Study setup

The goal of our study is to test our hypothesis that by encoding the local sensitivity of the risk to changes in the return, people are more confident in their decisions about how much risk to take. In this section we describe the design, participants, and apparatus of the controlled lab study we used to test our hypothesis.

0.1 Design

For this study we chose a within-subject design. Our independent variable is the visibility of the sensitivity widget in the interface. We designed two visualization interfaces, one without sensitivity (A-test) and one with a sensitivity feature (B-test). Other than this sensitivity feature the interfaces are identical in look and functionality. The dependent variables are the participants' responses to a set of questions designed to assess their confidence in investment decisions after using each interface (see Table 1) and questions about which interface they preferred overall (see Table 2).

We employed an A-B-A study design in order to mitigate any learning effect from using the system and any change in confidence from that learning effect. Each participant was given the baseline system without sensitivity, then the one with sensitivity, then the one without again. We measured their confidence in their decision after each round. In theory, the sensitivity widget will affect the confidence levels between As and B without affecting the confidence level between the two rounds of A. This design also facilitates the introduction of the interface without a special focus on the sensitivity features, these features get introduced on their own after the user has gained some experience in using the interface.

In order to prevent users from simply selecting the same risk/return trade-off value they selected in their first interface we created three portfolios from actual stock data. The names were anonymized in the interface, however, to prevent participants from picking investments in their "favorite" companies. Each interface was shown using a different pre-selected portfolio as data. We manually selected three portfolios. We selected a random permutation of these portfolios for each participant in order to focus our study only on whether the sensitivity feature itself was important.

0.2 Participants

As previously mentioned, the goal of this study is to see how helpful sensitivity measures are to a more general populace. Therefore, we recruited participants from the local universities in the area. In total we had 23 participants, 8 female and 15 male. Their ages ranged from 20 to 40 years old with an average age of 27.7. The median age was 26 years old. One reported as a beginner computer user, 7 as intermediate, and 15 as expert users. Only 7 participants had any prior investment experience.

0.3 Apparatus

The interfaces and questionnaires were all designed in HTML. All participants used a Chrome web browser running on an Apple MacBook Pro laptop connected to a 27 inch display, external keyboard, and mouse for the study.

After each interface test we presented a questionnaire designed to elicit the level of confidence in investment decisions participants had using our system. The confidence questions, listed in Table 1, were developed by the authors and are designed to be answered on a Likert scale. We used a 7-point scale for the questions for symmetry with the standard usability questionnaire that we also employed. We used the CSUQ [Lew95] questionnaire for our usability questions. The questionnaire was presented to the users in a wizard-style interface with 5 questions per page so as not to overwhelm them [May08]. In addition, we had a short questionnaire written by the authors comparing the two interfaces. This was a comparative survey (i.e. not on a Likert scale). The contents of this comparative survey is shown in Table 2.

Table 1: The five Likert scale questions we designed to help assess a participant's confidence after using each interface.

Question	Text
C1	I am positive that I made the best decision given the information at hand.
C2	I have been cautious with my decision.
C3	I am hopeful that the portfolio will perform as predicted.
C4	I am satisfied with my decision.
C5	The features available helped me make my decision.

References

[Lew95] Lewis J. R.: IBM computer usability satisfaction questionnaires: Psychometric evaluation and instructions for use. *International Jour-*

Table 2: The five A/B comparison questions that were presented to each participant after assessing all three interfaces. These were all "yes/no"- or "A/B"-style questions.

Question	Text
AB1	Did you find the sensitivity feature helpful?
AB2	Did you find the "whisker" feature helpful?
AB3	Which interface overall did you prefer?
AB4	The sensitivity measure helped me better make my decision.
AB5	The sensitivity feature helped me make my decision more quickly.

nal of Human-Computer Interaction 7, 1 (Jan. 1995), 57–78. doi:10.1080/10447319509526110.

[May08] Mayer R. E.: Applying the science of learning: Evidence-based principles for the design of multimedia instruction. *The American Psychologist 63*, 8 (Nov. 2008), 760–769. doi:10.1037/0003-066X.63.8.760.