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# Sometimes less is more – The influence of information aggregation on investment decisions☆

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ABSTRACT

We study the effect of information aggregation on individual investors' risk-taking behavior in two experiments, each having three different treatments. Subjects in the control group were given hypothetical returns for both the risk-free and the risky asset. Subjects in the account group were also given information about returns separately for each of the two assets. However, this information was scaled according to a subject's chosen investment amount. Subjects in the portfolio group could observe returns on a portfolio level, which constitutes the highest level of information aggregation in our study. Results show that a higher degree of information aggregation results in greater risk-taking. Increased risk-taking is associated with a lower risk perception and a more accurate estimation of the probability of a loss. Furthermore, reporting aggregated returns might lead investors to evaluate the aggregated outcome relative to a different reference point (the overall portfolio instead of the amount invested in risky assets), which makes them less likely to experience a loss and therefore increases the willingness to invest in the risky asset. Thus, aggregating information seems to reduce mental accounting, namely having one account for risky and one account for risk-free investments. Ex post, our findings show that the portfolio group also makes consistent subsequent allocation decisions and shows a lower dissatisfaction with outcomes in the loss domain. The results were consistent across both experiments despite the use of different subject pools and investment amounts.



## 1. Introduction

Past literature has documented several pitfalls private investors may encounter during the investment decision process. Avoiding these pitfalls is crucial, as we have observed increasing investor involvement in individual financial decision-making during the past years, especially in investment decisions. Individuals have to save for retirement and must decide which funds to select for their retirement plans. During the investment decision-making process, they face highly complex factors such as risk, ambiguity, and choice overload. These factors represent a challenge for financial professionals, experienced investors, and especially the ordinary private household. One important finding is that decision outcomes differ according to how information is presented or framed (e.g., Tversky and Kahneman, 1981).

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One possibility for reducing complexity is to aggregate information. Aggregation can be done in several ways, such as by providing information less frequently (e.g., quarterly instead of monthly) or by providing less detailed information in the cross-section (e.g., fund returns instead of returns of every single holding). The literature dealing with the question of how information aggregation influences risk-taking is linked to the literature about narrow framing and myopic loss aversion (e.g., Barberis and Huang, 2001; Gneezy and Potters, 1997; Thaler et al., 1997). Investors judge outcomes of an investment relative to a reference point and are more sensitive to losses than to gains of an equivalent amount (loss aversion): an investor purchasing a stock for $100 feels the loss more deeply if the price falls to $80 than he enjoys a price increase to $120. Myopic loss aversion refers to the finding that loss aversion increases if investors are myopic or frame the loss more narrowly, for example, by evaluating their portfolios more often. If the price for a stock decreases from $100 to $80 over half a year, the investor could, for example, observe the price at $80 after 6 months or he could also observe a value of $90 after three months. Studies show that this lower degree of information aggregation under temporal aspects leads to higher risk aversion (e.g., Fellner and Sutter, 2009; Haigh and List, 2005; Gneezy and Potters, 1997; Thaler et al., 1997). Additionally, strong support exists for the idea that both loss aversion and narrow framing influence investors' risk-taking. Two treatments displaying investors' returns – gains and losses of an investor's individual stocks versus those of the portfolio – revealed loss aversion in both cases, but stock returns were perceived as more volatile under individual stock accounting than under portfolio accounting (Baberis and Huang, 2001). However, evidence regarding the influence of information aggregation over asset returns on risk-taking remains inconsistent: Anagol and Gamble (2013) also find an increase in risk-taking for higher information aggregation in an experimental setup, while Beshears et al. (2011) find no effect of information aggregation on risk-taking in their field study.

We analyze the influence of information aggregation in a simple but important investment decision: the allocation between a risky and a risk-free asset. Experiment I uses three treatments to which participants are randomly assigned. All subjects received an endowment of $100 and were informed that the risk-free asset has a guaranteed payoff of $118, while the expected payoff of $100 investment in the risky asset is $153 after five years. The three treatments differ only in the dimension of how risk-return information is aggregated. In the first treatment, participants receive unscaled information about the two assets (*control group*). This situation is comparable to one in which an individual gets information about a stock or a mutual fund by examining its historical returns. In contrast to other studies (which use only an account group versus a portfolio group), we include this control group because investors might already have problems with calculating their expected payoff based on the amounts they want to invest. To explain our experimental design, we use the following example for every treatment:

> *If a participant of our experiment in the control group has chosen a portfolio allocation of $70 (risk-free) and $30 (risky), he is told that the payoff of a $100 investment in the risk-free fund is $118, and the expected payoff of a $100 investment in the risky fund is $153 after five years.*

In the second treatment, information is scaled according to the participant's preferred investment amount. Instead of a standardized risk-return profile ("if an investor were to invest $100"), participants are provided with the risk-return profile for the risky and the risk-free asset based on their chosen amounts (*account group*).

> *If a participant has chosen a portfolio allocation of $70 (risk-free) and $30 (risky), he is told that the guaranteed payoff of his $70 investment in the risk-free asset will be $82.50 and the expected payoff of his $30 investment in the risky asset will be $46 after five years.*

In the third group, participants receive the information on a portfolio level, which reflects the most aggregated level (*portfolio group*). They observe one return for the whole portfolio instead of two separate estimates.

> *If a participant has chosen a portfolio allocation of $70 (risk-free) and $30 (risky), he is told that the expected payoff of this portfolio investment will be $128.50 after five years.*

After the allocation, participants are asked to evaluate their decision. Like previous investigators (e.g., Anagol and Gamble, 2013; Langer and Weber, 2001), we use a subsequent allocation decision for that purpose. Participants receive one simulated payoff and are asked how they would allocate their endowment if they could choose again. In addition, we add subjective measures of decision satisfaction.

Results of Experiment I show that the degree of information aggregation affects risk-taking behavior. Participants take on more risk in the portfolio group, followed by the account group and the control group. We are able to show this effect using continuously distributed assets for the risky option in contrast to binary prospects frequently used in the literature (e.g., Steul, 2006; Langer and Weber, 2001). We also find that participants in the portfolio treatment "stay the course" and do not lower their risky position in a subsequent allocation. We find significantly lower levels of dissatisfaction in the portfolio treatment if we limit the analysis to participants who suffer a loss. Thus, individuals seem to take into account that a well-considered (ex ante) decision might (ex post) have a negative payoff.

The intentions of Experiment II are twofold. First, we want to replicate the results of Experiment I. In addition, we want to analyze the underlying mechanisms associated with differences in risk-taking behavior, and we use measures of risk and loss perception for this purpose. One apparent reason for the higher risk-taking in the portfolio treatment could be that investors do not observe the variance of the risky asset alone, but observe the variance of the portfolio as a whole and therefore perceive the risk to be lower. We therefore measure the participants' risk perception. Various studies have