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Time varying risk aversion☆

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ABSTRACT

Exploiting portfolio data and repeated surveys of an Italian bank's clients, we test whether investors' risk aversion increases following the 2008 crisis. We find that, after the crisis, both qualitative and quantitative measures of risk aversion increase substantially and that affected individuals divest more stock. We investigate four explanations: changes in wealth, expected income, perceived probabilities, and emotion-based changes of the utility function. Our data are inconsistent with the first two channels, while they suggest that fear is a potential mechanism underlying financial decisions, whether by increasing the curvature of the utility function or the salience of negative outcomes.

1. Introduction

As Campbell and Cochrane (1999) show, to fit historical data, asset pricing models require large fluctuations in the aggregate risk aversion. Yet, what is the direct evidence (i.e., not from stock prices) that aggregate risk aversion indeed fluctuates over time?

Aggregate risk aversion can fluctuate either because the risk aversion of the typical investor changes or because the distribution of wealth among investors with different risk aversion changes. In this paper we test the first channel and analyze whether *individual* risk aversion increases following the major financial crisis of the last 80 years—the 2008 one. We do so by exploiting portfolio choices and some survey-based measures of risk aversion elicited in a sample of clients (labeled *investors* from now on) of a large Italian bank (hereafter, *the bank*) in 2007 and repeated on the same set of people in 2009.

We find that both qualitative and quantitative measures of risk aversion exhibit large increases following the crisis. The risk premium required to accept a risky gamble with a 50% chance of winning 10,000 euros increases from 1000 euros to 2500 euros. Similarly, the fraction of investors who say they do not want to take any financial risk goes from 16% to 43%. Individuals who experience an increase in risk aversion are four times more likely to sell their stock holdings during the worst moment of the crisis than people who do not.

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There are many theories that can explain large changes in individual risk aversion. The best way to classify them is according to the channel that leads from the shock (large drop in stock prices) to the outcome (increase in individual risk aversion). The most prominent mechanism in the literature is changes in wealth, as predicted by the classical von Neumann-Morgenstern utility function and by the habit persistence model (Campbell and Cochrane, 1999). Prospect theory (Barberis et al., 2001) can also work through this channel.

Changes in background risk are the second most common explanation. Changes in the outside environment can affect an individual's expected income (Heaton and Lucas, 2000; Guiso and Paiella, 2008) and in so doing modify the risk aversion of the value function.

A third possibility is that a major shock has an effect on the expected distribution of returns as in Bordalo et al. (2012). In their model individuals' attention is directed to some particular realization that receives disproportionate weighting (salience). Therefore, individuals may become more risk averse because the financial meltdown has made the worst stock market realization more salient.

Finally, a major shock can affect the emotions of investors and alter their decisions about their willingness to take risks because it changes their perceived utility loss of bad outcomes (Loewenstein, 2000). In economic language, a major shock leads to a state-contingent increase in the curvature of the utility function.

Consistent with the wealth channel, we find that individuals who experience extraordinarily big losses exhibit a greater increase in the quantitative measure of risk aversion. Yet, we also find that risk aversion increases substantially even among those individuals who did not experience any loss, suggesting that not all the changes in risk aversion occur via changes in wealth.

We do not find much support for the changes-in-expected-income channel. For example, the increase in risk aversion of retirees (who in Italy enjoy a public pension) and of public employees (who at the time faced little or no risk of layoffs) is no smaller than that of the rest of the population.

We test the salience theory by looking at the individual responses on the expected distribution of returns. For those subjects willing to answer the question in both periods, we do find evidence of changes in the expected distribution of returns. Furthermore, we do find a significant increase in the fraction of people unwilling to answer that question.

Our evidence is also consistent with the Loewenstein (2000) hypothesis that, faced with a negative shock, individuals are affected by an emotion (fear) that alters their willingness to take risk in both financial and nonfinancial domains. However, with naturally occurring data it is difficult to design a direct test with any power to reject this hypothesis. For this reason, we run a laboratory experiment. While previous experiments have already shown that emotions can increase risk aversion (Kuhnen and Knutson, 2005, 2011; Knutson et al., 2008), our goal is to test whether the fear associated with a negative shock can indeed change our measures of risk aversion by a magnitude similar to what we observe in naturally occurring data.

To simulate in the lab this change in state, we rely on a fear conditioning model. As in the classical Pavlov (1927) experiment, the fear response can be triggered by conditioning factors, which have little or nothing to do with the experience itself. Kinreich et al. (2011) show that watching a horror movie stimulates the amygdala in a way consistent with the arousal of fear. Thus, to generate the fear produced by a stock market crash, we treat a sample of students with a five-minute excerpt from the movie *Hostel* (2005, directed by Eli Roth), characterized by stark and graphic images. It shows a young man inhumanly tortured in a dark basement.

We find that students treated with the horror movie exhibit a higher risk aversion (both according to the quantitative and the qualitative measure) that is very similar to the one experienced by the Italian bank's investors in 2009. The treated subjects' risk premium is $672 (27%) higher than the untreated ones'. Interestingly, the effect is entirely concentrated among students who dislike horror movies. The ones who like them seem unaffected.

Such an experiment shows that fear *causes* an increase in our measures of risk aversion, even in the absence of any change in the outside environment (which is the same for the treated and non-treated sample) and in their endowment (which is unaffected by the treatment). Obviously, the experiment cannot prove in any way that such a causal link exists among bank investors in our sample. Nevertheless, it does provide evidence that such a large increase in measured risk aversion can indeed occur even when not mediated by wealth changes and in absence of background risk. The psychology model based on fear is consistent with both the survey and the experimental data.

Our result is consistent with Cohn et al. (2015). In a lab experiment with a sample of financial professionals, they show that those "treated" with a stock market crash scenario become more risk averse and report an increase in fear, even though they do not experience any direct financial loss. This nice result is complementary to ours. Like us, they show that risk aversion can fluctuate with the stock market performance. Yet, we can show that an *actual* stock market crash, caused by the financial crisis, increases risk aversion and induces a change in portfolio allocation. Since Cohn *et al.* are limited to lab data, they are only able to show changes in the lab. However, they can successfully establish a causal link between the fear induced by the crash and a more conservative portfolio allocation, while we can only establish a correlation.

Our paper is also related to Weber et al. (2013). They survey online customers of a brokerage account in England between September 2008 and June 2009, asking them how they would allocate 100,000 pounds between a risk free asset and the UK stock market index and a few measures of risk attitudes. Similarly to us, they find that risk taking decreases between September and March, but, unlike us, their measures of risk attitudes do not change. One likely explanation for this difference is that their baseline measures are taken in September 2008 when the situation is already problematic, while our baseline measures are taken long before the inception of the crisis.

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