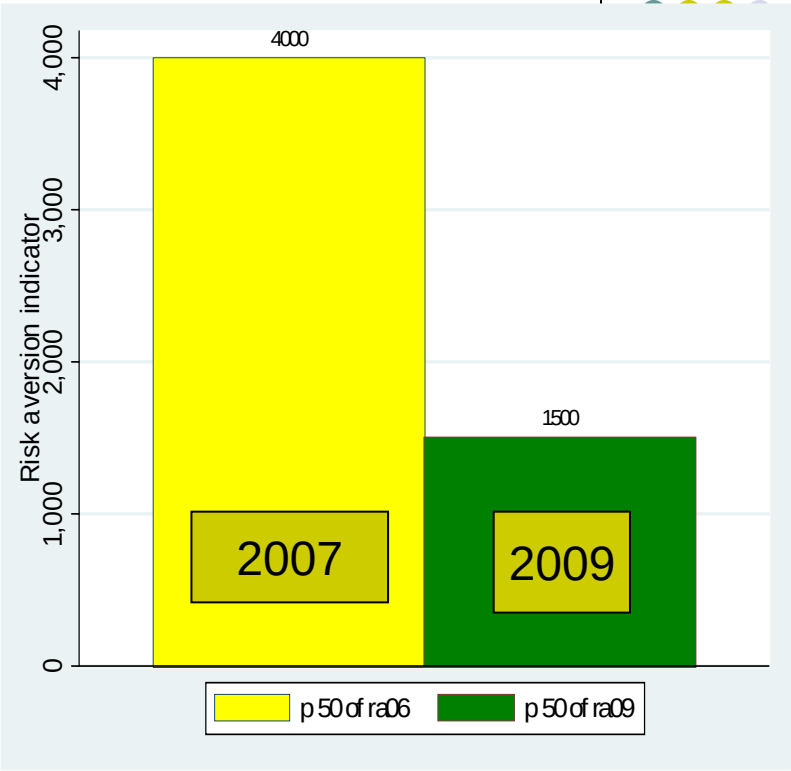
2007: before crisis

2009: after crisis

Did Risk Aversion Change?
Quantitative indicator



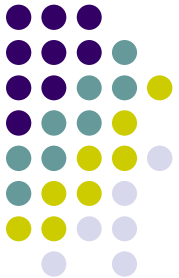
mean



median

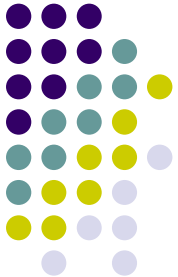
Suppose you are in a room and to get out you can chhose betwen 2 doors. If you choose the rigth door you get 10.000 euro, if you choose the wrong one, you get nothing. You do not know which door is which. You can take a third door and a get a sure sum. If you are offered EUR 100 to exit the third door would you exit from it or rather chhose among the other two? If "Yes", stop; if "NO" continue with another larger sure sum .

Why did it change?



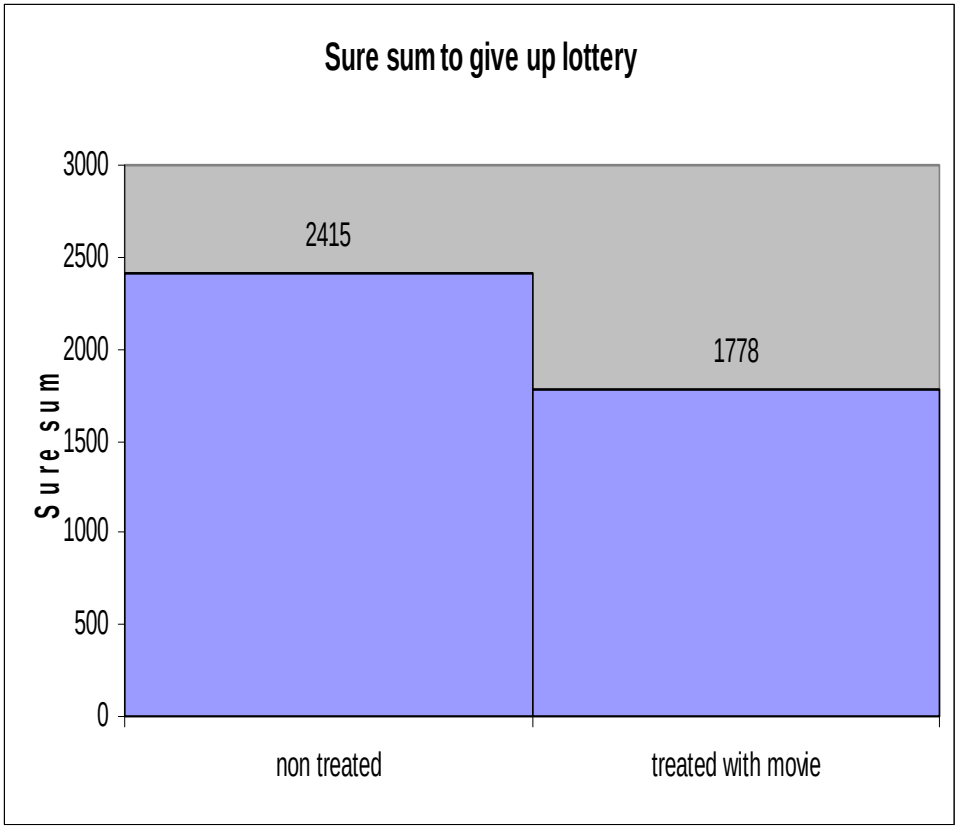
- Substantial increase in risk aversion after the crisis but puzzling why. Its increase is:
  - Not due to drop in wealth
  - Not due to change in habits
  - Not due to increase in background risk not to worsened expectations about the stock market
- Can we say that it was driven by irrational panic?
- Difficult to tell without an experiment

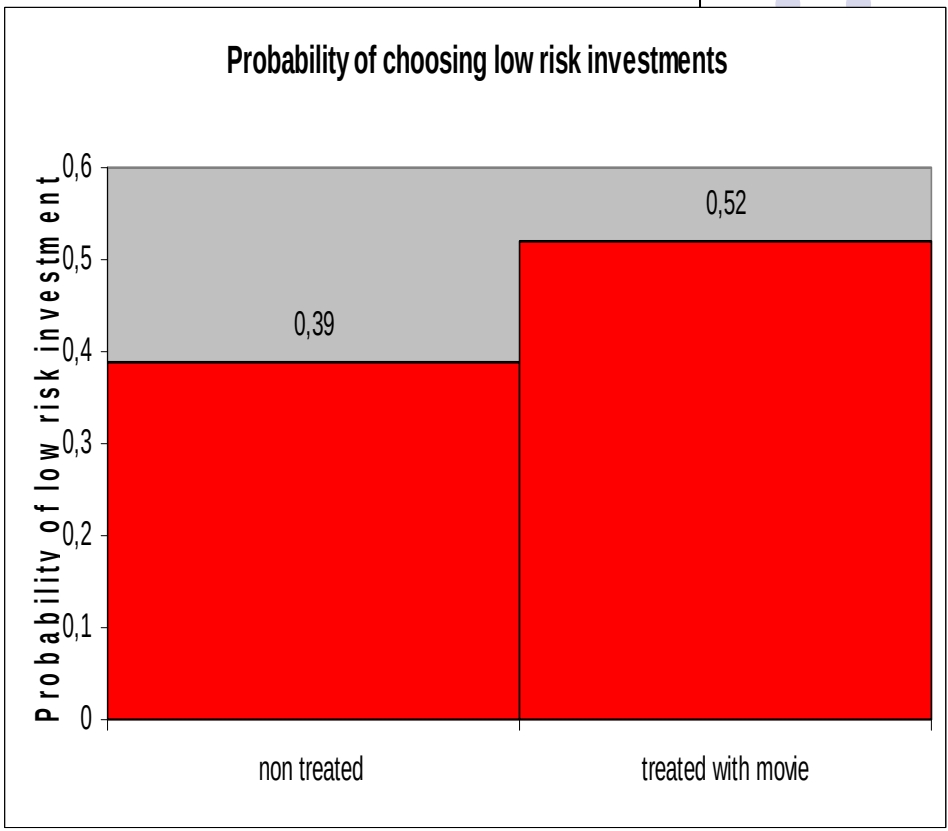
The Experiment



- To test whether fear can induce an increase in RA similar to the one observed after the 2008 crisis, we conducted a laboratory experiment with 200 students at Northwestern.
  - Treat half of participants with an excerpt from the 2005 movie, "The Hostel" (2007 best horror movie)
  - Face all with the same risk choice questions as in sample of investors

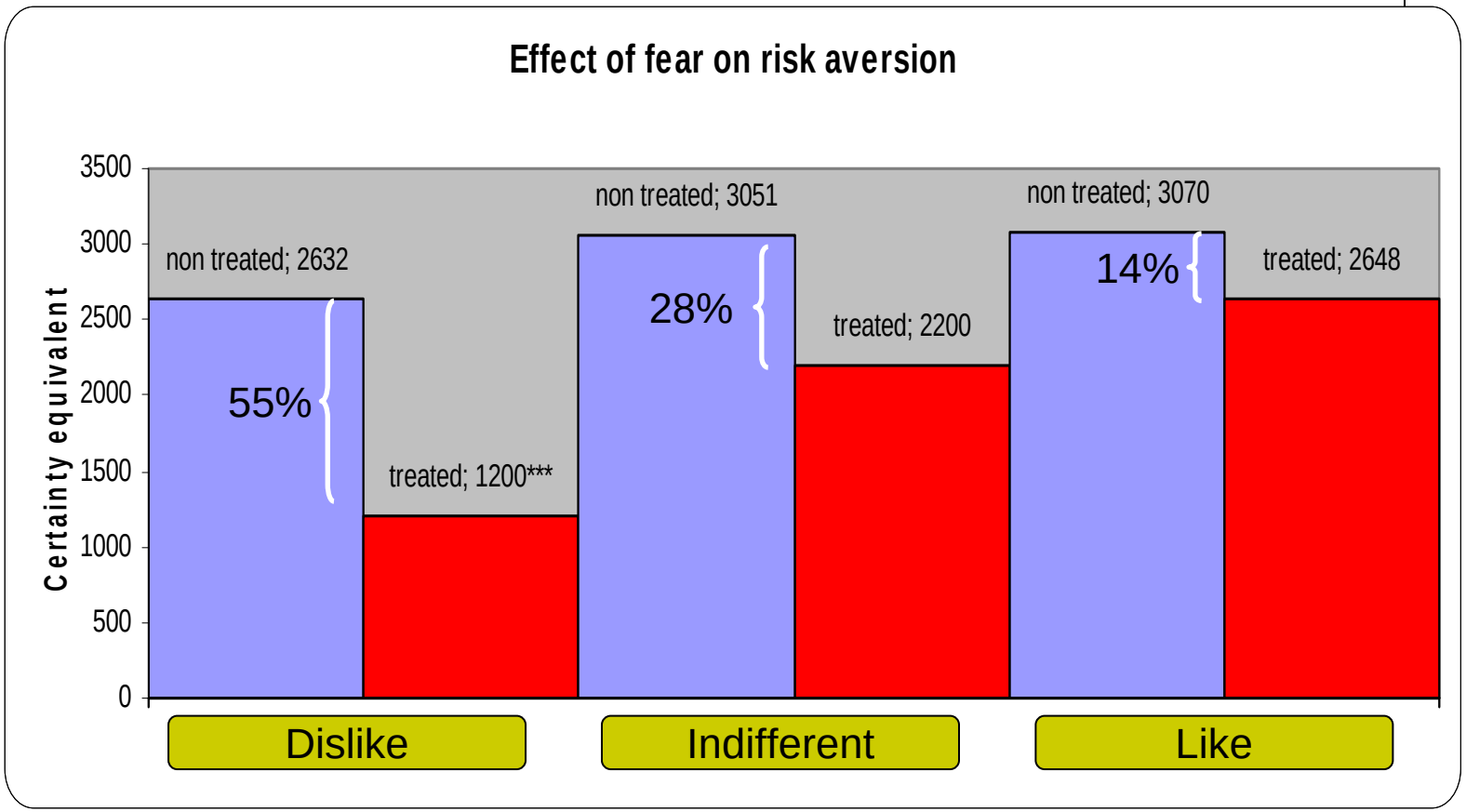
Results





Consistent with recent studies showing the neurological bases of risk aversion (De Martino et al. (2010); Kuhnen and Knutson (2005))

Splitting on Preferences for Horror Movies



- Not everybody is scared the same, some people like horror movies
- Split according to how much they like horror movies

The Biology of Fear

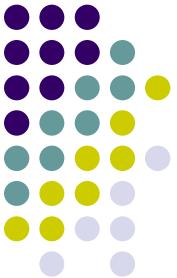
- Kuhnen and Knutson (Neuron, 2005)

  more activation in the anterior insula is followed by increased risk aversion (subjects less likely to invest in risky assets)

Kuhnen and Knutson (JFQA, forthcoming)

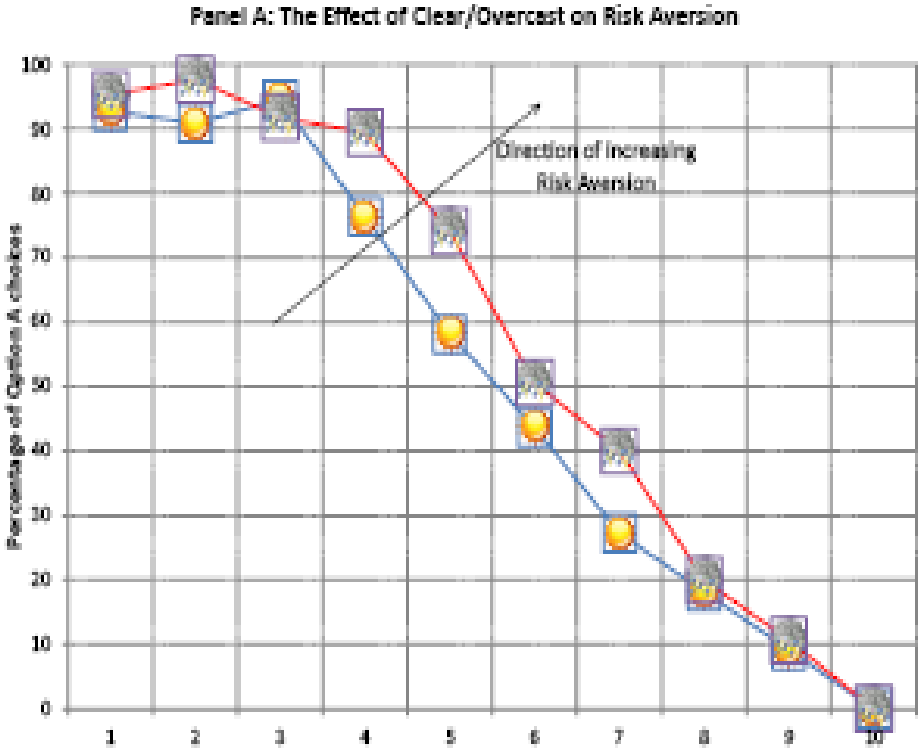
when subjects saw visual cues inducing anxiety (meant to increase activation in the anterior insula),they subsequently were more risk averse (less likely to invest in risky assets).

Does risk aversion varies over high-frequency states?



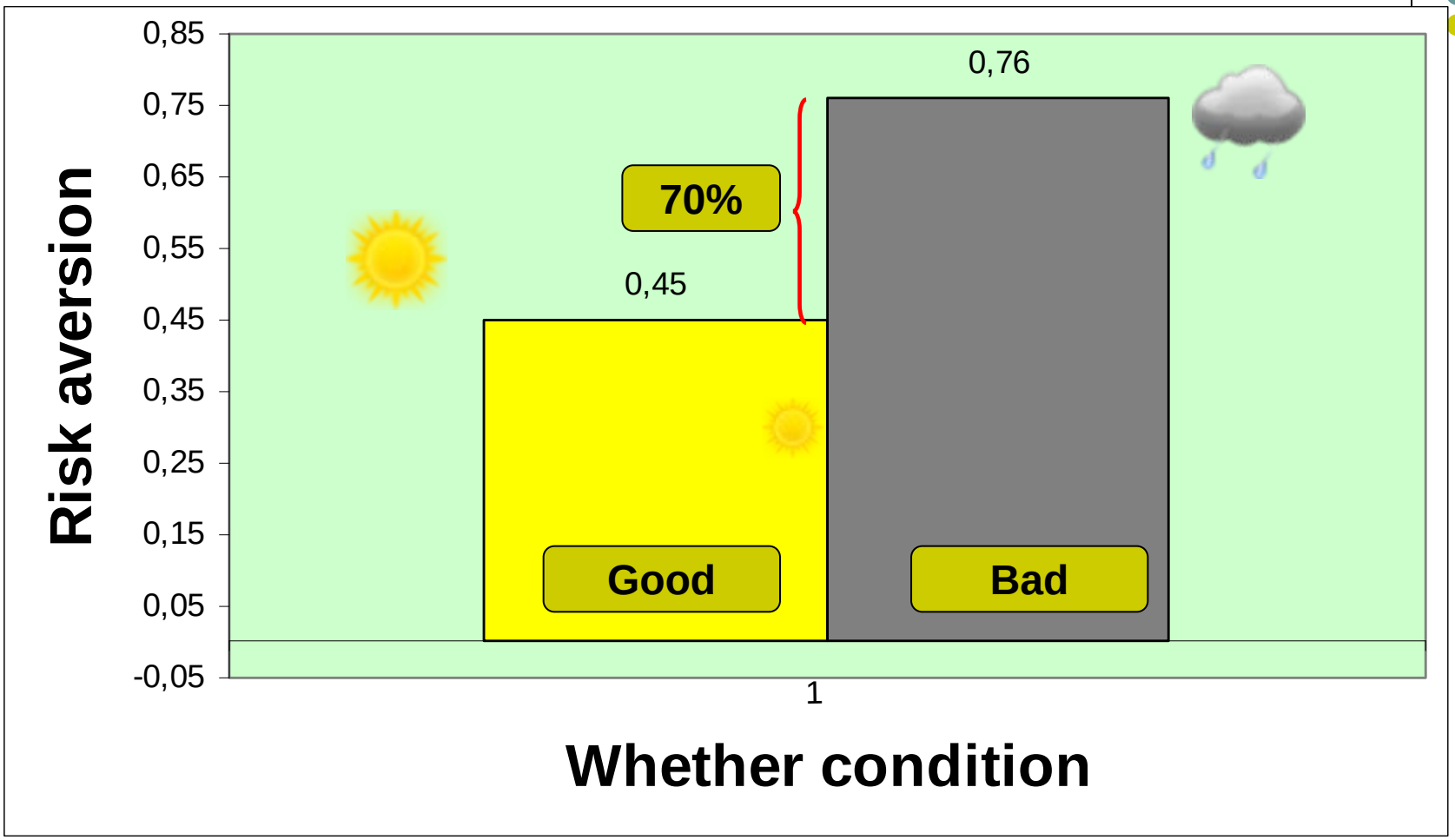
- Focus on the weather
- Variation in light exposure seems to alter people mood
- Does it alter also predisposition to take risk?
- Experiment with sample of students eliciting risk aversion under varying whether conditions suggests it does!

O sole mio!



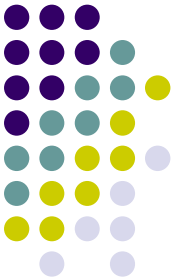
Sunshine and good weather promote risk taking.

But how large is it?



Sizeable effect: If in sunny day individual invests 50% of Wealth in risky assets he would invest 29% in rainy days

What is still missing?



- An experiment in the field with true customers at insurance companies
- Does insurance take up increases if policies are offered in rainy days?
- Let us try find an answer !

Summing up

- Eliciting risk aversion is hard
- Attempts made are encouraging
- Results thus far suggest that available measures are good at sorting individuals on the basis of their willingness to bear risk; harder to measure “the” degree of risk aversion
- A parallel line of research attempts at eliciting probability distribution of future events
- Systematic information on individual beliefs about risks and their risk tolerance are indispensable to monitor individual financial needs