April 2013

Time Varying Risk Aversion*

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Abstract

We use a repeated survey of a large sample of clients of an Italian bank to measure possible changes in investors' risk aversion following the 2008 financial crisis. We find that both a qualitative and a quantitative measure of risk aversion increase substantially after the crisis. These changes are correlated with changes in portfolio choices, but do not seem to be correlated with "standard" factors that affect risk aversion, such as wealth, consumption habit, and background risk. This opens the possibility that psychological factors might be driving it. To test whether a scary experience (as the financial crisis) can trigger large increases in risk aversion, we conduct a lab experiment. We find that indeed students who watched a scary video have a certainty equivalent that is 27% lower than the ones who did not. Following a sharp drop in stock prices, a fear model predicts that individuals should sell stocks, while the habit model has the opposite implications- people should actively buy stock to bring the risky assets to the new optimal level. We show that after the drop in stock prices in 2008 individuals rebalanced their portfolio in a way consistent to a fear model.

* We thank John Campbell, James Dow and Ivo Welch and for very and helpful comments. We have benefited from comments from participants at seminars a the University of Chicago Booth, Boston College, University of Minnesota, University of Michigan, London Business School, the 2011 European Financial Association Meetings, UCLA behavioral finance association. Luigi Guiso gratefully acknowledges financial support from PEGGED, Paola Sapienza from the Zell Center for Risk and Research at Kellogg School of Management, and Luigi Zingales from the Stigler Center and the Initiative on Global Markets at the University of Chicago Booth School of Business. We thank Filippo Mezzanotti for excellent research assistantship, and Peggy Eppink for editorial help.

In a seminal paper, Fama (1984) shows that existing asset pricing models can explain the pattern of exchange rate movements only by allowing for large changes in aggregate risk aversion. Since then, many papers (e.g., Campbell and Cochrane, 1999) have shown that to fit the time series of aggregate U.S stock prices, asset pricing models require large time variation in risk aversion.

Whether aggregate risk aversion does indeed fluctuate so sharply is crucial to assess the rationality of markets. Are fluctuations in risk aversion just a politically correct label for changes in market sentiment? Or is it the other way around? The source of risk aversion changes is crucial for another important debate: the one on fair value accounting. If we could establish that psychological factors drive risk aversion fluctuations, should we really mark to market all the assets and in so doing take into account the impact of these fluctuations on a firm's balance sheet and income statement?

In spite of the importance of these questions, there is no direct evidence that risk aversion changes substantially over a short period of time, let alone on the causes of these changes. Aggregate risk aversion can change for two reasons: because of changes in individual risk aversion or because of a change in the distribution of wealth across individuals with different risk aversions.[1] In this paper, we test the first channel.

Other than from asset prices, risk aversion can be inferred from portfolio choices or directly measured through experiments or surveys. The first approach suffers from a serious bias: if agents do not readjust their portfolio instantaneously, any significant drop in stock prices will be followed by a drop in the portfolio share invested in risky assets, leading to a positive spurious correlation. Measuring risk aversion through experiments is prohibitively expensive if we want to offer large enough gambles to a large enough sample. For this reason, we resort to measuring risk aversion through a survey. Surveys suffer from the problem that they ask purely hypothetical questions. To address this problem we use questions that have been shown to be reliable measures of risk aversion and we validate them with actual data on portfolio choices.

Since our interest is in determining how much large discount rate variations can be accounted for by changes in *individual* risk aversion, we focus on the 2008 financial crisis because Campbell et al (2011) show that at the end of 2008 there was a sharp increase in aggregate discount rates.

To measure risk aversion we rely on the answers to two questions. One, which we will label the quantitative question, tries to elicit the certainty equivalent for a gamble that delivers either

[1] In a stock market highly dominated by institutions, the aggregate risk aversion is likely to reflect the risk aversion of these institutions, i.e. of the people running it. In this paper we focus just on individual risk aversion. How individual risk aversion is reflected into the risk aversion of the institutions is a fascinating topic but is beyond the scope of this paper.

10,000 euros or zero with equal probability. It has been designed to resemble a television game popular in Italy, which has been analyzed by Bombardini and Trebbi (2010). When they look at the actual responses in the game they find that people exhibit a Von Neumann and Morgenstern utility function with a constant relative risk aversion close to 1. Thus, the framing of the question does not seem to create any distortion.

The second question, which we label the qualitative one, tries to elicit the investment objective of the respondent, offering them the choice among "Very high returns, even at the risk of a high probability of losing part of the principal," "A good return, but with an OK degree of safety on the principal," "An OK return, with a good degree of safety on the principal," "Low returns, but no chance of losing the principal."

While the quantitative measure is asked in a domain unrelated to financial investments, the second one is not. Fortunately, the survey asks some questions on the expected distribution of stock returns.

The same questions were asked to the same set of people in January 2007 and June 2009. The first survey, on a sample of 1,686 random clients of a large Italian bank, was conducted for internal purposes. We financed a follow-up in June 2009 and were able to obtain one third of the responses. Fortunately, since almost all depositors remained with the bank, we have administrative data for both dates and thus we can check that the attrition is random.

To gain some confidence on these measures, we validate them across measures, over time, and with actual behavior. We find that the two measures are correlated both in 2007 and 2009. We also find that both the qualitative and the quantitative measures in 2007 are positively and statistically significantly correlated with the same measures in 2009. The same is true when we correlate the changes in the two measures. Most importantly, both these measures are correlated with actual portfolio decisions, both in the cross section and in the time series.

Having gained some confidence on the reliability of these measures, we look at their changes from before to after the crisis. Both measures show a large increase in risk aversion. The certainty equivalent of the risky gamble drops from 4,000 euros to 2,500, with 55% of the respondents exhibiting an increase in the quantitative measure of risk aversion. Similarly, 46% of the respondents exhibits an increase in the qualitative measure of risk aversion, with the average responses (coded with integers from 1 to 4) increasing from 2.85 to 3.27. All these changes are statistically different from zero at the conventional levels.

We then try to explain the determinants of these changes. In the standard models (e.g., Constantinides (1990), Campbell and Cochrane (1999)) risk aversion varies because of changes in wealth, changes in habits, and changes in background risk. The bank administrative data provide us

with all the information needed to compute the changes in wealth. While we do not have consumption data, we use the Italian equivalent of the Survey of Consumer Finances to project individual consumption, which we use to compute a habit. Neither changes in wealth, nor changes in total habit seem to have any effect on changes in risk aversion, whether we use the qualitative or the quantitative measure.

To explore whether changes in background risk can justify the increase in risk aversion, we test whether retirees (who in Italy enjoy a public pension) and public employees (who face little or no firing risk) exhibit different changes in risk aversion. We do not find any difference.

To test whether the increase in risk aversion is due to an increase in knightian uncertainty, we create a dummy equal to one for those people who were able to answer the stock market expectation questions in 2007, but did not feel able to answer them in 2009. We find that these people exhibit a significantly higher increase in risk aversion. Similarly, we find that changes in trust towards the stock market are positively correlated with changes in risk aversion. Even these factors, however, explain very little of the changes in risk aversion.

Overall, existing models seem unable to account for the large changes in risk aversion that occurred around the crisis. One possible explanation is that our proxies are too noisy. Another is that these changes are due to other considerations, which have nothing to do with the standard models. For example, we know from Kuhnen and Knutson (2011) that visual cues inducing anxiety (meant to increase activation in the anterior insula of the brain) make subjects less likely to invest in risky assets.

Can these neurological dimensions explain the large drop in the certainty equivalent that we find in the data? To address this question, we conduct a laboratory experiment to test whether a scary experience (like the 2008 financial crisis was) can induce an increase in risk aversion. We "treat" a sample of students with a five-minute excerpt from the movie, "The Hostel" (2005, directed by Eli Roth), which is characterized by stark and graphic images and that show a young man inhumanly tortured in a dark basement. We find that treated students exhibit a 27% lower certainty equivalent than untreated ones. While this does not prove that fear caused the increase in risk aversion after the crisis, it shows that fear can lead to an increase in risk aversion as large as the one observed in the data. This is the only explanation not inconsistent with the data.

While the experiment is useful to gain confidence that fear may induce movements in risk aversion, it does not provide a definite proof that fear indeed caused the behavior we observed during the crisis. For fear to be a cause, we need to prove that the effect of fear is consistent with the empirical evidence. For that reason, we develop some testable implications of a model of fear and risk aversion that can possibly be contrasted with alternative models, such as the habit model.

Our simple model allows us to show that a fear model and a habit model have opposite different implications for active rebalancing following a sharp drop in stock prices; while the fear model predicts that if the stock market collapse is accompanied by fear individual should sell stocks, the habit model has the opposite implications- people should actively buy stock to bring the risky assets to the new optimal level. We then use the information in our data on net asset purchases at monthly frequency to run a horse race between the two models. Our empirical results are consistent with the predictions of the fear model.

Our conclusions are partially at odds with Weber et al. (2011). They survey online customers of a brokerage account in England between September 2008 and June 2009. They find that while risk taking decreases between September and March, their measures of risk attitudes do not. The difference in the results can be due to three causes. First, their sample of online customers who answer online surveys is likely to be biased in favor of risk takers who are less affected by negative events. Second, their measures of risk attitudes are different and tend to mix expectations and risk aversion. Third, the earlier measures are taken in September 2008 when the situation was already problematic, while our measures are taken way before the inception of the crisis.

The rest of the paper continues as follows. Section 1 reviews how risk aversion can be estimated. Section 2 describes the data. Section 3 presents the results about the changes in risk aversion, while Section 4 tests for possible explanations of these changes. Section 5 reports the results of the experiment. Section 6 develops some testable implication of the effects induced by fear versus those induced by habit. This model is tested in the data. Section 7 concludes.

1. Measuring individual risk aversion

If we want to test whether changes in risk aversion can explain movements in asset prices, we need a way to infer risk aversion that is independent of asset prices. There exist two different approaches: the first relies on a revealed preference strategy, the second on direct elicitation of risk attitudes from choices in experiments or survey questions.

1.1 Revealed preferences

Friend and Blume (1975) were the first to infer an individual relative risk aversion from his share of investments in risky assets. In Merton's (1969) portfolio model, the share of wealth invested in risky assets by individual *i* is

$$\alpha_i = \frac{r^e}{\theta_i \sigma^2}$$

where r^e is the equity premium, σ^2 the variance of the risky asset and θ_i the Arrow-Pratt degree of relative risk aversion of individual *i*. Under the (common) assumption that beliefs about stock market returns and riskiness, r^e and σ^2 are the same for all investors, individual *i* relative risk aversion is

$$\theta_i = \frac{r^e}{\alpha_i \sigma^2}$$

This indirect method is easy to apply, but it also has several shortcomings. First, it imposes strong assumptions about beliefs: all investors use the same historical distribution of returns. If this is false, belief heterogeneity biases the estimated degree of risk aversion. Second, a measure of risk aversion can only be computed for those with a positive amount invested in risky assets. Many do not participate in the risky assets market, perhaps because they are highly risk averse; but their risk aversion is not computable and thus this possibility cannot be tested. Most importantly, if we want to test time series changes in risk aversion, the necessary maintained assumption is that portfolio shares are instantaneously adjusted. If not, any adjustment costs will be reflected in the estimated changes in risk aversion (Bonaparte and Cooper, 2010).

1.2 Qualitative Measures

To overcome these problems, researchers have resorted to direct measurement of the risk aversion parameter by relying on specifically designed questions asked through laboratory or field experiments or in household surveys. Some questions are meant to provide qualitative indicators to sort individuals into risk tolerance groups. This approach is commonly used in psychology, where individual attitudes towards risk, viewed as a personality trait, are measured using Zuckerman (1979, 2007) "sensation seeking" scales for instance.[2]

Yet, qualitative questions meant to capture individual risk aversion are now asked often in economists' questionnaires. For instance, the Survey of Consumer Finances elicits risk attitudes by asking individuals: "*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) *Take substantial financial risks expecting to earn substantial returns; 2) Take above average financial risks expecting to earn*

[2]Zuckerman divides sensation-seeking into four traits: thrill and adventure-seeking, experience seeking, boredom susceptibility meant to capture willingness to take risks over different domains. An index on each trait is obtained by asking individuals to choose between a set of binary alternative descriptions meant to capture their type, such as 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." Answers are then aggregated into a single index.

above average returns; 3) Take average financial risks expecting to earn average returns; 4) Not willing to take any financial risks.

These questions result in very few non-responses. They have also been shown to predict risk taking behavior in various domains (see for instance Dohmen et al. (2011), M. Donkers et al. (2001)) and can thus be used to sort people into risk tolerance groups. The main drawback is that 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). That is, probability distributions are not held constant across respondents. In addition they are hard to interpret as a preference parameter in the Arrow-Pratt sense.

1.3 Quantitative measures

These problems can be dealt with by confronting individuals with specific risky prospects. Barsky et al. (1997) use this approach to obtain a measure of relative risk aversion from respondents to the Panel Study of Income Dynamics, by confronting them with the option of giving up their present job with fixed salary for an (otherwise equivalent) job with uncertain lifetime earnings. Answers allow them to bound the degree of relative risk aversion for the respondents into four intervals.

Guiso and Paiella (2008) recover a point estimate of an individual's absolute risk aversion by asking people in the SHIW (The Italian Survey of Households Income and Wealth) their willingness to pay for a hypothetical lottery involving a gain of 5000 euros with probability ½.[3]

One advantage of these survey-based measures is that they are generally asked as part of a long questionnaire, which can provide a lot of individual-specific information. As a result, they can be used to study the properties of the risk aversion function, in particular how it relates to their wealth, demographic characteristics, and the economic environment where the investor lives.

A third alternative that has been used to measure individual risk preferences and avoid incentive effects is to rely on actual choices from such settings as people's participation in television games, (Beetsma and Schotman (2001), Bombardini and Trebbi (2011)), betting choices in sports (Kopriva (2009), Andrikogiannopoulou (2010)), choices over menus of premiums and deductibles in insurance contracts (Cohen and Einav (2007), Barseghyan et al. (2010)), and the *Lending Club* (a peer-to-peer lending on the Web) investment choices (Parravicini and Ravina, 2010). Because actual money is involved, these studies are not subject to the incentive distortions of hypothetical survey questions. This is not without cost, though. In some cases (as in television games) relevant variables—such as people's wealth and its composition—are not observed. Hence

[3] Hartog and al. (2002) use a similar approach in a sample of Dutch accountants.

measured risk preferences cannot be related to wealth. Second, these samples are not representative of the population and can be highly selected (e.g. sport bettors), which makes it difficult to extrapolate the findings to the general population. Third, in some of these instances measures of risk preferences can only be obtained by restricting individuals beliefs, e.g. about the probability of an accident (as in Cohen and Einav (2007), Barseghyan et al. (2010)) or the odds of a bet (as in Andrikogiannopoulou (2010)).

1.4 Our Choice

Our goal is to measure the risk aversion in a large sample of individual investors. Thus, selection issues are very important and so are cost considerations. Individuals should be approximately risk neutral over small gambles. Yet, offering large enough gambles to a large sample is prohibitively expensive. For this reason, we resort to measuring risk aversion through a survey. Surveys do suffer from the problem that they are pure hypothetical questions. To address this problem we use questions that have been shown to result in reliable measures of risk aversions and we validate them with actual data on portfolio choices.

2. Data Description

2.1 Sample

Our main data source is the second wave of the Unicredit Clients' Survey (UCS) which was run between June and September 2007. The survey is comprised of interviews with a sample of 1,686 Italian customers of Unicredit, one of the largest European banking groups. The sample was stratified according to three criteria: geographical area, city size, and financial wealth. To be included in the survey, customers must have had at least 10,000 euros worth of assets with Unicredit at the end of 2006. The survey is described in greater detail in Appendix 1 where we also compare it to the Bank of Italy survey.

Besides collecting detailed demographic information, data on investors' financial investments, information on beliefs, expectations, and risk perception, the survey collected data on individual risk attitudes by asking both qualitative questions on people's preferences regarding risk/return combinations in financial decisions as well as their willingness to pay for a (hypothetical) risky prospect. We describe these questions below.

For the sample of investors who participated in the 2007 survey, Unicredit gave us access to the administrative records of the assets that these clients have with Unicredit. Specifically, we can merge the survey data with Unicredit administrative information on the stocks and on the net flows of 26 assets categories that investors have at Unicredit. We describe in detail this dataset and its

content in the Appendix. These data are available at monthly frequency for 35 months beginning in December 2006 and we use them to obtain measures of variation in wealth and portfolio investments over time. Since some households left Unicredit after the interview the administrative data are available for 1,541 households instead on the 1,686 in the 2007 survey.

In order to study time variations in risk attitudes, in the spring of 2009 we asked the same company that ran the 2007 UCS survey to run a telephone survey on the sample of 1,686 investors interviewed in 2007. The telephone survey was fielded in June 2009 and asked a much more limited set of questions in a short 12-minute interview. Specifically, investors were asked two risk aversion questions, a generalized trust question, a question about trust in their bank, and a question about stock market expectations using exactly the same wording that was used to ask these questions in the 2007 survey. Before asking the questions the interviewer made sure that the respondent was the same person who answered the 2007 survey by collecting a number of demographic characteristics and matching them with those from the 2007 survey.

Of the 1,686 who were contacted, roughly one third agreed to be re-interviewed so that we end up with a two- year panel of 666 investors. Table I compares the characteristics of respondents and non-respondents to the 2009 survey along several dimensions. In the first part of the table, we compare the two samples according to their demographic characteristics collected in the 2007 survey such as age, gender, marital status, geographical location, and education. The differences are small and not statistically significant, with the exception of education where we cannot reject statistically the hypothesis that the two samples differ. Yet the economic magnitude of the difference is small (less than a year of education).

In the middle part of the table, we compare the two samples according to their risk attitudes, as measured in 2007. Along this dimension, which is the most important one for our analysis, participants in the 2009 survey do not differ from non-participants. For instance, the average 2007 certainty equivalent for the hypothetical risky prospect (described below) is 3,278 euros among non-respondents and 3,266 euros among respondents in the 2009 telephone survey.

While the two samples do not differ in observable characteristics in 2007, they might differ in time-varying characteristics. For example, the crisis might have affected the two groups differentially, in a way that is correlated with their willingness to be re-interviewed. Fortunately, we have the administrative data (and hence the portfolio choices) of both the respondents and the non-respondents both in 2007 and in 2009. Hence, the last part of Table I compares these choices. The stock of financial assets, both before and after the crisis, does not differ between the two groups, nor does the fraction of wealth invested in stock. Similarly, there are no differences in the percentage

of people who own stock. From this we conclude that there does not seem to be any systematic selection in the investors' decisions to be re-interviewed in June 2009.

2.2. Measuring attitudes towards risk

The 2007 survey has two measures of risk attitudes. The first, patterned after a question in US Survey of Consumer Finance, is a qualitative indicator of risk tolerance. Each participant is asked: 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 losing money; (2) high return and high risk; (3) moderate return and moderate risk; (4) low return and no risk.

Only 18.6 percent of the sample chooses "low return and no risk" so most are willing to accept some risk if compensated by a higher return, but very few (1.8 percent) are ready to choose very high risk and very high return. From this question we construct a categorical variable ranging from 1 to 4 with larger values corresponding to greater dislike for risk.

In a world where people face the same risk-return tradeoffs and make portfolio decisions according to Merton's formula, their risk/return choice reflects their degree of relative risk aversion. In such a world, the answers to the above questions can fully characterize people's risk preferences. However, if people differ in beliefs about stock market returns and/or volatility these differences will contaminate their answers to the above question. This bias would affect not only cross-sectional comparisons, but also inter-temporal ones, possibly revealing a change in risk preferences when none is present.

The second measure of risk aversion contained in the 2007 survey helped us to deal with this problem. Each respondent was presented with several choices between a risky prospect, which paid 10,000 euros or zero with equal probability and a sequence of certain sums of money. These sums were progressively increasing between 100 euros and 9,000 euros. Since more risk averse people will give up the risky prospect for lower certain sums, the first certain sum at which an investor switches from the risky to the certain prospect identifies (an upper bound for) his/her certainty equivalent. The question was framed so as to resemble a popular TV game ("Affari Tuoi", the Italian version of the TV game Deal or no Deal), analyzed by Bombardini and Trebbi (2010). Incidentally, it is similar to the Holt and Laury (2002) strategy which has proved particularly successful in overcoming the under/over-report bias implied when asking willingness to pay/accept.

Specifically, respondents were asked: "Imagine being in a room. To get out you have two doors. If you choose one door you win 10,000 euros. If you choose the other you get zero.

Alternatively, you can get out from the service door and win a known amount. If you were offered 100 euros, would you choose the service door? "

If he accepted 100 euros the interviewer moved on to the next question, otherwise he asked whether the investor would accept 500 euros to exit the service door and if not 1500 and if not…, 3000, 4000, 5000, 5500, 7000, 9000, more than 9000 euros.

We code answers to this question both as the certainty equivalent value required by the investor to give up the risky prospect as well as integers from 1 to 10 where 1 corresponds to a certainty equivalent of 100 euros and 10 to a certainty equivalent larger than 9000 euros: the first is decreasing in risk aversion the second increasing.

We will refer to the measure based on preferences for risk-return combinations as the qualitative indicator and to the one based on the lottery as the quantitative indicator.

These two questions were asked both in the 2007 and the 2009 survey. Since the hypothetical lottery faces each respondent with the same probabilities for the risky prospect, differences in the certainty equivalent will reflect differences in risk preferences either across individuals or over time for the same individual when we compare them across the 2007 and 2009 surveys.

The measure of risk aversion that is obtained should be thought as a measure of the risk aversion for the respondent's value function and as such is potentially affected by any variable that impacts people's willingness to take risk, such as their wealth level or any background risk they face.

2.3 Validating the risk aversion measures

A large and increasing literature shows that questions like the ones above predict risk taking behavior in various domains (see for instance Dohmen et al. (2011), Donkers et al. (2001), Barsky et al. (1997), Guiso and Paiella (2006, 2008)). They are also robust to the specific domain of risk: using a panel of 20,000 German consumers Dohmen et al. (2011) show that indicators of risk attitudes over different domains tend all to be correlated, with correlation coefficients of around 0.5 - a feature that is consistent with the idea that risk aversion is a personal trait. Importantly, Dohmen et al. (2011) also document that measures from choices involving money are similar to those based on hypothetical questions, thus reassuring that incentive compatibility problems are unlikely to conceal the information content of qualitative indicators of risk aversion or of measures based on hypothetical risky choices.

To validate our measures we run various tests. First, in Table II we document that our qualitative and quantitative measures are positively correlated either when using the 2007 cross,

section (correlation coefficient 0.12) or the 2009 cross section (correlation 0.16) or when looking at the correlation between the changes in the two measures between 2007 and 2009 (correlation coefficient 0.12). Furthermore, in the 2009 survey we ask "After the stock market crash did you become more cautious and prudent in your investment decisions?". The possible answers are: "More or less like before", "A bit more cautious", "Much more cautious." 35% of the respondents declare to have become much more cautious, while 18% a bit more. If we create a variable cautiousness equal to zero if the response is no change, 1 if the response is a bit more, and 2 if it is much more, we find that this variable has a 12% correlation (p-value 0.002) with the changes in the qualitative measure of risk aversion and a 7.5% correlation (p-value 0.056) with changes in the quantitative measure of risk aversion.

Second, we document that our measures tend to be correlated in expected ways with classical covariates of risk attitudes. As Table IV shows, risk aversion is lower for men and tends to be higher among the elderly. It is also negatively correlated with education and with wealth levels in both the 2007 and the 2009 cross sections. These patterns of correlations have been documented in several studies, either using surveys or experiments (e.g. Croson and Gneezy (2009) for gender; Barsky et al. (1997), Guiso and Paiella (2006, 2008), Hartog et al. (2002)).

Third, we document that our measures have predictive power on investor's financial choices. Table V shows that the qualitative indicator of risk aversion is strongly negatively correlated with ownership of risky financial assets (Panel A) and their portfolio share in the 2007 cross section. The correlation with the lottery-based measure is negative but weaker. This is partly due to some investors providing noisy answers in the two questions. When we drop inconsistent answers - those who are highly risk averse according to the first indicator (a value greater than 2), but a risk lover on the basis of the lottery question (a certainty equivalent greater or equal to 9000 euros) - we also find that the quantitative measure significantly predicts risky asset ownership and portfolio shares.

Finally, Table VI documents that variation over time in our measure of risk aversion predicts change in portfolio decisions. These regressions are run on the sample of respondents to both the 2007 and 2009 survey using the administrative portfolio data to uncover dynamics in investors' portfolio decisions. We lose some observations because some investors left the bank in the meantime. The table shows that those who increased their risk aversion were more likely to lower their share in risky assets (Panel B) and/or to liquidate their risky asset positions altogether (Panel A); the effect is particularly pronounced when comparing the portfolio in June 2009 with that in June 2008, that is right before the financial collapse of October 2008.

2.4 Changes in wealth

For all the participants in the survey, we have access to the administrative data, which include the amount of deposits at the bank, the amount and composition (by broad categories) of their brokerage account at the bank, the proportion of financial wealth represented by their holdings at bank, and the value of their house. Thanks to these data we can infer the changes in respondents' wealth as the sum of their actual changes in the financial wealth held at Unicredit (divided by the proportion of financial wealth held at this bank to obtain an estimate of total household assets) and the imputed changes in home equity. To impute these changes we look at the variation in local indexes of real estate prices.

3 Changes in Risk Aversion

Figure 1A compares the distribution of the qualitative measure of risk aversion before and after the crisis. While before the crisis the average response was 2.85, after the crisis it has jumped to 3.28 (recall, a higher number indicates higher risk aversion). This change is statistically different from zero at the 1% level. In 2007 only 16% of the respondents chose the most conservative option "low return and no risk," in 2009 46% did. Table VII shows the transition matrix of the responses. There is a homogenous shift toward more conservative combinations of risk and return. Albeit the numbers are low, 83% of the people who chose the most aggressive "Very high returns, even at the risk of a high probability of losing part of the principal" change toward a more conservative one. 74% of those who had chosen the second more risky combination ("high return and high risk") move to more conservative options, while only 2% move to the more aggressive one. Forty-four percent of those who chose "moderate return and moderate risk" move to "low return and no risk," while only 9.5% move to more aggressive options.

Figure 3 shows the distribution of changes in the qualitative measure of risk aversion. Forty-six percent exhibit an increase in risk aversion, while only 10% a decrease. This distribution underestimates the actual change due to a truncation: people who were already in category 4 ("low return and no risk") cannot go any higher. When we drop these people, 63% of the sample exhibits an increase in risk aversion (Panel B).

Figure 1B compares the distribution of the discrete quantitative measure of risk aversion before and after the crisis and Figure 2 the underlying value of the certainty equivalent. As Figure 2 shows, before the crisis the average certainty equivalent to avoid a gamble offering 10,000 euros and zero with equal probability was 4,164 euros. In 2009, the same certainty equivalent for the same group of people dropped to 2,785 euros. The median dropped from 4,000 to 1,500. All these changes are statistically different from zero.

Figure 3 also shows the distribution of changes in the quantitative measure of risk aversion. 55% exhibit an increase in risk aversion, while only 27% a decrease. When we drop the 16.8% of the sample that was in the category 10 in 2007 (and thus cannot increase its measure of risk aversion) 64.4% of the sample exhibits an increase in risk aversion.

Given that the expected value of the lottery is 5,000 euros these changes in the certainty equivalent imply an increase in the average risk premium from 1,000 to around 2,200 euros and in median risk premium from 1000 to 3500 euros. Since the risk premium is proportional to the investor risk aversion, these estimates imply that the average risk aversion has increased by a factor of 2 and that of the median investor by a factor of 3.5! Needless to say, all these changes are statistically different from zero.

One benign reason why risk aversion might have increased is that from the first to the second survey our respondents became older. While true, this effect is likely to be small, since only two years went by. Nevertheless, we computed the average risk aversion by age and then took the difference of risk aversion between the first and the second survey keeping the age constant (i.e. between the average of people who were thirty in 2009 and the people who were thirty in 2007). The results are unchanged.

Overall, there is a clear sharp increase in individual risk aversion. This increase cannot be attributed solely to a worsening of expectations about the distribution of future investments, since it manifests itself also in the quantitative measure, which is unrelated to the stock market. In fact, the probability distribution underlying the gamble in the qualitative measure is objective, not subjective. These results beg the question of why aversion to risk has changed.

4 Cross-Sectional Determinants of Risk Aversion

4.1 Basic Specification

We model preferences so as to allow (and thus be able to test) for habit persistence formation (e.g., Costantinides (1990); Campbell and Cochrane (1999)) and background risk (e.g. Heaton and Lucas (1999)).

In models exhibiting habit, risk aversion can be affected by the changes in the level of habits. Consider preferences with habits:

$$u(W_{it}) = \frac{(W_{it} - X_i)^{1-\gamma_{it}}}{1-\gamma_{it}}$$

where W_{it} is the stock of wealth of individual i at time t, X_i his stock of habits, and γ_{it} his risk aversion parameter. We assume that this stock of habit varies across individuals, but it is constant

over time, as it is realistic in a two period model. The degree of absolute risk aversion of this utility function is

$$A(W) = \frac{\gamma_{it}}{(W_{it} - X_i)}.$$

Assuming *X/W* is "small" the log of absolute risk aversion is approximately

$$\log A_{it} = -\log W_{it} + X_i / W_{it} + \log \gamma_{it}$$

Taking first differences

$$\Delta \log A_{it} = -\Delta \log W_{it} + \Delta(X_i / W_{it}) + \Delta \log \gamma_{it} \quad (1)$$

Here we assume that the underlying risk aversion parameter γ might depend on a set of variables Z_{it} as $\gamma = \gamma_0 e^{a_2 Z_{it}}$. Putting (1) in regression format we have:

$$\Delta \log A_{it} = -\alpha_0 \Delta \log W_{it} + \alpha_1 \Delta(X_i / W_{it}) + \alpha_2 \Delta \log Z_{it} + \varepsilon_{it}. \quad (2)$$

Following Guiso and Paiella (2008) and allowing for background risk in the form of labor income risk, our empirical specification can be written as

$$\Delta \log A_{it} = -\alpha_0 \Delta \log W_{it} + \alpha_1 \Delta(X_i / W_{it}) + \alpha_2 \Delta \log Z_{it} + \alpha_3 \Delta \sigma_{it}^2 + \varepsilon_{it}. \quad (3)$$

Where σ_{it}^2 denotes the variance of log earnings and measures background risk; the parameter α_3 reflects the initial degree of prudence of the investor as well as the exposure to background risk measured by the ratio of labor income to accumulated wealth.

The first determinants of changes in the absolute risk aversion are changes in wealth. Since the 2008 financial crisis significantly reduced the value of financial and real assets, it is a distinct possibility that the increase in risk aversion be due to the drop in wealth. Fortunately, we have a pretty good measure of the changes in wealth of each individual. From the administrative data we have the actual changes in their financial wealth held at the bank. We also have the proportion of total financial wealth represented by the financial wealth held at the bank in 2007. Assuming that this proportion has remained unchanged, we can use this to project the total change in financial assets. To arrive to the total change in wealth we add the change in the value of home equity. In 2007 each respondent reported his estimate of the market value of his house and the value of his mortgage. We estimate the 2009 value of the house, multiplying the 2007 price by the change in the provincial-level house price index. We then use the difference between the two as a measure of the difference in the value of the house. To determine the change in home equity we subtract from this estimate the 2007 level of the mortgage.

Unfortunately, we do not have a similarly good measure of consumption habits. The UCS does not have any information on consumption. For this reason we rely on an Italian version of the Survey of Consumer Finances, where there is information on consumption, income, wealth, and other standard demographics. Therefore, we use this alternative dataset to impute consumption based on their level of income, wealth, and other demographics to the respondents of the UCS. We then divide this flow by the level of wealth (computed as above) in 2007 and 2009 to determine $\Delta(X_i / W_{it})$ over this period.

Since both the qualitative and the quantitative measures of risk aversion are bounded, the magnitude of the possible change is censored. For this reason, in all the specifications we control for the initial starting level of the same measure of risk aversion

$$\Delta \log A_{it} = \beta A_{it-1} - \alpha_0 \Delta \log W_{it} + \alpha_1 \Delta(X_i / W_{it}) + \alpha_2 \Delta \log Z_{it} + \alpha_3 \Delta \sigma_{it}^2 + \varepsilon_{it} \quad (4)$$

4.2 Classical Determinants

The results of this regression are reported in Table IX. In Panel A, where the dependent variable is the change in the qualitative measure of risk aversion, the change in logarithm of wealth between 2007 and 2009 has a negative effect, albeit not statistically significant effect (column 1). If we compute the change from 2008 to 2009 (just surrounding the crisis) the effect becomes positive, albeit still statistically insignificant. In Panel B, the dependent variable is the change in the quantitative measure of risk aversion, but the results are very similar. Note that while wealth does enter significantly in the cross section of the qualitative measure (Table IV), it does not enter in the time series.

In column 4 of both tables we insert the change in habit, which has a positive and significant effect on the changes in the qualitative measure and a negative but insignificant effect on the changes in the quantitative measure. Both these effects, however, are insignificant when we also control for changes in wealth (column 5). Overall, both these variables seem to have no explanatory power.

In Table X we explore the possible effect of background risk. The income from financial assets is generally small relative to labor income. If there is a significant change in the expected labor income, this might have an effect on changes in risk aversion. To test this hypothesis we create a dummy for people who are retired and for people who are government employees. All retirees in Italy receive a pension from the Government, in an amount which is proportional to their past contributions. Therefore, these people suffer no change in their future income. Nevertheless,

retirees do not exhibit any smaller change in the qualitative measure of risk aversion (column 1) or in the quantitative one (column 3), as the background risk hypothesis would suggest.

The same is true for government employees, who face little or no risk of becoming unemployed and have very little fluctuations in their income (columns 2 and 4). Hence, these large changes in risk aversion do not seem to be explainable with changes in background risk.

The increase in risk aversion, especially for the qualitative measure that is context-specific, might reflect a worsening of the expectations about future stock market returns. If the notion of "good" return drops, the willingness to take risk to achieve these returns might go down. Fortunately, the UCS has measures of expectations. Specifically, in 2007 depositors were asked to state what (in their view) the minimum and maximum value of a 10,000 euro investment in a fully diversified stock mutual fund would be 12 months later. Next, they were asked to report the probability that the value of the stock by the end of the 12 months was above the mid-point of the reported support. Under very simple assumptions about the shape of the distribution, this parsimonious information allows computing the subjective mean and variance of stock market returns. We have computed these moments assuming the distribution is uniform but results are the same assuming it is triangular. In 2009 we re-ask the same questions, thus the change in stock market expectation is the difference in the expected return in the two surveys and the change in the range is the difference between the ranges (measured as the maximum value of the investment minus the minimum value) as computed in 2009 and in 2007.

In Table XI we insert these two measures of changes in expectations into our standard specification (columns 1 and 2). Neither of the two has any effect, regardless of whether we use the qualitative or quantitative measure of risk aversion.

To try to capture the worsening of the subjective beliefs, in 2009 we asked a more direct question: "How is your trust towards the stock market changed between September 2008 and today?". The possible answers were "a) increased a lot; b) increased a bit; c) unchanged; d) decreased a bit; e) decreased a lot. We coded the answers with integers between 1 and 5, where higher numbers reflect an increase in trust.

Not surprisingly, people whose trust increased (or decreased less) exhibit a lower increase in the qualitative measure of risk aversion. The effect is not only statistically, but also economically significant. For the 22 people who experienced an increase in trust, the qualitative measure of risk aversion increased by only 3%. For the 216 people who experienced a large decrease in trust, the qualitative measure of risk aversion increased by 22%.

More surprisingly (and interestingly), this variable has predictive power also with respect to changes in the quantitative measure of risk aversion, a measure that has nothing to do with stock

market performance. For people who did not change their level of trust, the quantitative measure of risk aversion increased by 15%, for people whose trust dropped a lot, the quantitative measure dropped by 30%.

Since this is an ex-post measure, it might reflect more the emotional state of a person, rather than his subjective probability. To test whether this trust measure captures the feeling of uncertainty, we exploit the fact that many more people (29%) refused to respond to the question on the distribution of stock returns in 2009 than in 2007. We take this unwillingness/inability to state an expectation about a future distribution as a measure of the Knightian uncertainty. Thus, we create a dummy variable equal to one if in 2007 the investor is able to answer the question about the probability distribution of stock prices but is unable in 2009. This variable captures changes in the level of Knightian uncertainty.

When we insert this variable in the standard specification for the changes in the qualitative measure of risk aversion (Table XII, column 1), we find it to have a positive and highly statistically significant effect. The average change in risk aversion is almost double (0.64 vs. 0.33) among those who experience an increase in Knightian uncertainty.

Interestingly, this variable has no effect on the quantitative measure of risk aversion. This is reasonable, since the question has very objective probabilities, thus there is no uncertainty in the Knigthian sense.

4.3 Other Possible Characteristics and Risk Aversion

Equation (2) leaves open the possibility that some factors z_{it} might impact the risk aversion parameter. Here, we look into what these factors might be. In Tables 13 to 16 we try to identify whether there are other individual characteristics that can explain this increase in risk aversion. One question we asked in the 2009 survey was: "In September 2008 and in the following weeks did you: a) withdraw your deposits (totally or partially) from Unicredit and keep them cash; b) Transfer them (totally or partially) to another bank; c) Transfer deposits from another bank where you have an account to Unicredit; d) Seriously think of implementing action (b) but then you did not; e) Seriously think of implementing action (c) but then you did not." A depositor who answers yes to a, b, or c, exhibits a high degree of fear that his bank would collapse. Hence, this measure can be taken as an indicator of fear, albeit not necessarily irrational fear, since there exists the possibility of multiple equilibria. Up to 109,000 euros of the deposited amount is covered by deposit insurance, thus an alternative measure of fear is the combination between the previous variable and a deposit above 109,000 euros. Both variables have no effect on the changes in the qualitative and quantitative measures of risk aversion (Table XIII, columns 1 and 2).

The 2007 survey asked the frequency with which individuals check their investments. The possible answers are a) every day; b) at least once a weak; c) every 15 days; d) once a month; e) about every three months; f) about every six months; g) about once in a year; h) less than once a year i) never check. This variable is only defined for people with positive investments and is coded with integers from 1 to 9, where a higher value indicates a lower frequency of monitoring. As Table XIII shows, investors who check their investments more rarely tend to have a larger increase in risk aversion, at least when this is measured in the qualitative way. The same is not true for the quantitative measure. A possible interpretation is that people who check their investments less frequently are not used to large fluctuations in the value of their investments. Thus, when the crisis hit and they realized their losses even if they do not look at their account (it is enough to read the newspapers) they get more worried.

In Table XIV we explore whether there is any correlation between the typical source of financial information for an investor and the increase in his risk aversion. We find that investors who receive their financial information from the bank tend to exhibit a higher increase in risk aversion (both the qualitative and the qualitative measure). This result cannot be necessarily interpreted as saying that the bank scares its investor. In fact, it could be that investors more prone to scare prefer to get their news from a bank officer. This effect is not due, however, to difference in financial literacy. We measure financial literacy using eight financial literacy questions that were asked to assess the financial capability of the sample in different domains. For each question the correct answer is defined by a dummy variable equal to 1. The index of financial literacy sums these eight dummies and ranges from 0 (all answers were incorrect), to 8 (all answers were correct) (see Guiso and Jappelli (2009)).

When we add this index to the regression, the effect of sourcing financial information from the bank does not change. People who are more financially literate exhibit a lower increase in the qualitative measure of risk aversion, but not in the quantitative one.

In Table XIV we also observe that investors who get their financial information from the economic section of a generalist newspaper exhibit a lower increase in the qualitative measure of risk aversion, but not in the quantitative one. As before, this might indicate the type of people who do that, rather than the nature of the information they receive.

In Table XV we look at the effect of other individual characteristics as measured by the survey. In column 1 we use a self-reported measure of financial ability. In the 2007 UCS depositors were asked: “Think of your ability in managing your investments. Compared to the average investor do you have an ability a) well above average; b) just above average; c) as the average; d) slightly below average; e) well below average.” Answers where coded with integers from -2 (well below the

average) to +2 (well above the average). This variable has a negative and statistical significant effect on the changes in risk aversion. Investors who think they are less able than the mean exhibit a 17% increase in the qualitative measure of risk aversion, while those who think they are better than the average exhibit only a 13% increase. We observe a similar pattern for the quantitative measure.

Note that this self-reported measure of ability is not necessarily a measure of actual ability. In fact, this measure has a zero correlation (correlation coefficient 0.05, p-value 0.11) with the measure of financial literacy. Hence, it can be interpreted more as a measure of self-confidence. The 2007 survey asks a specific overconfidence question: "In general do you think to be: a) an above average driver; b) an average driver; c) a below average driver; d) I do not drive." We assigned a value of 3 to the 28% of the sample that think to be above average, 2 to the 70% who think to be average; and zero to the 2% who think to be below average. Surprisingly, this measure is not correlated with the self-reported measure of ability (correlation coefficient 5%, p-value 0.12). Consistently, this measure of overconfidence does not affect the changes in risk aversion.

Hence, one interpretation of the correlation of perceived ability with risk aversion is that investors who think have poor ability avoid exposing themselves to risks they cannot manage and become more risk averse. This is consistent with Campbell (2006) idea that people lacking financial sophistication choose to invest safe to avoid making costly mistakes.

Finally, the 2007 survey asks a question to assess loss regret. The question is "Two years ago a friend of yours that is knowledgeable about finance recommended you to undertake an investment which, on the basis of the information available then to him, had good chances of success. You invested a significant amount. Meanwhile market conditions have deteriorated and your investment has lost half of its value. In such a circumstance, today you would: a) Regret a lot for having undertaken the investment; b) Regret but would not be too upset; c) Would feel no regret". We code the three responses with integers from 1 to 3 increasing in regret.

When we insert this variable in the standard regression it is positively correlated with the changes in both the qualitative and quantitative measure of risk aversion, albeit the statistical significance is only at the 10% level and only for the qualitative measure of risk aversion.

4.4 Summing up

Overall, Tables 10 to 15 are remarkable for their lack of results. Given the number of variables we tried, we should have gotten more statistical significant results just by pure luck. The "classical" determinants of risk aversion have no explanatory power. Among the others, only changes in the trust towards the stock market seem to be consistently correlated with the changes in both measures of risk aversion. The change in trust, however, is an ex post measure and thus it

might reflect more the mood of the investor than true Knightian uncertainty. In fact, a better measure of Knightian uncertainty affects only the qualitative measure of risk aversion, and not the lottery-based one, as it should.

This leaves the possibility that the increase in risk aversion be due to some psychological factors. An increasing number of studies have identified the neurological bases of risk aversion. De Martino et al. (2010) find that amygdala-damaged patients take risky gambles much more often than subjects of the same age and education who have no amygdala damage. The amygdala is an almond-shaped group of nuclei located deep within the medial temporal lobes of the brain, which perform primary roles in the formation and storage of memories associated with emotional events. Kuhnen and Knutson (2005) find that an activation of the anterior insular, a part of the brain associated with a number of basic emotions such as anger, fear, and disgust, is followed by an increase in risk aversion. Knutson et al. (2008) show that exogenously increasing the activation of the nucleus accumbens (another part of the brain) by presenting erotic pictures to heterosexual men before a financial decision causes the subjects to make riskier investments. Finally, Kuhnen and Knutson (2011) show that positive emotional states triggered by visual cues such as erotic pictures induce people to take risk and to be confident in their ability to evaluate investment options, while negative emotions ,triggered by visual cues such as rotten food, have the opposite effects.

Given these findings, it is legitimate to ask whether the experience of the financial crisis might have affected the willingness to take risk of investors. While we cannot test that directly, we can test whether a scary experience can generate a similar increase in risk aversion when measured in the same way we do in the survey.

5 Fear-Inducing Experiment

To test whether fear and anxiety can induce an increase in risk aversion similar to the one observed after the 2008 crisis, we conducted a laboratory experiment. To simulate a scary experience such as the 2008 financial crisis, we treat a random sample of students with a brief sequence from a horror movie.

We wanted a brief horrifying scene from a movie that was sufficiently recent to be really scary for undergraduates used to the most scariest videogames (Psycho would not cut it), but sufficiently old to minimize the chance they had already seen it. We chose a five-minute excerpt from the 2005 movie, “The Hostel” , directed by Eli Roth, which is characterized by stark and

graphic images and that show a young man inhumanly tortured in a dark basement. This movie won the "Best Horror" at the Empire Awards in 2007.[4]

Our experiment was run at Northwestern University in March 2011 in three different sessions. A total number of 249 students took part. The participants were recruited through an internal mailing list service that is normally employed for experiment at Northwestern.[5] A compensation of $5 was paid in cash to each subject for taking part in the experiment, which in general takes around 10/15 minutes.

All the participants were asked to complete a questionnaire of approximately 40 questions. The main scope of this is to construct some measures of risk aversion, as well as to provide other controls. In order to identify the effect of fear on the subjects, we decide to rely on a simple treatment and control framework. In particular, around half of the participants were asked to watch a short video before completing the questionnaire. Since the subjects were randomly assigned to watch the video, the idea is that the difference in risk aversion between the two groups should be completely driven by this difference in the treatment.

Given the nature of the video, which potentially disturbs some of the subjects, we had to give them the option to skip the video at any moment. We dropped the observations of the subjects (27) who decided to skip the video in the first minute of the five minute presentation, since they did not really experience much horror. This choice might underestimate the effect of the treatment, since the most sensitive to the treatment drop out.

Another possible concern is that, if a subject has already watched the video, its perceived effect would be different from the true effect. We therefore decide to drop those 13 subjects who declared to have already watched it.

In order to guarantee the reliability of the results, the experiment was designed in such a way that the participants were not aware that the treatment was not identical for everyone. As measures of risk aversion, we use answers to the very same questions that were used in the Unicredit survey, where we translated euro into dollars at a 1:1 ratio.

As Table XVI shows, the random assignment assumption cannot be rejected: none of the main personal characteristics and demographic information has been found to be statistically different between treatment and control group. Furthermore, around 40% of the participants were female and the average age is 20, which is not surprising given that the sample is selected from undergraduate students.

[4] The Youtube excerpt we use is http://www.youtube.com/watch?v=Jk0qeqAvdQo&feature=related.

[5] The students can freely enroll to the mailing list and, after they have completed an introductory demographic survey, they receive periodic communications on the experiments that are going on at the University.

When we look at the risk aversion measure we find that there is a large and statistical significant increase in the quantitative measure of risk aversion. Among the treated students the certainty equivalent of the risky lottery is $671 (i.e., 27%) lower. This holds true without controls and controlling for observables (Table XVII).

In the qualitative measure we observe a drop, but this drop is not statistically significant at the conventional level (p-value =0.111). In part, this phenomenon is due to the fact that students bunched their choices in the two central values: 96% of the responses are either 2 or 3. Hence, the scale 1-4 is probably better reduced to a dichotomist choice: low risk aversion (1 and 2) and high risk (3 and 4). When we look at the proportion of people choosing the low risk option, this proportion increases by 13.5 percentage points (30% of the sample mean) among the treated group. This difference is statistically significant at the 5% level.

In the second half of the sample we asked people how much they liked horror movies on a scale from 0 to 100. Roughly a third of the sample declared they do not like it at all (i.e., like=0). In Table XVIII we split the sample on this basis. In the first column there are students who really do not like horror movies. In column 2, the ones that they like them so and so. And in column 3 the ones that like them. As one can see, the effect of the treatment is mostly concentrated among the people who really dislike horror movies, where the certainty equivalent is more than halved. The treatment effect on the students who are indifferent is roughly half of what it is for students who do not like horror and it is not statistically significant. For people who like horror movies the effect is positive but not statistically significant.

We get a similar result when we look at the declared willingness to invest in a low risk asset. Among people who dislike horror movies the treatment effect increases the probability of buying risky assets by 50 percentage points. Among everybody else the effect is not statistically different from zero.

6. Testing the fear and habits model in the field

The results from the experiment in the previous section show that fear has the potential to cause increases in risk aversion as large as the ones observed in the data during the crisis. They however only suggest that fear is a potential factor not that it was the factor at work during the crisis. For this one needs to develop some testable implications of a model of fear and risk aversion that can possibly be contrasted with those of an alternative model such as the habit model and contrast them with the data. In this section we move a step in this direction. We show that a fear model and a habit model have opposite different implications for active rebalancing following a sharp drop in stock prices; while the fear model predicts that if the stock market collapse is accompanied by fear

individual should sell stocks, the habit model has the opposite implications- people should actively buy stock to bring the risky assets to the new optimal level. We then use the information in our data on net asset purchases at monthly frequency to run a horse race between the two models.

Let α^* and α denote the optimal share invested in stocks after the stock market collapses and α and the actual share before individuals rebalance their portfolio. Active rebalancing is then given by $R = \alpha^* - \alpha$. A purchase of stock (risky assets) is the optimal decision if $R > 0$ and a sale if $R < 0$ and no action if $R = 0$. Let also S denote the amount invested in stocks prior to the shock to the price of stocks, F the amount in safe assets and $W=S+F$ total financial wealth. Denote with p the value of stocks after the shock, $p < 1$.

6.1. *Fear model*

To see the implication for rebalancing of different assumptions about risk aversion let γ_F be the investor relative risk aversion after the shock and γ the level prior to it. In the absence of habits the optimal share prior to the shock is α^M , the Mertonian share. The value of rebalancing in the fear model is

$$(1)\quad R = \alpha^* - \alpha = \frac{\gamma}{\gamma_F}\alpha^M - \frac{pX}{pX+S} = \alpha^M \frac{\gamma}{\gamma_F} - \frac{p\alpha^M}{p\alpha^M + 1 - \alpha^M}$$

Hence under this model the investor sells stocks if $\frac{\gamma}{\gamma_F} < \frac{p}{p\alpha^M + (1-\alpha^M)} < 1$. This is more likely the larger the initial share in stocks α^M for given loss in wealth following the drop in price.

6.2. *Habit model*

Let h be the initial stock of habit X/W and $W/W' = S + F/(pS+F)$ the ratio of initial and post-shock wealth. Then

$$R = \alpha^* - \alpha = \alpha^M (1 - \frac{W}{W'}h) - \frac{pS}{pS+F} = \alpha^M (1 - \frac{W}{W'}h - \frac{p(1-h)}{p(1-h)\alpha^M + 1 - \alpha^M (1-h)})$$

Noticing that $W/W' = 1/(p\alpha^M(1-h) + 1 - \alpha^M(1-h))$, replacing and readjusting we obtain

$$(2)\quad R = \frac{\alpha^M(1-\alpha^M)(1-h)(1-p)}{p\alpha^M(1-h) + 1 - \alpha^M(1-h)} \geq 0$$

Since the right hand side term of (2) is positive, the habit model implies that investors should actively and unambiguously buy stocks after the fall in the price of risky assets in order to achieve the new optimal share. Interestingly, this is opposite implication of the fear model. Notice also that

since under the habit model there is no change in the curvature of the utility function the size of active rebalance only depends of the size of the stock price fall (1-*p*) and the importance of habits. With no habits, since relative risk aversion is constant the investor has to buy stocks actively to take the share back to its initial level once it has been lowered by the fall in the price of stocks. With habits the extent of the rebalance is more contained as now the risk aversion of the investor has also increased and thus the after shock optimal share is lower than before.

6.3. *Empirical implementation*

Our strategy is to build empirical counterparts of the terms on the right hand side of (1) and (2) that should affect rebalancing under the fear and the habit model and then runs a horse race between them. First, we need to measure the shock and identify the period over which we measure the drop in stock prices. To define the shock we use data on stock price volatility; after Lehmann there is an unprecedented sharp increase in stock market volatility followed by a fall in stock prices that continues up until February 2009. Accordingly we define August 2008 as the pre-shock and subsequent months from September until February 2009 as the shock interval.

Since prices continue to fall until February 2009 we define various measures of the drop in risky asset prices since August 2008 computed at different months from September 2008 until February 2009. Importantly, we construct an investor specific measure of *p* by taking portfolio-weighted means of the drop in different components of the risky portfolio using as weights the risky portfolio compositions of each individual as of August 2008.[6] Of course this measure is only defined for individuals that hold risky assets before the shocks. To obtain an undistorted measure of α^M we take the mean risky asset share over the 12 months of 2007. In fact, during 2007 stock prices were fairly stable before they started to fall. Hence any deviation from the optimal Mertonian share induced by movements in stock market prices had enough time to be corrected through rebalancing. To estimate the ratio between the pre-crisis and post-crisis risk aversion we take the ratio between the qualitative indicator in 2007 and the one measured in June 2009 while we use the measure of habits as imputed consumption divided by total wealth in 2007 as a gauge of h. Using these values we obtain empirical counterparts of the following terms:

[6] We group assets in the risky portfolio into stocks, corporate bonds, mutual funds and bank bonds. The change in the price of the risky portfolio is computed by taking the weighted mean of the percentage change in the price of its components. For stock prices we use the StoXX Europe TMI index, for corporate bonds the FTSE Euro Corporate bonds index and for bank bonds Unicredit bonds index. Mutual funds price is computed taking into account the stock and bond weights and then using the stock and bond index. .

$$Z_1 = \alpha^M \frac{\gamma}{\gamma_F},$$

$$Z_2(p_t) = \frac{p_t \alpha^M}{p_t \alpha^M + 1 - \alpha^M}$$

$$Z_3(p_t) = \frac{\alpha^M (1-\alpha^M)(1-h)(1-p_t)}{p_t \alpha^M (1-h) + 1 - \alpha^M (1-h)}$$

where the first two are predicted to affect rebalancing by the fear model while the third is the size of rebalancing implied by the habit model. Notice that $Z_2(p_t)$, $Z_2(p_t)$ depend on time because the fall in price differs depending on the interval over which is computed. Finally, allowing variables to differ across individuals indexed by *i* we run horse-race regressions estimating:

(3) $R_i(t) = \alpha_1 Z_{i1} + \alpha_2 Z_{i2} + \alpha_3 Z_{i2} + \alpha_3 Y_{i2} + \varepsilon_i$

where $R_i(t)$ is the value of rebalancing by individual *i* in response to measured risky price drop over the interval *t*, Y_i a set of individual investors controls discussed below and ε_i an error term. The null that the fear model is true and the habit is not entails $\alpha_1 > 0$, $\alpha_2 < 0$ and $\alpha_3 = 0$. To operetionalize (3) we need an estimate of the left hand side. We obtain this measure using the information on portfolio trades available at the monthly frequency from the administrative records at Unicredit; we compute the net flow of risky assets (positive for net purchases and negative for net sales) and scale it by the value of total financial assets in August 2008. Since individuals are unlikely to rebalance continuously in response to stock market changes, we compute the assets sales/purchases over the months covered drop in price and the subsequent three months. Thus, for example, when we look at the reaction to the fall in stock prices in September 2008 relatively to August 2008, we compute assets sales over the three months after the shock, i.e. October, November and December; when we consider the fall in prices in October relatively to August we consider assets over October, November, December and January and so on.

6.4. *Estimation results*

Table XIX shows the results; each column reports estimates when the price shock is computed over intervals of different length and the flow of assets transactions is defined accordingly. Since risky assets may be purchased or sold also for other reasons than rebalancing – e.g. to buy goods or because the household has generated savings – we control in the regression for the total flow of financial wealth over the same period the left hand side variable is computed. In addition, since our

proxy for the ratio in risk preferences is meant to reflect variation in curvature rather than in endowments, we control for the rate of growth in wealth between 2007 (when the first measure of risk aversion was elicited) and the second quarter of 2009 (when the second was obtained). Consider the results in the first column, where the shock to the price of risky assets is the one in the first month after the collapse of Lehman and active rebalancing is measured over the first three months following the shock the first. The risk aversion ratio has a positive and statistically significant effect implying that after Lehman individuals actively sold risky assets; on the other hand the post- shock share has a negative effect, significant at the 10% level. This is consistent with the predictions of the fear model. On the other hand the rebalancing factor implied by the habit model, though positive, lacks statistical significance. The subsequent columns repeat the exercise by varying the period over which we compute the shock to risky assets prices, until February 2009, when stock prices bottomed before starting to recover. Interestingly, the response to the risk aversion ratio is always positive and increases somewhat in magnitude and we consider a longer interval of stock price drop and a longer interval of active rebalancing and so does the reaction to the post shock risky assets share. On the other hand the habit model rebalancing factor is never statistically significant and has sometimes even a wrong sign. We take this as evidence in support of the fear model.

7. Conclusions

It is broadly believed that the equity risk premium fluctuates over the business cycle, rising in recessions and dropping in expansions. These fluctuations, however, tend to be larger than what can be explained by the changes in the aggregate wealth. Is there a possibility that psychological factors might drive these fluctuations?

In this paper we provide some evidence consistent with this possibility. We use a repeated questionnaire to document that individual risk aversion increases substantially following the 2008 financial crisis. This increase cannot be explained on the basis of standard reasons (such as changes in wealth, habits, or background risk). The only variables that have any explanatory power are proxies for changes in confidence.

To test whether these changes could be attributed to fear, we conduct a lab experiment where we treat a random sample of students with a very scary movie. We find that the students treated exhibit a significant increase in risk aversion, similar to the one observed in the data. Also, we show that following a sharp drop in stock prices, a fear model predicts that individuals should sell stocks, while the habit model has the opposite implications- people should actively buy stock to bring the risky assets to the new optimal level. We show that the data support the former model.

Our results suggest that risk aversion does indeed fluctuate in a major way. Hence it is possible fluctuations in risk aversion can explain those movements in asset prices that are not justified by changes in expected cash flow. These changes in risk aversion, however, cannot be easily explained on the basis of the existing models. In fact, the only explanation that is not inconsistent with the data is that these changes in risk aversion are caused by fear.

A question we are unable to answer in this paper is how persistent this change in risk aversion is. The evidence of Malmendier and Nagel (2011), who find a cohort effect of depression-babies in the risk aversion measure of the Survey of Consumer Finances, suggests it might be long-lasting. Unfortunately, our sample is unable to answer this question (even if we were to go back) because of the subsequent events in the eurozone that made the 2008 shock not an isolated incident.

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Data Appendix

A.1 Variables Definition

Habit stock: is the ratio of imputed non durable consumption and the stock of household total net worth, defined as the sum of housing wealth and financial assets net of total outstanding debt.

House consumption commitment: is the ratio of housing value divided by the stock of financial assets.

Financial ability: a self-reported measure of financial ability obtained from the answers to the question: "Think of your ability in managing your investments. Compared to the average investor do you have an ability a) well above average; b) just above average; c) as the average; d) slightly below average; e) well below average." Answers where coded with integers from -2 (well below the average) to +2 (well above the average).

Overconfident: answers to the question: In general do you think to be: a) an above average driver; b) an average driver; c) a below average driver; d) I do not drive." Coded with integers from 1 to 4 increasing in confidence.

Regret loss: obtained from the question: "Two years ago a friend of yours that is knowledgeable about finance recommended you to undertake an investment which, on the basis of the information available then to him, had good chances of success. You invested a significant amount. Meanwhile market conditions have deteriorated and your investment has lost half of its value. In such a circumstance, today you would: a) Regret a lot for having undertaken the investment; b) Regret but would not be too upset; c) Would feel no regret". We code the three responses with integers from 1 to 3 increasing in regret.

Index of Financial Literacy: obtained from 8 financial literacy questions that were asked to assess the financial capability of the sample in different domains. For each question the correct answer is defined by a dummy =1; the index of financial literacy sums these 8 dummies and ranges from 0 (all answers were incorrect), to 8 (all answers were correct). See Guiso and Jappelli (2009).

Actual bank run: This is an indicator variable obtained from the question asked in the 2009 UCS phone survey: "In September 2008 and in the following weeks did you: a) withdraw your deposits (totally or partially) from Unicredit and keep them cash; b) Transfer them (totally or partially) to another bank; c) Transfer deposits from another bank where you have an account to Unicredit; d) Seriously think of implementing action (b) but then you did not; e) Seriously think of implementing action (c) but then you did not. " We define a dummy =1 if respondents answer yes to either a, b, or c. As an alternative definition of bank run we define a variable equal to *q* if the respondent answer yes to either a, b, or c above and in addition he had more than 109,000 euros of deposits overall in 2007, this being the maximum deposit amount covered by deposit insurance. We call it bank run without deposit insurance.

Frequency people check investments: answers to the question "How often do you check the value of your financial investments?". They could answer: a) every day; b) at least once a weak; c) every

15 days; d) once a month; e) about every three months; f) about every six months; g) about once in a year; h) less than once a year i) never check. This variable is only defined for people with positive investments and is coded with integers from 1 to 9, with frequency of checking.

Sources of information: answers to the question "Here is a list of of sources you can use to obtain financial information. For each source can you say how often you use it? " Answers are coded with integers from 1 ("never") and 5 ("quite often"). We use five sources (and define five variables accordingly): "Your bank", "Your broker", "Friends, relatives and colleagues", " "Specialized and Non Specialized Press", "Dedicated Tv Programs and Web"

Change stock market expectations: investors were asked to report the distribution of stock returns one year ahead. Specifically they were asked to state what he thinks would be the value of a 10,000 euro investment in a fully diversified stock mutual after 12 months. They were asked to report the minimum value first, then the maximum. Subsequently they were asked to report the probability that the value of the stock by the end of the 12 months is above the mid-point of the reported support. Under some assumptions about the shape of the distribution, this parsimonious information allows computing the subjective mean and variance of stock market returns. Stock market expectation is the first moment of the distribution. We have computed these moments assuming the distribution is uniform but results are the same assuming it is triangular. The change in stock market expectation is the difference between the two surveys.

Range in stock market beliefs: is the difference between the maximum and minimum value of the investment reported in the answers to the previous question. The change in the range is the difference between the two surveys.

Knightian uncertainty: a dummy equal to 1 if in 2007 the investor is able to answer the question about the probability distribution of stock prices but is unable to in 2009; zero otherwise.

Change in trust in stock market: answers to the question asked in the 2009 survey: "How is the trust towards the stock market changes between September 2008 and today? a) increase a lot; increased a bit; c) unchanged; d) decreased a bit; decreased a lot. Answers are coded with integers between 1 and 5 with higher numbers reflecting increased trust.

Trust advisor: answers to the question asked in both surveys: "Overall, how much trust do you have in your bank advisor or financial broker concerning your financial investments?" with the answers ranging from 1 (I trust a lot) to 5(No trust at all). We have recoded them so that the variable is increasing in trust.

A.2. The UCS 2007 survey

The survey data used draw on a sample of Italian retail investors of the Unicredit Group. The Unicredit Clients' Survey (UCS) was conducted between June and September 2007 and elicited detailed financial and demographic information on a sample of 1,686 individuals with a checking account in one of the banks of the Unicredit Group. The eligible population of customers excludes customers under 20 and over 80, and customers with assets of less than 10,000 Euros with Unicredit. The sampled population size is around 1.3 million customers. The survey was aimed at acquiring information on the behavior and expectations of Unicredit Group customers and focused on multi-banking, attitude towards saving and investing, financial literacy and propensity for risk, pensions and need for insurance. The sample is stratified according to three criteria: geographical area, city size, financial wealth, and it explicitly over-samples rich clients. In

particular, only clients with at least €10,000 of financial wealth at Unicredit at the end of 2006 are included in the sample.

An important feature of the survey is that the sample selection is based on Unicredit individual retail investors. The survey, however, also contains detailed information on the spouse, if present. Financial variables are elicited for both respondents and households. In the paper, demographic variables refer to the household head (even if different from the respondent), and economic variables (real and financial assets) to the household, not to the individual investor. The survey contains detailed information on ownership of real and financial assets, and amounts invested. For real assets, UCS reports separate data on primary residence, investment real estate, land, business wealth, and debt (distinguished between mortgage and other debt). Real asset amounts are elicited without use of bracketing.

The sampling scheme is similar to that of the Bank of Italy Survey of Household Income and Wealth (SHIW). The population is stratified along two criteria: geographical area of residence (North-East, North-West, Central and Southern Italy) and wealth held with Unicredit as of June 30 2006. The sample size is 1,686 customers, of whom 1,580 are from Unicredit Retail Bank, and 106 from Unicredit Private Bank (the upper tier customer bank). The survey was administered between May 1 and September 30 of 2007 by a leading Italian polling agency, which also conducts the SHIW for the Bank of Italy. Most interviewers had substantial experience of administering the SHIW, which is likely to increase the quality of the data. The UCS was piloted in the first quarter of 2007, and the Computer Assisted Personal Interview methodology was employed for all interviews. To overcome some of the problems arising from non-responses, the sample was balanced ex-post with respect to the true distribution of assets, area of residence, city size, gender, age and education of the eligible population.

The questionnaire comprises 9 sections. Sections A and B refer, respectively, to respondent and household demographic and occupation variables. Section C focuses on saving, investment and financial risk. Section D asks detailed questions about financial wealth and portfolio allocation, and Section E enquires about consumer debt and mortgages. By design, Sections A, B, D and E allow a perfect matching with the SHIW questionnaire. Questions on real estate and entrepreneurial activities are included in Section F. Section G contains questions on subjective expectations, and section H focuses on insurance and private pension funds. The last two sections ask about income and expectations and need for insurance and pension products.

As shown in Table 1A, compared with the Italian population, as surveyed by the 2006 Bank of Italy SHIW, Unicredit Group customers are older, more educated, less likely to work in the manufacturing sector, and more likely to live in the North.

Table A1: UCS – SHIW comparison

	UCS	*SHIW* *Highest income earner*	*SHIW* *Bank account holder*
Gender			
Male	0.69	0.69	0.71
Female	0.31	0.31	0.29
Age			
Up to 30	0.04	0.06	0.06
31 to 40	0.18	0.19	0.20
41 to 50	0.22	0.22	0.22
51 to 65	0.36	0.24	0.24
Over 65	0.20	0.29	0.27
Education			
Elementary School	0.10	0.27	0.22
Middle School	0.29	0.36	0.37
High School	0.41	0.27	0.30
University Degree	0.20	0.10	0.10
Sector of activity			
Agriculture	0.03	0.03	0.03
Industry	0.13	0.21	0.23
Public Administration	0.19	0.15	0.17

Other sectors	0.30	0.19	0.20
Not employed	0.35	0.40	0.37
Household Size			
1 member	0.21	0.25	0.23
2 members	0.29	0.28	0.29
3 members	0.26	0.21	0.22
4 members	0.20	0.18	0.19
5 or more members	0.04	0.07	0.06
Geographical Area			
Northern Italy	0.73	0.48	0.52
Central Italy	0.14	0.20	0.21
South and Islands	0.13	0.32	0.27

Note: The table compares sample means of selected demographic variables in the UCS and 2006 SHIW. Means are computed using sample weights.

A3. The administrative UCS data

We complement the 2007 survey with administrative data on assets' stocks and net flows that we use to compute measures of wealth and changes and portfolio allocation before and after the crisis.
The Unicredit administrative dataset contains information on the stocks and on the net flows of 26 assets categories that investors have at Unicredit[7]. These data are available at monthly frequency for 35 months beginning in December 2006. The administrative data reports this information for the investors that actually participated in the 2007 survey and can indeed be matched with the 2007 UCS data. Notice that the administrative data form a balanced panel. We use these data to obtain measures of people financial wealth and portfolio compositions at various points in time before and after the financial crisis.

A4. The 2009 telephone survey

In June 2009, the same company that fielded the 2007 UCS survey re-contacted the respondents to the 2007 survey asking for their willingness to participate in a short telephone interview. Out of 1,686 contacts, 666 completed the telephone interview.

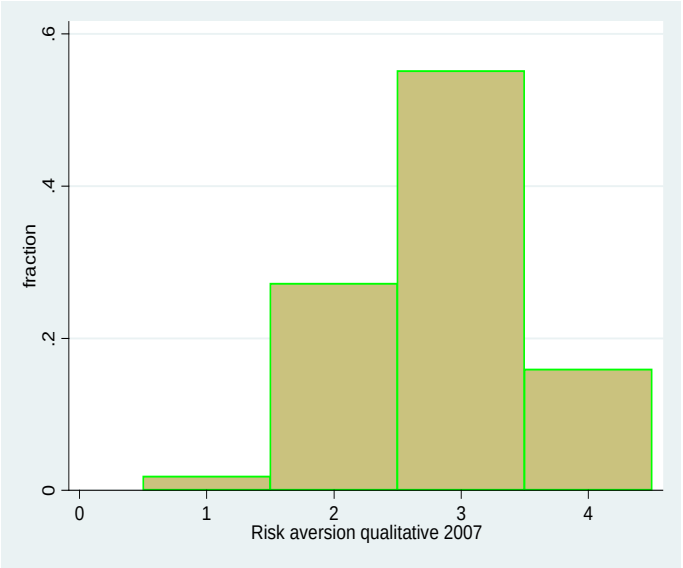
The questionnaire was designed to ask a set of select questions that were asked in the 2007 using exactly the same wording. In particular we asked a qualitative risk aversion question, a hypothetical risky lottery question, a generalized trust and trust in own bank question and a question eliciting the probability distribution of stock market returns. In addition, a few other questions were asked that were not asked in the 2007 survey. At the beginning of the interview the interviewer asked a number of demographic characteristics in order to make sure that the respondent was the same who participated in the 2007 interview.

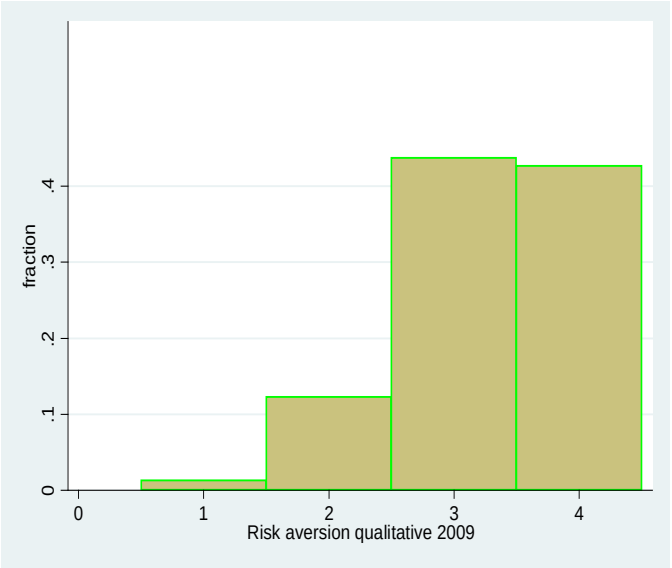
[7] The list includes: checking accounts, time deposits, deposit certificates, stock mutual funds, money market mutual funds, bond mutual funds, other mutual funds, ETF, linked funds, Italian stocks, foreign stocks, unit linked insurance, recurrent premium, unit linked insurance, one shot premium, stock market index, life insurance recurrent premium, life insurance one shot premium, pension funds, T-bills short term, T-bonds, indexed T-bonds, other T-bills, managed accounts, own bank bonds, corporate bonds Italy, corporate bonds foreign, other bonds.

Figure 1: Frequency distribution of the level of risk aversion indicators in 2007 and 2009

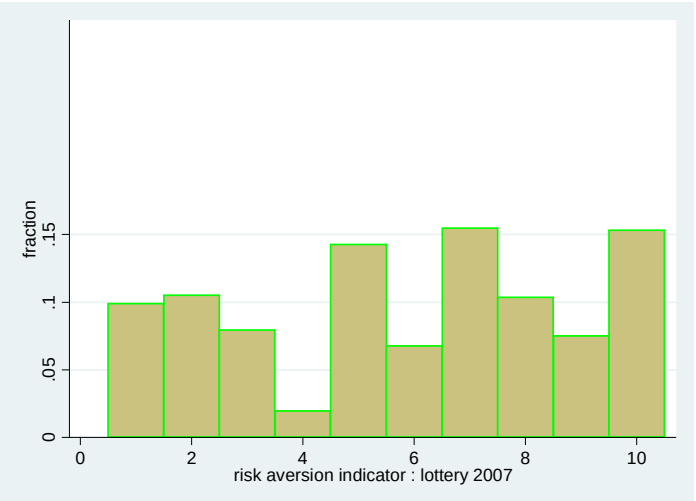
Panel A, reports the frequency distribution of the qualitative measure of risk aversion in 2007 and 2009. The qualitative indicator tries to elicit the investment objective of the respondent, offering them the choice among "Very high returns, even at the risk of a high probability of losing part of my principal"; "A good return, but with an ok degree of safety of my principal;" "A ok return, with good degree of safety of my principal," "Low returns, but no chance of losing my principal." Responses are coded with integers from 1 and 4, with a higher score indicating a higher aversion to risk. Panel B reports the frequency distribution of the quantitative measure of risk aversion in 2007 and 2009. This measure tries to elicit the certainty equivalent for a gamble that delivers either 10,000 euro or zero with equal probability.

A. Qualitative measure of risk aversion





B. Quantitative measure of risk aversion



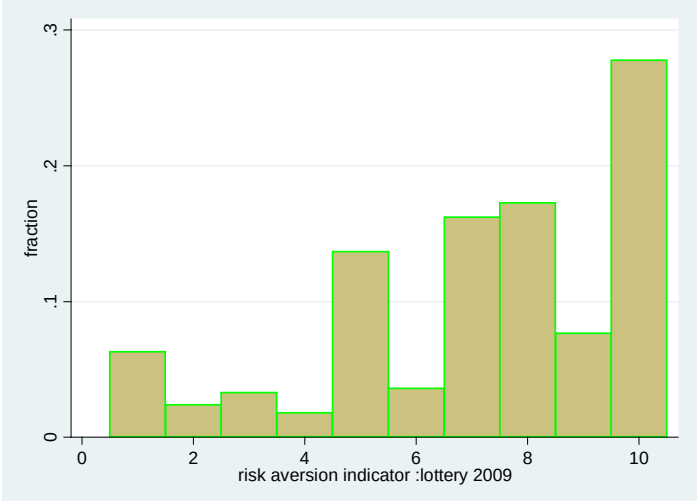
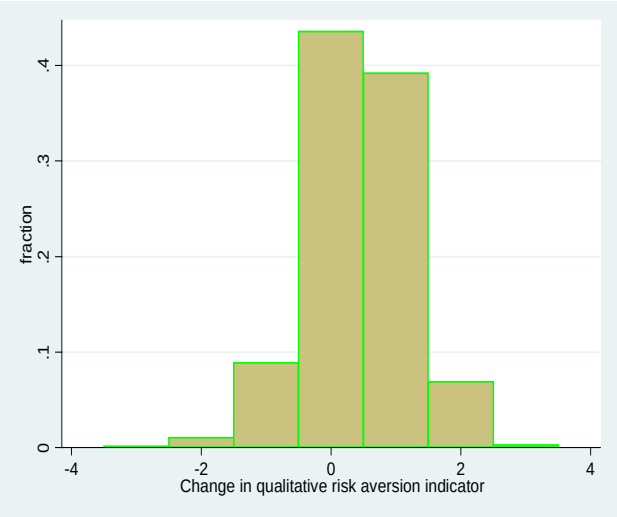
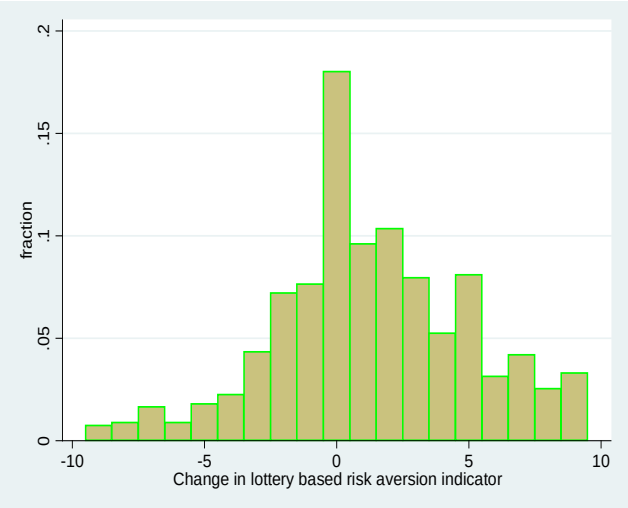


Figure 2. Frequency distribution of the change in risk aversion indicators 2009 and 2007

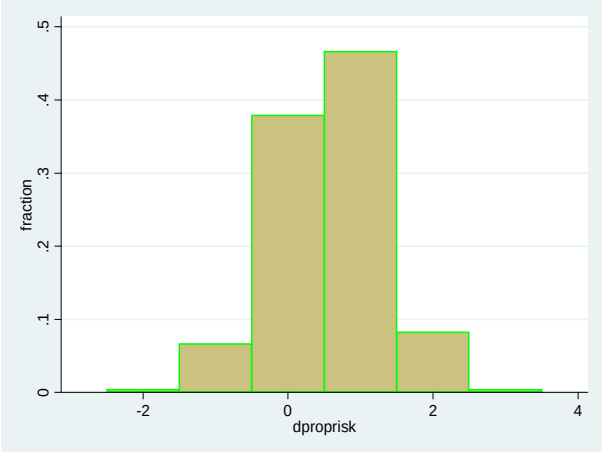
The figure shows the distribution of the first difference of the risk aversion indicators between 2009 and 2007. Panel A used the whole sample; Panel B and C reports the distribution of the change accounting for censoring (Panel B) and dropping inconsistent answers across the two questions (Panel C)

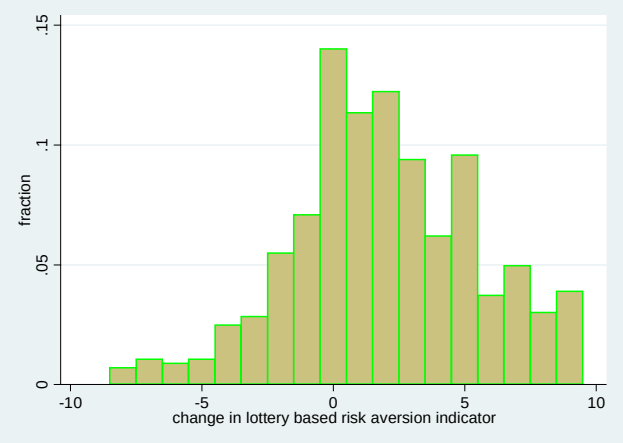
A. Whole sample



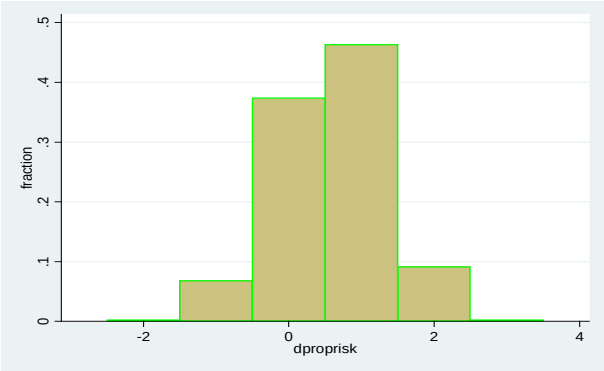


B. Accounting for censoring





C. Dropping the inconsistent and accounting for censoring



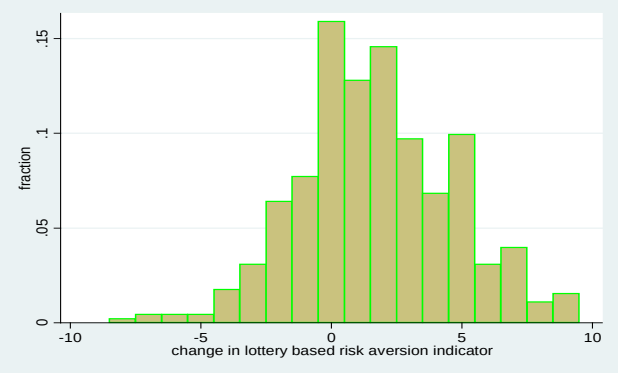


Table I: Comparing the sample of non participants and participants to the second interview

This table shows summary statistics for the two samples of respondents to the 2007 UCS survey: those that did not participate to the 2009 survey and those who did.

	Non participants (N. 1,020)	Participants (N. 666)	*p*-value of test of equality
Age	55.02	54.5	0.39
Male	0.7	0.7	0.77
Married	0.69	0.67	0.40
North	0.53	0.49	0.12
Center	0.24	0.25	0.61
Education	12.44	13.18	0.00
Trust	0.25	0.27	0.23
Trust Advisors	2.25	2.17	0.05
Risk attitude: Qualitative	2.88	2.85	0.31
Risk attitude: Quantitative Indicator	5.85	5.85	0.89
Willingness to Accept Lottery in Euro	3,278	3,266	0.94
Stock Financial Asset Jan 2007 in Euro	150,977	158,950	0.22
Stock Financial Asset Jun 2009 in Euro	139,723	142,287	0.73
Stockownership Jan 2007	0.438	0.44	0.93
Stockownership June 2009	0.413	0.42	0.80
Share in Stocks Jan 2007	0.1	0.106	0.54
Share in Stocks Jun 2009	0.084	0.078	0.51
Holder of Risky Assets Jan 2007	0.793	0.81	0.41
Holder of Risky Assets Jun 2009	0.743	0.732	0.63
Share in Risky Assets Jan 2007	0.557	0.578	0.29
Share in Risky Assets Jun 2009	0.497	0.5	0.90

Table II: Correlation between the various measures of risk aversion and habits

Panel A reports the correlation between the two measures of risk aversion for the two waves (2007 and 2009), the correlation between their changes, and the correlations between their changes and a measure of change in cautiousness in investing. The qualitative risk aversion measure tries to elicit the investment objective of the respondent, offering them the choice among "Very high returns, even at the risk of a high probability of losing part of the principal;" A good return, but with an ok degree of safety of the principal;" "A ok return, with good degree of safety of the principal," "Low returns, but no chance of losing the principal." The responses are coded with integers from 1 to 4, with a higher score meaning a higher risk aversion. The quantitative risk-aversion measure tries to elicit the certainty equivalent for a gamble that delivers either 10,000 euro or zero with equal probability. We code the certainty equivalent with integers between 1 and 10, increasing in risk aversion. Change in cautiousness is obtained from answers to the following question asked in the 2009 survey: "After the stock market crash did you become more cautious and prudent in your investment decisions?". The possible answers are: "More or less like before", "A bit more cautious", "Much more cautious." The variable change in cautiousness is zero if the response is "no change", 1 if the response is "a bit more", and 2 if it is "much more". Panel B reports the correlation between the measures of habit in 2007 and 2009. Habit is the ratio of imputed non durable consumption and the stock of household total net worth, the sum of housing wealth and financial assets net of total outstanding debt; house consumption commitment is the ratio of housing value divided by the stock of financial assets.

Panel A. Correlations between measure of risk aversion					
	Qualitative and quantitative indicator: 2007	Qualitative and quantitative indicator: 2009	Change in qualitative and change in quantitative indicator: 2007-2009	Change in qualitative indicator and change in cautiousness	Change in quantitative indicator and change in cautiousness
	0.1163	0.1596	0.1184	0.119	0.074
p-value	0.00	0.00	-0.002	0.002	0.056

Panel B. Correlation between measure of habit		
	Correlation between Log (1-habit) and Log (house consumption commitment) 2007	Correlation between Log (1-habit) and Log (house consumption commitment) 2009
	-0.310	-0.214
p-value	0.00	0.00

Table III: Summary statistics of risk aversion measures, other variables and controls

Panel A reports the summary statistics for the quantitative and qualitative risk aversion measures defined in Table II. Panel B and C report the summary statistics for all the other variables defined in Table II and in the Appendix.

Panel A. Risk aversion measures in 2007 and 2009						
	Quantitative measure (certainty equivalent in euros)			Qualitative measure		
	Mean	Median	Sd	Mean	Median	Sd
Level in 2007	4,164	4,000	3,254	2.87	3	0.72
Level in 2009	2,785	1,500	2,815	3.28	3	0.73
Change between 2009 and 2007	-1,423	-1,000	3,994	0.42	0	0.81
Fraction of People with Increase in Risk Aversion		0.55			0.46	
Fraction of People with Unchanged Risk Aversion		0.18			0.44	
1- Fraction of People with a decrease in Risk Aversion		0.73			0.90	

Panel B. Other variables: levels			
	Mean	Median	Sd
Male	0.70	1	0.46
Age	54.81	57	12.3
Educations (years)	12.73	13	4.25
Retired	0.33	0	0.47
Government Employee	0.33	0	0.47
Net Wealth 2007 (Log)	13.11	13.10	0.59
Net Wealth 2009 (Log)	13.05	13.03	0.64
Stock of Habits 2007 (Log)	-0.07	-0.07	0.04
Stock of Habits 2009 (Log)	-0.08	-0.07	0.16
Commitments 2007 (Log)	1.04	0.93	1.17
Commitments 2009 (Log)	1.43	1.19	1.66
Risky Asset Ownership 2007	0.65	1	0.48
Risky Asset Share 2007	0.27	0.20	28.5
Knigthian Uncertainty	0.29	0	0.46
Trust Advisors 2007	3.78	4	0.91
Generalized Trust 2007	0.25	0	0.44
Frequency of Checks	4.53	4	0.91
Financial Literacy Index	4.62	5	1.14
Self Reported Financial Capability	3.20	3	0.85
Overconfident	2.25	2	0.50
Regret Losses	2.16	2	0.74
Bank Run: Actual	0.16	0	0.36
Bank Run: Money at Risk	0.15	0	0.35
Panel C. Other variables: first differences			
	Mean	Median	Sd
Wealth 2007-2009, ΔLog	-0.06	-0.051	0.27
Wealth 2008-2009, ΔLog	-0.04	-0.005	0.20
Habit 2007-2009, ΔLog	-0.003	-0.001	0.15
Commitments 2007-2009, ΔLog	0.40	0.16	1.16
Ownership Risky Assets	-0.06	0	0.35
Share Risky Assets	-0.04	0	0.24
Generalized Trust	-0.08	0	0.52
Trust Advisors	-0.23	0	1.11
Trust Stock Market	1.20	2	0.94
Stock Market Expected Return	819	47	6,626
Stock Market Return Uncertainty	-144	50	5,674

Table IV: Cross sectional correlates of risk aversion

Panel A reports the coefficients of the estimates of an ordered probit model; the dependent variable is the qualitative of risk aversion for the two different waves, 2007 and 2009. Panel B reports interval regressions; the dependent variable is the interval of absolute risk aversion obtained from the lottery question. The risk aversion variables are defined in Table II. All the other variables are defined in the Data Appendix. Robust standard errors are in brackets. */**/*** indicates statistical significance at the 10%, 5%, and 1% level. Wealth outliers have been trimmed out at first and ninety-ninth percentile.

Panel A. Risk aversion qualitative				
	2007	2009	2007	2009
	(1)	(2)	(3)	(4)
Male	-0.332***	-0.498***	-0.341***	-0.487***
	(0.065)	(0.112)	(0.065)	(0.110)
Age	-0.037*	-0.007	-0.045**	-0.006
	(0.021)	(0.034)	(0.020)	(0.033)
Age2	0.000*	0.000	0.000**	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Education	-0.031***	-0.042***	-0.032***	-0.040***
	(0.008)	(0.012)	(0.007)	(0.012)
Log Net Wealth: 2007	-0.259***		-0.139***	
	(0.074)		(0.048)	
Log (1 - Habit): 2007	3.111**			
	(1.217)			
Log Net Wealth: 2009		-0.272**		-0.173**
		(0.125)		(0.077)
Log (1 - Habit): 2009		1.932		
		(1.841)		
Log Committed Housing Consumption: 2007			-0.061**	
			(0.026)	
Log Committed Housing Consumption: 2009				-0.026
				(0.031)
Observations	1,464	573	1,464	563

Panel B. Risk aversion quantitative						
	Whole sample				Drop inconsistent answers	
	(1)	(2)	(3)	(4)	(5)	(6)
	2007	2009	2007	2009	2007	2009
Male	-0.074	-0.062	-0.060	-0.087	-0.136	-0.644
	(0.206)	(0.426)	(0.204)	(0.419)	(0.222)	(0.425)
Age	-0.008	0.108	-0.010	0.174	0.033	0.136
	(0.068)	(0.122)	(0.064)	(0.113)	(0.067)	(0.120)
Age2	0.000	-0.000	0.000	-0.001	-0.000	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Education	-0.082***	-0.133***	-0.093***	-0.116**	-0.109***	-0.164***
	(0.025)	(0.050)	(0.024)	(0.048)	(0.026)	(0.049)
Log Net Wealth: 2007	-0.446*		-0.163		-0.520**	
	(0.263)		(0.158)		(0.262)	
Log (1 - Habit): 2007	3.888				7.976**	
	(4.044)				(3.234)	
Log Net Wealth: 2009		0.174		-0.060		0.125
		(0.488)		(0.296)		(0.478)
Log (1 - Habit): 2009		-6.002				-6.116
		(7.277)				(7.128)
Log Committed Housing Consumption: 2007			-0.080			
			(0.087)			
Log Committed Housing Consumption: 2009				0.085		
				(0.110)		
Observations	1,464	573	1,464	563	1,296	537

Table V: Risk aversion and risky assets ownership and share

Panel A reports the marginal effects of probit models, where the dependent variable is a dummy variable equal to one if the individual holds risky assets in her portfolio. Panel B reports the coefficients of tobit regressions, where the dependent variable is the share of risky assets over the entire portfolio. The measures of risk aversion are defined as in Table II. The last column reports the results dropping those who reported inconsistent answer to the risk aversion question (those who are highly risk averse according to the first measure- a value greater than 2 - but risk lover on the basis of the quantitative question - a certainty equivalent greater or equal to 9000 euro). All the other variables are defined in the Data Appendix. Robust standard errors are in brackets. */**/*** indicates statistical significance at the 10%, 5%, and 1% level. Wealth outliers have been trimmed out at first and ninety-ninth percentile.

Panel A. Ownership of risky financial assets in 2007						
	Whole sample					Drop inconsistent answers
	(1)	(2)	(3)	(4)	(5)	(6)
Risk Aversion Qualitative: 2007	-0.122***	-0.120***	-0.114***			
	(0.032)	(0.030)	(0.030)			
Risk Aversion Quantitative: 2007				-0.001	0.000	-0.011**
				(0.004)	(0.005)	(0.004)
Male	0.129***	0.115***	0.133***	0.140***	0.157***	0.149***
	(0.016)	(0.020)	(0.018)	(0.025)	(0.026)	(0.023)
Age	0.022**	0.014	0.022**	0.017**	0.025***	0.017*
	(0.010)	(0.015)	(0.011)	(0.008)	(0.008)	(0.009)
Age2	-0.000**	-0.000	-0.000**	-0.000*	-0.000***	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Education	0.018***	0.013***	0.016***	0.015***	0.018***	0.014***
	(0.005)	(0.005)	(0.006)	(0.003)	(0.003)	(0.003)
Trust Advisor 2007	0.039***	0.032***	0.042***	0.041***	0.050***	0.043***
	(0.011)	(0.011)	(0.010)	(0.006)	(0.008)	(0.007)
Log Net Wealth: 2007	0.145***	0.291***	0.158***	0.303***	0.164***	0.287***
	(0.030)	(0.048)	(0.027)	(0.054)	(0.032)	(0.048)
Log (1 - Habit): 2007		-3.017***		-3.170***		-3.134***
		(0.631)		(0.564)		(0.542)
Log Committed Housing Consumption: 2007			0.041***		0.044***	
			(0.010)		(0.011)	
Observations	1,494	1,464	1,464	1,464	1,464	1,282

Panel B. Risky financial asset share in 2007							
	Whole sample						Drop inconsistent answers
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Risk Aversion Qualitative: 2007	-0.141***	-0.138***	-0.133***				
	(0.021)	(0.020)	(0.019)				
Risk Aversion Quantitative: 2007				-0.003	-0.003	-0.002	-0.012***
				(0.005)	(0.004)	(0.005)	(0.004)
Male	0.084***	0.072***	0.086***	0.115***	0.102***	0.115***	0.098***
	(0.018)	(0.018)	(0.018)	(0.026)	(0.025)	(0.023)	(0.026)
Age	0.018**	0.012	0.017*	0.022**	0.016	0.021**	0.017*
	(0.009)	(0.012)	(0.010)	(0.009)	(0.010)	(0.009)	(0.010)
Age2	-0.000**	-0.000	-0.000*	-0.000**	-0.000	-0.000**	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Education	0.012***	0.008**	0.010**	0.015***	0.011***	0.013***	0.010***
	(0.004)	(0.003)	(0.004)	(0.002)	(0.002)	(0.002)	(0.002)
Trust Advisor 2007	0.023**	0.018*	0.025***	0.032***	0.027***	0.034***	0.028***
	(0.011)	(0.010)	(0.008)	(0.008)	(0.008)	(0.010)	(0.008)
Log Net Wealth: 2007	0.107***	0.212***	0.110***	0.121***	0.234***	0.123***	0.219***
	(0.008)	(0.026)	(0.006)	(0.029)	(0.039)	(0.028)	(0.036)
Log (1 - Habit): 2007		-2.168***			-2.418***		-2.330***
		(0.540)			(0.280)		(0.292)
Log Committed Housing Consumption: 2007			0.031***			0.036***	
			(0.012)			(0.009)	
Observations	1,494	1,464	1,464	1,494	1,464	1,464	1,282

Table VI: Effect of changes in risk aversion on changes in ownership and share of risky assets

Panel A reports the marginal effects for ordered probit regressions; the dependent variable is the change in a dummy variable equal to one if an individual owns risky assets between June 2008 (just before the financial collapse) and June 2009. Panel B reports the coefficients of OLS regressions, where the dependent variable is the change in the share of risky assets owned between June 2008 and June2009. The change in risk aversion is calculated as the difference between the reported answers in the 2009 and 2007 surveys. All the other variables are defined in the Data Appendix. Robust standard errors are in brackets. */**/*** indicates statistical significance at the 10%, 5%, and 1% level. Wealth outliers have been trimmed out at the first and ninety-ninth percentile.

Panel A. Change in risky assets ownership							
	Whole sample						Drop inconsistent answers
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Δ Risk Aversion: Quantitative Measure	-0.172	-0.180*	-0.212**				
	(0.105)	(0.106)	(0.097)				
Δ Risk Aversion: Quantitative Measure				-0.035*	-0.035*	-0.032	-0.049**
				(0.019)	(0.019)	(0.021)	(0.021)
Male	0.367**	0.375**	0.472***	0.379**	0.387**	0.499***	0.322*
	(0.172)	(0.172)	(0.178)	(0.171)	(0.171)	(0.177)	(0.190)
Age	0.074	0.076	0.109*	0.071	0.072	0.108	0.071
	(0.062)	(0.062)	(0.066)	(0.062)	(0.062)	(0.066)	(0.071)
Age^2	-0.001	-0.001	-0.001*	-0.001	-0.001	-0.001*	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Education	0.006	0.007	-0.005	0.008	0.010	-0.003	0.012
	(0.019)	(0.019)	(0.021)	(0.020)	(0.020)	(0.021)	(0.020)
Δ Advisor Trust	-0.065	-0.069	-0.125	-0.082	-0.085	-0.142*	-0.085
	(0.072)	(0.073)	(0.080)	(0.072)	(0.073)	(0.079)	(0.084)
Δ Log Net Wealth 2009-2007	1.467***	1.088	0.660	1.351***	1.115*	0.612	1.241
	(0.371)	(0.672)	(0.504)	(0.366)	(0.677)	(0.508)	(0.774)
Δ Log (1- Habit)		5.885			4.184		0.507
		(6.474)			(6.417)		(7.611)
Δ Log (Committed Housing Consumption)			-0.097			-0.075	
			(0.137)			(0.137)	
Observations	569	563	550	569	563	550	496

Panel B. Change in share of risky assets:							
	Whole sample						Drop inconsistent answers
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Change in Risk Aversion: Qualitative Measure	-0.010	-0.012	-0.017				
	(0.013)	(0.013)	(0.012)				
Change in Risk Aversion: Quantitative Measure				-0.006**	-0.006**	-0.005**	-0.006**
				(0.002)	(0.002)	(0.002)	(0.003)
Male	-0.018	-0.019	-0.023	-0.015	-0.015	-0.019	-0.032
	(0.023)	(0.023)	(0.022)	(0.023)	(0.023)	(0.022)	(0.023)
Age	-0.000	0.001	0.001	0.001	0.001	0.002	-0.001
	(0.009)	(0.009)	(0.009)	(0.008)	(0.008)	(0.009)	(0.009)
Age^2	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Education	-0.002	-0.002	-0.002	-0.001	-0.001	-0.002	-0.001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Δ Trust Advisor	-0.006	-0.006	-0.011	-0.008	-0.008	-0.013	-0.014
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.010)
Δ Log Net Wealth 2009-2007	-0.168***	-0.174***	-0.165***	-0.164***	-0.170***	-0.160***	-0.155***
	(0.023)	(0.024)	(0.024)	(0.022)	(0.023)	(0.024)	(0.024)
Δ Log (1- Habit)	0.134**	-0.007	-0.039	0.123*	-0.005	-0.039	0.050
	(0.065)	(0.130)	(0.080)	(0.064)	(0.129)	(0.081)	(0.146)
Δ Log (Committed Housing Consumption)		1.838			1.666		0.579
		(1.513)			(1.501)		(1.508)
Initial Share in Risky Assets			-0.033			-0.030	
			(0.020)			(0.020)	
Observations	571	568	553	571	568	553	499
R-squared	0.09	0.10	0.09	0.10	0.10	0.09	0.10

Table VII: Transition matrix of the qualitative measure of risk aversion 2007-2009

This table reports the transition matrix of the qualitative measure of risk aversion, between 2007 and 2009. The indicator is defined in Table II.

	Risk aversion: Qualitative Indicator 2009				
Risk aversion: Qualitative Indicator 2007	High risk/high return	Moderate risk/medium return	Small risk/ some return	No risk/ low return	Total
High Risk/High Return	2	6	2	2	12
Moderate Risk/Medium Return	4	38	95	44	181
Small Risk/Some Return	2	33	172	160	367
No Risk/Low Return	1	5	22	78	106
Total	9	82	291	284	666

Table VIII: Transition matrix of the quantitative measure of risk aversion 2007-2009

Panel A maps ARA intervals and certainty equivalent into risk categories; the ARA interval is the interval of the degree of absolute risk aversion (x1,000) implicit in the answers to the lottery questions. Panel B reports the transition matrix of the quantitative measure of risk aversion, between the 2007 and 2009. The measure is illustrated in Table II. Values for 2007 are reported in rows, while those for 2009 are displayed in columns. For the open interval of the lowest (respectively, highest) risk aversion category the lower (respectively higher) bound is not observed and is denoted with a "."

Panel A. ARA Interval and Certainty equivalent mapped into Risk categories

	Risk aversion category									
	1	2	3	4	5	6	7	8	9	10
Certainty equivalent	>9000	9000	7000	5500	5000	4000	3000	1500	500	100
ARA interval										
Lower bound	.	-0.692	0.180	0.04	0.00	0.082	0.18	0.446	1.386	6.932
Upper bound	-0.692	0.180	0.04	0.00	0.082	0.18	0.446	1.386	6.932	.

Panel B. Transition matrix of the quantitative measure of risk aversion between the 2007 and 2009

	Risk aversion 2009										
Risk aversion 2007	1	2	3	4	5	6	7	8	9	10	Total
1	5	2	3	0	8	4	8	11	3	22	66
2	6	3	5	3	14	4	10	7	4	14	70
3	4	2	2	1	11	1	5	10	4	13	53
4	1	0	0	1	1	1	4	2	1	2	13
5	5	3	3	2	18	3	21	8	3	29	95
6	4	2	0	0	4	2	9	8	3	13	45
7	4	0	2	3	16	5	21	23	6	23	103
8	4	0	1	0	8	2	11	19	8	16	69
9	4	2	1	1	5	1	6	10	8	12	50
10	5	2	5	1	6	1	13	17	11	41	102
Total	42	16	22	12	91	24	108	115	51	185	666

Table IX: Determinants of changes in risk aversion

Panel A and first two columns of Panel C report ordered probit model estimates for first difference of the qualitative measure of risk aversion. Panel B and last two columns of Panel C report interval regressions estimates for the changes in the quantitative measure. All the other variables are defined in the Data Appendix. Robust standard errors are in brackets. */**/*** indicates statistical significance at the 10%, 5%, and 1% level. Outliers have been trimmed out at the first and ninety-ninth percentile.

Panel A. Change in qualitative measure of risk aversion

	Whole sample							All assets at Unicredit
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Risk Aversion Qualitative 2007	-1.142***	-1.153***	-1.167***	-1.149***	-1.146***	-1.160***	-1.186***	-1.214***
	(0.076)	(0.084)	(0.083)	(0.083)	(0.084)	(0.084)	(0.087)	(0.109)
Male	-0.412***	-0.390***	-0.402***	-0.391***	-0.392***	-0.406***	-0.457***	-0.418***
	(0.094)	(0.102)	(0.103)	(0.102)	(0.103)	(0.103)	(0.102)	(0.132)
Age	0.020	0.010	0.006	0.011	0.010	0.002	-0.006	0.032
	(0.031)	(0.033)	(0.034)	(0.033)	(0.033)	(0.033)	(0.034)	(0.044)
Age^2	-0.000	-0.000	0.000	-0.000	-0.000	0.000	0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Education	-0.034***	-0.037***	-0.039***	-0.038***	-0.037***	-0.040***	-0.040***	-0.043***
	(0.011)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.013)	(0.015)
Δ Log Net Wealth 2009-2007		0.209			-0.605			
		(0.230)			(0.507)			
Δ Log Net Wealth 2009-Q2 2008			0.542			0.601	0.769*	0.028
			(0.390)			(0.477)	(0.454)	(0.646)
Δ Log (1- Habit)				3.122	10.302*	0.575		3.019
				(2.548)	(5.481)	(3.238)		(3.980)
Δ Log (Committed Housing Consumption)							0.023	
							(0.060)	
Observations	666	569	572	570	563	562	550	339

Panel B. Change in quantitative measure of risk aversion									
	Whole sample							Drop inconsistent answers	All assets at Unicredit
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Risk Aversion Quantitative: 2007	-0.619***	-0.624***	-0.633***	-0.623***	-0.625***	-0.628***	-0.633***	-0.707***	-0.654***
	(0.045)	(0.048)	(0.048)	(0.048)	(0.049)	(0.049)	(0.049)	(0.060)	(0.062)
Male	-0.291	-0.107	-0.095	-0.097	-0.119	-0.098	-0.083	-0.417	-0.441
	(0.284)	(0.304)	(0.304)	(0.305)	(0.306)	(0.306)	(0.308)	(0.335)	(0.393)
Age	0.122	0.157*	0.140*	0.162*	0.160*	0.150*	0.123	0.165*	0.200*
	(0.081)	(0.083)	(0.084)	(0.083)	(0.084)	(0.084)	(0.084)	(0.089)	(0.104)
Age^2	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Education	-0.038	-0.040	-0.036	-0.033	-0.041	-0.037	-0.035	-0.066*	-0.031
	(0.031)	(0.033)	(0.033)	(0.033)	(0.033)	(0.034)	(0.034)	(0.036)	(0.046)
Δ Log Net Wealth 2009-2007		-1.054			-0.148				
		(0.697)			(1.482)				
Δ Log Net Wealth 2009-Q2 2008			-1.419			-0.648	-0.170	-0.847	-0.579
			(1.196)			(1.451)	(1.425)	(1.705)	(1.923)
Δ Log (1- Habit)				-13.981*	-13.074	-9.134		-7.514	-13.893
				(7.525)	(15.951)	(9.568)		(11.371)	(11.498)
Δ Log (Committed Housing Consumption)							0.131		
							(0.186)		
Observations	666	569	572	570	563	562	550	468	339

Panel C. Non linear effects of wealth changes				
	Change in Qualitative Indicator of Risk Aversion		Change in Quantitative Indicator of Risk Aversion	
	(1)	(2)	(3)	(4)
Risk Aversion Qualitative 2007	-1.155***	-1.168***		
	(0.083)	(0.084)		
Risk Aversion Quantitative: 2007			-0.625***	-0.631***
			(0.048)	(0.049)
Male	-0.393***	-0.405***	-0.098	-0.105
	(0.102)	(0.103)	(0.303)	(0.304)
Age	0.010	0.005	0.157*	0.134
	(0.033)	(0.034)	(0.083)	(0.083)
Age^2	-0.000	0.000	-0.001	-0.001
	(0.000)	(0.000)	(0.001)	(0.001)
Education	-0.036***	-0.039***	-0.041	-0.034
	(0.012)	(0.012)	(0.033)	(0.033)
Δ Log Net Wealth 2009-2007	0.363		-1.711**	
	(0.289)		(0.833)	
$(\Delta \text{ Log Net Wealth 2009-2007})^2$	0.453		-1.956	
	(0.469)		(1.423)	
Δ Log Net Wealth 2009-Q2 2008		0.134		-3.078*
		(0.562)		(1.684)
$(\Delta \text{ Log Net Wealth 2009-Q2 2008})^2$		-1.153		-4.588
		(1.167)		(3.989)
Observations	569	572	569	572

Table X: The effect of uncertainty about future income and employment

The first column reports ordered probit model estimates; the dependent variable is the change in risk aversion. measured with the qualitative question. The second column reports interval regression estimates; the dependent variable is the quantitative measure of risk aversion. Risk aversion is measured with the qualitative question in the first two columns and with the quantitative one in the others. These measures are defined in Table II. All the other variables are defined in the Data Appendix. Robust standard errors are in brackets. */**/*** indicates statistical significance at the 10%, 5%, and 1% level. Wealth outliers have been trimmed out at the first and ninety-ninth percentile.

	Change Risk Aversion: Qualitative		Change Risk Aversion: Quantitative	
	(1)	(2)	(3)	(4)
Risk Aversion Qualitative 2007	-1.163***	-1.153***		
	(0.084)	(0.089)		
Risk Aversion Quantitative: 2007			-0.630***	-0.645***
			(0.049)	(0.051)
Male	-0.409***	-0.411***	-0.102	-0.150
	(0.103)	(0.113)	(0.306)	(0.331)
Age	0.006	-0.006	0.156*	0.153*
	(0.034)	(0.036)	(0.089)	(0.092)
Age^2	0.000	0.000	-0.001	-0.001
	(0.000)	(0.000)	(0.001)	(0.001)
Education	-0.039***	-0.042***	-0.036	-0.018
	(0.012)	(0.013)	(0.034)	(0.038)
Δ Log Net Wealth 2009-Q2 2008	0.599	0.471	-0.652	-1.631
	(0.475)	(0.541)	(1.447)	(1.576)
Δ Log (1- Habit)	0.577	0.909	-9.112	-7.267
	(3.247)	(3.356)	(9.549)	(9.799)
Retired	0.079	-0.016	0.123	-0.048
	(0.138)	(0.146)	(0.453)	(0.484)
Government Employee		0.100		-0.302
		(0.107)		(0.301)
Observations	562	525	562	525

Table XI: The effect of stock market expectations

Panel A reports ordered probit model estimates; the dependent variable is the change in risk aversion. measured with the qualitative question. Panel B reports interval regression estimates; the dependent variable is the quantitative measure of risk aversion. These measures are defined in Table II. All the variables are defined in the Data Appendix. Robust standard errors are in brackets. */**/*** indicates statistical significance at the 10%, 5%, and 1% level. Wealth outliers have been trimmed out at the first and ninety-ninth percentile.

Panel A. Qualitative measure of risk aversion			
	(1)	(2)	(3)
Risk Aversion Qualitative 2007	-1.050***	-1.055***	-1.070***
	(0.093)	(0.093)	(0.091)
Male	-0.329**	-0.321**	-0.277**
	(0.129)	(0.129)	(0.134)
Age	0.007	0.005	0.005
	(0.040)	(0.039)	(0.040)
Age^2	-0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)
Education	-0.033**	-0.033**	-0.033**
	(0.015)	(0.015)	(0.015)
Δ Log Net Wealth 2009-Q2 2008	0.499	0.537	0.536
	(0.563)	(0.565)	(0.561)
Δ Log (1- Habit)	-0.307	-0.642	-0.718
	(3.868)	(3.892)	(3.806)
Δ stock market expectation	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)
Δ range stock market		-0.000	-0.000
		(0.000)	(0.000)
Δ trust stock market			-0.150**
			(0.059)
Observations	407	405	405

Panel B. Quantitative measure of risk aversion			
	(1)	(2)	(3)
Risk Aversion Quantitative: 2007	-0.605***	-0.608***	-0.603***
	(0.056)	(0.056)	(0.055)
Male	-0.211	-0.153	-0.002
	(0.365)	(0.365)	(0.368)
Age	0.056	0.045	0.043
	(0.099)	(0.098)	(0.098)
Age^2	0.000	0.000	0.000
	(0.001)	(0.001)	(0.001)
Education	-0.015	-0.015	-0.015
	(0.041)	(0.041)	(0.040)
Δ Log Net Wealth 2009-Q2 2008	-2.280	-2.058	-2.074
	(1.719)	(1.719)	(1.676)
Δ Log (1- Habit)	-3.204	-4.036	-4.423
	(10.458)	(10.476)	(10.319)
Δ stock market expectation	-0.000	-0.000	0.000
	(0.000)	(0.000)	(0.000)
Δ range stock market		-0.000	-0.000
		(0.000)	(0.000)
Δ trust stock market			-0.445***
			(0.154)
Observations	407	405	405

Table XII: The effect of Knightian uncertainty

The first column reports ordered probit model estimates; the dependent variable is the change in risk aversion. measured with the qualitative question. The second column reports interval regression estimates; the dependent variable is the quantitative measure of risk aversion. Measures of risk aversion are defined in Table II. All the other variables are defined in the Data Appendix. Robust standard errors are in brackets. */**/*** indicates statistical significance at the 10%, 5%, and 1% level. Wealth outliers have been trimmed out at the first and ninety-ninth percentile.

	Change Risk Aversion: Qualitative	Change Risk Aversion: Quantitative
	(1)	(2)
Risk aversion qualitative 2007	-1.167***	
	(0.084)	
Risk Aversion Quantitative: 2007		-0.629***
		(0.049)
Male	-0.332***	-0.096
	(0.105)	(0.307)
Age	0.007	0.150*
	(0.033)	(0.084)
Age^2	0.000	-0.001
	(0.000)	(0.001)
Education	-0.035***	-0.037
	(0.012)	(0.034)
Δ Log Net Wealth 2009-Q2 2008	0.598	-0.649
	(0.500)	(1.477)
Δ Total Habit 09-07	-0.391	10.044
	(3.792)	(11.046)
Knigthian Uncertainty	0.453***	0.015
	(0.106)	(0.321)
Observations	562	562

Table XIII: The effect of bank run and frequency of checking investments

Panel A reports ordered probit model estimates; the dependent variable is the change in the qualitative measure of risk aversion. Panel B reports interval regression estimates; the dependent variable is the change in the quantitative measure of risk aversion. These measures are defined in Table II. All the variables are defined in the Data Appendix. Robust standard errors are in brackets. */**/*** indicates statistical significance at the 10%, 5%, and 1% level. Wealth outliers have been trimmed out at the first and ninety-ninth percentile.

Panel A. Qualitative measure of risk aversion			
	(1)	(2)	(3)
Risk Aversion Qualitative: 2007	-1.160***	-1.164***	-1.201***
	(0.084)	(0.084)	(0.102)
Male	-0.419***	-0.423***	-0.287**
	(0.103)	(0.103)	(0.125)
Age	0.001	0.001	-0.001
	(0.034)	(0.034)	(0.041)
Age^2	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)
Education	-0.041***	-0.041***	-0.031**
	(0.012)	(0.012)	(0.014)
Δ Log Net Wealth 2009-Q2 2008	0.569	0.561	0.783
	(0.478)	(0.479)	(0.504)
Δ Log (1- Habit)	0.665	0.727	-1.953
	(3.295)	(3.323)	(3.482)
Actual Bank Run	0.124		
	(0.137)		
Actual Bank Run, no deposit insurance		0.178	
		(0.141)	
Frequency People Check Investments			0.099***
			(0.030)
Observations	562	562	424

Panel B. Quantitative measure of risk aversion			
	(1)	(2)	(3)
Risk Aversion Quantitative: 2007	-0.631***	-0.632***	-0.669***
	(0.049)	(0.049)	(0.058)
Male	-0.054	-0.061	-0.226
	(0.305)	(0.305)	(0.380)
Age	0.154*	0.154*	0.150
	(0.084)	(0.084)	(0.102)
Age^2	-0.001	-0.001	-0.001
	(0.001)	(0.001)	(0.001)
Education	-0.035	-0.035	-0.066*
	(0.034)	(0.034)	(0.038)
Δ Log Net Wealth 2009-Q2 2008	-0.523	-0.537	-1.295
	(1.462)	(1.461)	(1.630)
Δ Log (1- Habit)	-9.452	-9.496	-7.414
	(9.557)	(9.556)	(11.351)
Actual Bank Run	-0.447		
	(0.367)		
Actual Bank Run, No insurance		-0.430	
		(0.374)	
Frequency People Check Investments			-0.051
			(0.082)
Observations	562	562	424

Table XIV: Determinants of change in risk aversion: nature of the source of information

The first two columns report ordered probit model estimates; the dependent variable is the change in the qualitative measure of risk aversion. The remaining two columns report interval regression estimates; the dependent variable is the change in the quantitative measure of risk aversion. These measures are defined in Table II. All the variables are defined in the Data Appendix and we provide summary statistics in Table III. Robust standard errors are in brackets. */**/*** indicates statistical significance at the 10%, 5%, and 1% level. Wealth outliers have been trimmed out at the first and ninety-ninth percentile.

	Change Risk Aversion: Qualitative		Change Risk Aversion: Quantitative	
	(1)	(2)	(3)	(4)
Risk Aversion Qualitative: 2007	-1.376***	-1.338***		
	(0.140)	(0.142)		
Risk Aversion Quantitative: 2007			-0.600***	-0.598***
			(0.074)	(0.074)
Male	-0.528***	-0.484**	-0.732	-0.712
	(0.189)	(0.192)	(0.534)	(0.536)
Age	0.067	0.067	0.103	0.102
	(0.064)	(0.065)	(0.151)	(0.150)
Age^2	-0.001	-0.001	-0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)
Education	-0.037*	-0.035	-0.045	-0.044
	(0.021)	(0.021)	(0.057)	(0.057)
Δ Log Net Wealth 2009-Q2 2008	1.275**	1.333**	-2.646	-2.627
	(0.574)	(0.571)	(1.940)	(1.951)
Δ Log (1- Habit)	-3.671	-4.980	6.271	5.609
	(3.846)	(3.830)	(14.179)	(14.199)
Sources of information				
- Your bank	0.318***	0.354***	0.476*	0.491*
	(0.090)	(0.095)	(0.257)	(0.258)
- Your broker	-0.125**	-0.130**	-0.165	-0.168
	(0.062)	(0.062)	(0.178)	(0.178)
- Friends, relatives, colleagues	-0.002	-0.003	-0.161	-0.159
	(0.076)	(0.077)	(0.198)	(0.198)
- Specialized and non specialized press	-0.072	-0.063	-0.094	-0.091
	(0.114)	(0.112)	(0.307)	(0.309)
- Dedicated Tv programs and web	-0.121	-0.131	0.179	0.175
	(0.100)	(0.101)	(0.281)	(0.281)
Index of Financial Literacy		-0.154**		-0.079
		(0.071)		(0.190)
Observations	235	235	235	235

Table XV: The effect of financial ability, overconfidence, and regret.

The first three columns report ordered probit model estimates; the dependent variable is the change in the qualitative measure of risk aversion. The remaining three columns report interval regression estimates; the dependent variable is the change in the quantitative measure of risk aversion. All the variables are defined either in Table II or in the Data Appendix and we provide summary statistics in Table III. Robust standard errors are in brackets. */**/*** indicates statistical significance at the 10%, 5%, and 1% level. Wealth outliers have been trimmed out at the first and ninety-ninth percentile.

	Change Risk Aversion: Qualitative			Change Risk Aversion: Quantitative		
	(1)	(2)	(3)	(4)	(5)	(6)
Risk Aversion Qualitative: 2007	-1.226***	-1.139***	-1.177***			
	(0.107)	(0.085)	(0.085)			
Risk Aversion Quantitative: 2007				-0.681***	-0.636***	-0.628***
				(0.058)	(0.050)	(0.049)
Male	-0.372***	-0.417***	-0.402***	-0.087	-0.070	-0.098
	(0.121)	(0.106)	(0.103)	(0.363)	(0.315)	(0.307)
Age	0.000	0.001	0.003	0.144	0.147*	0.150*
	(0.041)	(0.034)	(0.034)	(0.102)	(0.085)	(0.084)
Age^2	0.000	0.000	0.000	-0.001	-0.001	-0.001
	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)
Education	-0.028**	-0.041***	-0.039***	-0.059	-0.026	-0.037
	(0.014)	(0.012)	(0.012)	(0.038)	(0.034)	(0.034)
Δ Log Net Wealth 2009-Q2 2008	0.631	0.586	0.605	-1.478	-0.818	-0.648
	(0.505)	(0.480)	(0.474)	(1.622)	(1.438)	(1.451)
Δ Log (1- Habit)	-1.405	0.476	0.633	-6.570	-5.461	-9.134
	(3.544)	(3.389)	(3.240)	(11.296)	(9.326)	(9.570)
Financial Ability	0.229***			0.244		
	(0.070)			(0.185)		
Overconfident		0.057			0.193	
		(0.099)			(0.281)	
Regret Loss			0.103			0.000
			(0.066)			(0.195)
Observations	424	541	562	424	541	562

Table XVI: Experimental evidence: comparison between the group of treated and untreated

This table shows the summary statistics for treated and untreated subjects in the experiment run at Northwestern University. The risk aversion measures are elicited as described in Table II. The indicator for low risk investment is constructed from the qualitative question, setting it equal to 1 if the person chose "A OK return, with good degree of safety of my principal" or "Low returns, but no chance of losing my principal," and zero otherwise. */**/*** indicates statistical significance at the 10%, 5%, and 1% level

Variable	Obs. Tot.	Mean treated	Mean non-treated	Difference
Risk Aversion Quantitative	207	1,802	2,474	-672**
Risk Aversion Qualitative	210	2.54	2.41	0.13
Low Risk Investment	210	0.53	0.39	0.14*
Sex	206	0.39	0.34	0.05
Age	203	19.77	19.83	-0.06
White	206	0.41	0.40	0.01
Income (Thousands of dollars)	210	111.68	120.96	- 9.28

Table XVII: Experimental evidence

The table reports estimates of the effect of the treatment on subjects risk aversion. In columns 1 and 2 the dependent variable is the quantitative measure of risk aversion measured by certainty equivalent in columns 3 and 4 the left hand side is the qualitative measure of risk aversion; and in columns 5 and 6 a dummy variable equal to 1 if low risk investments are chosen. Columns 1-4 report results from OLS regressions, while columns 5-6 marginal effects from probit estimates. The variable "Treated" is a dummy variable equal to one if the individual was treated by showing him the video, and zero otherwise. All the other variables are defined in Table II, XVI and in the Data Appendix. Robust standard errors are in brackets. */**/*** indicates statistical significance at the 10%, 5%, and 1% level

	Risk Aversion Quantitative		Risk Aversion Qualitative		Prob. Choose Low Risk Inv.	
	(1)	(2)	(3)	(4)	(5)	(6)
Treated	-671.739**	-637.516**	0.128	0.120	0.135**	0.143**
	(300.210)	(300.136)	(0.080)	(0.080)	(0.069)	(0.070)
Sex		347.001		-0.185**		-0.165**
		(313.255)		(0.080)		(0.071)
Income (Million dollars)		-980.767		-0.193		0.200
		(1,032.326)		(0.397)		(0.303)
Constant	2,473.913***	2,415.522***	2.409***	2.510***		
	(214.947)	(293.520)	(0.055)	(0.078)		
Observations	207	203	210	206	210	206
R-squared	0.023	0.028	0.012	0.036	0.013	0.031

Table XVIII: Experimental evidence

The table reports estimates of the effect of the treatment on subjects risk aversion for groups of subjects that differ in how much they like horror movies – a variable ranging from 0 to 100 increasing in liking. In the first three columns the dependent variable is the quantitative measure of risk aversion measured by certainty equivalent; in the other columns is a dummy variable equal to 1 if low risk investments are chosen. Columns 1-3 report results from OLS regressions, while columns 4-6 show marginal effects from probit estimates. "Dislike" is the group that report zero in how much they like horror movies; "Indifferent" if they like horror movies between 1 and 20; "Like" if subjects like horror movies more than 20 and up to 100. The variable "Treated" is a dummy variable equal to one if the individual was treated by watching the video, and zero otherwise. All the other variables are defined either in Table II or in the Data Appendix. Robust standard errors are in brackets. */**/*** indicates statistical significance at the 10%, 5%, and 1% level.

	Quantitative Measure			Prob. Choose Low Risk Inv.		
	Dislike	Indifferent	Like	Dislike	Indifferent	Like
	(1)	(2)	(3)	(4)	(5)	(6)
Treated	-1,431.747*	-774.954	422.089	0.497***	0.152	0.148
	(815.555)	(563.126)	(784.107)	(0.144)	(0.152)	(0.159)
Sex	1,386.884	430.087	-675.781	-0.329**	-0.071	-0.051
	(957.917)	(578.674)	(712.978)	(0.159)	(0.163)	(0.158)
Income (Million dollars)	2,129.391	-3,039.331**	-1,465.401	-0.646	1.109	-0.631
	(3,058.701)	(1,260.632)	(2,386.514)	(1.073)	(0.765)	(0.636)
Constant	2,632.001***	2,568.339***	3,069.635***			
	(804.805)	(503.767)	(647.321)			
Observations	36	41	44	37	41	45
R-squared	0.148	0.101	0.031	0.212	0.070	0.035

Table XIX: Fear and rebalancing

The table reports the coefficients of regressions where the dependent variables is the flow of risky assets bought (positive) or sold (negative) over the period specified in each column scaled by the value of total financial assets at the end of August 2008, prior to the Lehman Brothers collapse. The risk aversion ratio is the ratio between the risk aversion before and after Lehman multiplied by the average risky share in 2007; the post shock share is the risky share implied by the level of the risky asset price at various dates after the collapse of Lehman; Z_3 is the adjustment in the risky asset share implied by the habit model. Its value depends on the drop in the price of risky assets between August the specified date. Total flow is the cumulative flow of total financial assets over the specified period. Robust standard errors are in brackets. */**/*** indicates statistical significance at the 10%, 5%, and 1% level. Outliers have been trimmed out at the first and ninety-ninth percentile.

	Oct 08	Oct 08 /Jan 09	Oct 08 /Feb 09	Oct 08 /Mar 09	Oct 08 /Apr 09	Oct 08 /May 09
	(1)	(2)	(3)	(4)	(5)	(6)
Fear Model Factors						
Risk aversion ratio (Z_1)	0.049**	0.040	0.036	0.079**	0.077**	0.082*
	(0.024)	(0.026)	(0.028)	(0.038)	(0.037)	(0.042)
Post shock share: Sep 08 (Z_2)	-0.054*					
	(0.031)					
Post shock share: Oct 08 (Z_2)		-0.026				
		(0.037)				
Post shock share: Nov 08 (Z_2)			-0.048			
			(0.042)			
Post shock share: Dec 08 (Z_2)				-0.112**		
				(0.050)		
Post shock share: Jan 08 (Z_2)					-0.137***	
					(0.052)	
Post shock share: Feb 08 (Z_2)						-0.143**
						(0.058)
Habit Model Factors						
September 08 ($Z_{3)}$	0.713					
	(0.781)					
October 08 (Z_3)		0.226				
		(0.434)				
November 08 (Z_3)			-0.184			
			(0.396)			
December 08 (Z_3)				-0.210		
				(0.381)		
January 09 (Z_3)					-0.120	
					(0.348)	
February 09 (Z_3)						0.013
						(0.304)
Male	-0.007	-0.029*	-0.034*	-0.035*	-0.044**	-0.045**
	(0.013)	(0.016)	(0.018)	(0.019)	(0.019)	(0.020)
Age	0.008**	-0.003	0.001	-0.002	-0.004	-0.004
	(0.004)	(0.007)	(0.008)	(0.008)	(0.007)	(0.008)
Age^2	-0.000**	0.000	-0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Education	0.001	0.001	0.003	0.002	0.004*	0.002
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Δ Log Net Wealth 2009-Q2 2008	0.246**	0.285***	0.265***	0.342***	0.191**	0.257**
	(0.095)	(0.101)	(0.102)	(0.121)	(0.093)	(0.106)
Tot flow Oct 08/Dec 08	0.045					
	(0.062)					
Tot flow Oct 08/Jan 08		0.158*				
		(0.084)				
Tot flow Oct 08/Feb 08			0.137*			
			(0.080)			
Tot flow Oct 08/Mar 09				0.088		
				(0.104)		
Tot flow Oct 08/Apr 09					0.322***	
					(0.064)	
Tot flow Oct 08/May 09						0.314***
						(0.073)
Observations	375	375	375	375	375	375
R-squared	0.095	0.161	0.133	0.127	0.262	0.251