A Comparison of Survey and Incentivized-Based Risk Attitude Elicitation*

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Abstract: This paper reports results from an on-line economics experiment with heads of households that explores the link between a sample of survey questions on a "Know-Your-Client" survey form, required by financial regulation to establish an advisor-client relationship, and several incentivized laboratory instruments for preferences under risk. We find that the risk instruments significantly predict responses to risk questions, with the exception of a question that includes a time dimension. By contrast, the loss aversion instruments do not predict responses to loss questions. Indeed, if anything, risk instruments predict the majority of the loss questions. This paper is the first to use experimental methods to study this important form used in the finance industry.

Keywords: *Risk preferences, Risk preference elicitation, Prudence, Temperance, Ambiguity, Investing behavior*

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Introduction

One of the duties of financial advisors is to assist investors with building a portfolio that fits their needs and preferences. An important issue is how much risk the investor should be exposed to. To address this issue advisors typically begin by looking at an investor's profile, collecting such information as income, age, level of financial literacy, investing experience, and tax status. The problem is that although socioeconomic variables can proxy for the willingness to take risk, they cannot fully capture it.[1] Attempting to measure risk preferences more accurately, advisors can turn to surveys aimed at identifying risk tolerance and financial objectives.[2]

An alternate method of eliciting preferences relevant for investment decisions is the use of incentivized instruments in economics experiments. With these instruments people make decisions that reveal their preference and attitudes through actions rather than words or socioeconomic status. In fact, experiments, through the control of the laboratory environment, make it possible to measure multiple dimensions of risk attitudes. However, experiments are costly, with regard to both time and resources, making their use unfeasible in many contexts. This limitation often makes questionnaires the only alternative to measure risk attitudes. Thus it is important to understand what the questionnaires measure with as much precision as possible.

One way to pin down the interpretation of questionnaire responses is to explore the association between survey and experimental methods. In this paper for the first time we do exactly that by comparing responses to the "Know-Your-Client" (KYC) survey form and a set of incentivized laboratory instruments in an on-line experiment with heads of households. The survey included seven questions aimed at assessing the participants' level of financial risk tolerance and attitudes towards losses. The experimental tasks measured four dimensions of risk preferences, risk and ambiguity aversion, temperance, prudence, and loss aversion. We explore the association between the results of the survey and the experimental tasks. While other papers explore the determinants of risk attitudes (Dohmen et al. (2011), Ding et al. (2010)), the association between different experimental measures of risk aversion (Menkhoff et al. (2006)), and the empirical association

[1] See Yao and Curl (2011) and Mandal and Roe (2014) for age and risk preferences, Outreville (2015) for education, Dohmen et al. (2009) for cognitive ability, Eckel and Grossman (2002a) and Charness and Gneezy (2012) for gender and Guiso and Jappelli (2008) for wealth.Holt and Laury (2014) and Hey (2014) summarize the literature.

[2] In Canada, these surveys are part of what is called as the Know-Your-Client process, a step mandated by regulation, in which financial advisors assess their clients' investment needs and objectives, financial circumstances and level, and risk tolerance OSC (2009).

between different dimensions of risk preferences (Deck and Schlesinger (2014)), none examine a specific questionnaire in use in the finance industry.

We find that the response to the risk questions in the survey are highly correlated with each other, as are the responses to the loss questions. Indeed, the risk and loss questions are also correlated with each other. By contrast, we find less correlation among the incentivized instruments. We find that the risk instruments significantly predict responses to the risk questions with the exception of one question that includes a time dimension. By contrast, the loss aversion instruments do not predict responses to the loss questions. Indeed, if anything, risk instruments predict the majority of the loss questions. We conclude that the survey appears to be successful in eliciting attitudes towards risk, and that the survey appears to be less successful with regard to loss aversion. We speculate that the survey may benefit from questions about higher order risk preferences.

This paper proceeds as follows. Section 1 contains the experimental design and main behavioral conjectures of the paper. Section 2 describes the experimental procedures. Section 3 presents the results, and Section 4 concludes.

1 Experimental design

1.1 The Know-Your-Client (KYC) Form

Figure 1 presents the Know-Your-Client form, as presented to the experiment participants, taken from a sample survey designed by the Mutual Fund Dealers Association of Canada (MFDA (2014)) to guide its members. The form consists of seven questions, each designed to reveal preferences or actions in a hypothetical situation. Regulation requires that every client respond to this questionnaire before a client-advisor relationship can be established.

The first KYC question elicits the primary goal for the client's portfolio, with responses ranging from safety to growth: we call this "Portfolio Goal". The second question elicits a "Descriptive Risk Preference" using language ranging from conservative to aggressive, and the third question attempts to obtain a "Loss Tolerance" in the form of a maximum acceptable loss for a twelve month period. Question 4 asks whether the client is more concerned with a "Loss or Gain". Question 5 presents a graphical depiction of investments with different variances and expected value in the form of a "Risk Preference" elicitation instrument, asking the client to choose her

most preferred hypothetical investment. The sixth question asks what the client would do, "Buy, Sell or Hold", with an investment that lost 30% of its value in the last three months. Question 7 displays portfolios of different variances as a time series and based on this hypothetical "Historical Performance Preference" requires the client to select her preferred portfolio. Question 7, with its time series in returns, despite the fact that it is worded strongly towards tolerance for variance, could invoke time preferences in a client's response.

Notice that it is possible to divide the questions into two categories. The first category includes questions 1, 2, 5, and 7 all of which, in some fashion, refer to tolerance for risk using different frames. Question 5, interestingly, is analogous to a hypothetical laboratory instrument to measure risk preferences. One can see this by noticing that as the client moves through the possible responses from first to last, each response is an increase in both variance and expected value over the previous response.

The second category is represented by questions 3, 4 and 6, all three of which refer in some manner to tolerance for losses. Question 4, for example, is framed specifically around loss tolerance. Questions 3 and 6 directly ask about losses in two different frames. Question 6, in fact, relates to myopic loss aversion, touching on the issue of the frequency of portfolio updating.

Table 1 presents categories and labels for each question with regard to the information being sought. The table divides the questions into the two categories of risk and loss, summarizes the topic each question covers, and presents the abbreviations we will use to describe each question in this paper.

1.2 The Experimental Tasks

The experimental tasks measure four dimensions of the participants risk preferences: risk preference, temperance, prudence, and ambiguity preference. Two additional tasks measure myopic loss aversion.

1.2.1 Risk Preference

We elicit risk preferences using a measure based on the well-known instruments of Binswanger (1981) and Eckel and Grossman (2002b). The instrument is presented in Table 2. In the table, there are five main rows representing a decision between binary lotteries with 50/50 outcomes

("Event A" and "Event B"), presented in the third and fourth columns labeled "Lottery 1" and "Lottery 2". For example, Decision 1 is a choice between \$28 for sure (Lottery 1) and a 50/50 chance of earning either \$24 or \$36 (Lottery 2).

Notice that Lottery 2 is constructed by subtracting \$4 from Event A and adding \$8 to Event B in Lottery 1, and that Lottery 2 in Decision 1 becomes Lottery 1 in Decision 2. This pattern continues down the five rows of the table, guaranteeing that each subsequent lottery increases in both variance and expected value. Thus an expected utility maximizer will either always choose the relatively safe Lottery 1 (maximum risk aversion), always choose the relatively risky Lottery 2 (minimum risk aversion), or at some row switch from risky to safe because of the increasing variance, i.e., from Lottery 1 to Lottery 2.[3] Table 2 displays the expected value and standard deviation of each lottery, as well as the implied range of the CRRA utility function parameter when the decision-maker switches from risky to safe on that particular row.

Our instrument does not test for risk-preferring, but agents who always choose Lottery 2 may in fact be risk-preferring. Note that if an agent's preferences can be represented by a differentiable utility function, risk aversion is equivalent to $u(\cdot)'' < 0$.

1.2.2 Prudence

We elicited predispositions towards prudence base on the instrument of Deck and Schlesinger (2014). The instrument is presented in Table 3. In the table, there are five main rows representing a decision between binary lotteries with 50/50 outcomes ("Event A" and "Event B"), presented in the third and fourth columns labeled "Lottery 1" and "Lottery 2". For example, Decision 1 is a choice between either a 50/50 chance of either \$24 or \$36 followed by a 50/50 chance of receiving \$2 or -\$2 (Lottery 1), and a 50/50 chance of either \$24 followed by a 50/50 chance of receiving \$2 or -\$2 or \$36 (Lottery 2).

Notice that each lottery in Table 3 is constructed from a lottery in the risk preference elicitation instrument of Table 2. Notice also that these lotteries all measure the extent to which participants are predisposed to invest in a high wealth state. For example, Decision 1 is a choice to either take an additional chance while in the relatively high wealth state of \$36 (Lottery 1) or while

[3] An alternative approach is to change the odds between lotterys as in Holt and Laury (2002). We opted for a version that always presented 50/50 lotterys for ease of explaining and understanding.

in the relatively low wealth state of $24 (Lottery 2). All of the subsequent decisions are similar. By contrast with the risk preference instrument, a subject is either prudent or not, and this is represented by choosing to take the additional risk in the relatively high wealth state. Thus this instrument is a measure of consistency rather than a direct parameter measure. Note that for each decision, the third moment differs between Lottery 1 and Lottery 2.

Prudence was first introduced in the precautionary savings literature Leland (1968). It refers to the desire to increase savings in the presence of income risk (Menegatti (2014)). In statistical terms, prudence can be defined as the aversion to decreasing skewness of the distribution of a random payoff (Chiu (2005)). Intuitively, prudence is the aversion to an increase in the probability of facing a downside risk, while keeping unchanged the mean and variance of the distribution. If preferences can be represented by a utility function, prudence is equivalent having convex marginal utility: $u(\cdot)''' > 0$.

1.2.3 Temperance

We elicited predispositions towards temperance base on the instrument of Deck and Schlesinger (2014). The instrument is presented in Table 4. In the table, there are five main rows representing a decision between binary lotteries with 50/50 outcomes ("Event A" and "Event B"), presented in the third and fourth columns labeled "Lottery 1" and "Lottery 2". For example, Decision 1 is a choice between either $52 followed by a 50/50 chance of receiving $2 or -$2 (Lottery 1), or a 50/50 chance of either $52 or $52 followed by a 50/50 chance of receiving $4 or -$4 (Lottery 2).

Notice that the lotteries in Table 4 are constructed from the payoffs in the risk preference elicitation instrument of Table 2. Notice also that these lotteries all measure the extent to which participants are predisposed to disaggregate risk. For example, Decision 1 is a choice to either face a risk of $2 or -$2 with a 50/50 chance for sure (Lottery 1), or to take a chance on not having to take the additional risk at all (Lottery 2). All of the subsequent decisions are similar. By contrast with the risk preference instrument, a subject is either temperate or not, and this is represented by choosing to disaggregate the risk. Thus this instrument is a measure of consistency rather than a direct parameter measure.

The term temperance was first coined by Kimball (1992) to refer to the desire to moderate

the total exposure to risk. Eeckhoudt and Schlesinger (2006) describe it as the preference for disaggregating harms. In statistical terms it is the aversion to higher kurtosis, the fourth moment of a random variable. Intuitively, as described by Kimball (1992), temperance implies that facing unavoidable risk should make an individual less willing to face other risks, even if the risks are uncorrelated. If preferences can be represented by a utility function, temperance equates to $U''''(\cdot) < 0$.

1.2.4 Ambiguity Preference

We elicited ambiguity preferences using a measure based on the instruments of Engle-Warnick et al. (2011). The instrument is presented in Table 5. In the table, there are six main rows representing a decision between binary lotteries with either 50/50 outcomes ("Event A" and "Event B"), presented in the third column labeled "Lottery 1", or with outcomes with unknown probabilities, presented in the fourth column and labeled "Lottery 2". For example, Decision 2 is a choice between \$23 and \$35 with a 50/50 chance (Lottery 1) or \$24 or \$36 with unknown chances for either outcome (Lottery 2).

Notice that the lotteries in Table 5 are constructed from the payoffs in the risk preference elicitation instrument of Table 2. Notice also that these lotteries represent the extent to which participants are willing to pay to avoid lack of knowledge of the probabilities of the lottery outcomes. In each decision, it costs \$1 to avoid this ambiguity. An expected utility maximizer will either always pay to avoid ambiguity (maximum ambiguity aversion), never pay to avoid ambiguity (minimum ambiguity aversion), or at some row switch from not paying to avoid ambiguity to paying. Table 5 displays the expected value and standard deviation for either choice Lottery 1 or Lottery 2.

Ambiguity refers to the state of not knowing the probability distribution over outcomes. Our measure is based on the theory of Klibanoff et al. (2005), and there is an implied parameter of ambiguity aversion that depends on both the degree of risk aversion and the switch point from not paying to paying to avoid ambiguity with this instrument.

1.2.5 Myopic Loss Aversion

We measured myopic loss aversion (MLA) using the framework of Gneezy and Potters (1997) depicted in Table 6. The first dimension in our two-by-two experimental design consists of risky

vs. ambiguous treatments. The second dimension consists of nine decision-making periods (T9) vs. three decision-making periods (T3). In T9, subjects make decisions in nine consecutive periods, while in T3 subjects make 3 decisions, each of which is implemented for three consecutive periods. Thus both T9 and T3 are nine-period games, but with a different number of decisions to make.

In the risky treatment, depicted in the first row of Table 6, participants receive $3 at the beginning of each period. They choose how much of the $3 to keep in cash and how much to place into a lottery. The lottery has a return of -100% with a 65% chance and 250% with a 35% chance. The choice is made, the lottery is implemented, the return is computed and added to the cash for a total payoff for the period. In T9, the process repeats independently in the next period. In T3, the lottery is implemented for three consecutive periods before the next independent choice is made.

In the ambiguous treatment, there were two possible scenarios, represented in the last row of Table 6. Everything else is the same as in the risky treatment. In Scenario 1, there is a 50/50 chance of each return occurring. In Scenario 2, the low return occurs with an 80% chance and the high return with a 20% chance. Notice that the overall expected return in both risky and ambiguous treatment is 22.5%.

This instrument simulates the effect of evaluation periods on risk-taking. It is well-known that subjects invest in the lottery at a higher rate when updating their portfolio less often. This phenomenon, called myopic loss aversion, can be explained by a simple loss aversion model.

1.3 Behavioral Conjectures

Our aim in this paper is to test to what extent survey questions used by financial professionals are associated with incentivized measures of risk attitudes. With our experiments we measured five dimensions of risk preference: risk and ambiguity aversion, prudence, temperance, and myopic loss aversion. We organize the discussion of our results around two self-explanatory behavioral conjectures.

Conjecture 1: The survey measures of risk preference elicit related information using different frames, as do the measures of loss aversion. Thus responses to questions 1, 2, 5 and 7 will be correlated with each other as will responses to questions 3, 4 and 6.

Conjecture 2: The survey measures of risk preference will be correlated with the experimental measures of risk and ambiguity preference. The survey measures of loss aversion will be correlated with the experimental measures of myopic loss aversion.

2 Experimental Procedures

2.1 Session Details

Participants logged on to a secure website with a unique URL to participate. Participants agreed to an on-line consent form and were informed that they had forty-eight hours to complete the experiment. Participants who exceeded this time limit were blocked from completing the experiment. Following the consent form were the on-line experimental instructions. After reading the instructions, the experimental tasks were presented. Participants were compensated according to the results of one randomly-chosen decision in the experiment. After completing the experiment, participants completed the survey, for which they were paid $10. The survey included questions about investing, as described previously, and socio-demographics. Two-hundred and four people participated in the on-line experiment earning an average of $58 for their participation.

We recruited a group of people likely to be active in saving and investing for our experiments. We limited participation to people between the ages of thirty and fifty. People in this age range are likely to have substantial working, saving, and investing experience. They were also likely to still be in the accumulation phase of their life cycle, i.e., they had not reached retirement. The average age of the participants was thirty-seven.

We required the income of the participants to be between $45,000 and $120,000. People with very low income have limited room to save or invest, while people with a very high income are very likely to be different in their investment behavior than people in the middle class. We sampled as evenly as possible between men and women. We asked participants if they considered themselves to be investors, sampling from both investor and non-investor categories. We used the recruiter "Asking Canadians", which has a subject pool of participants who regularly participate in on-line surveys and focus groups, to locate our subject pool. Ours was the first incentivized experiment run with this group of participants.

3 Experimental Results

3.1 Subject Characteristics

Among the 204 participants, 59.3% were women, 71% were married or had a common-law marriage, 22% were single, and 7% were divorced or separated. Just under 2% of the participants reported that they were in poor health, 41.2% reported fair or good health, and 56.9% reported excellent health. On average, a participant's household consisted of two adults and just a bit less than one child. Educational achievement was high: the modal response for the highest level of educational achievement was completed college, reported by 30.4% of the participants, 5.4% completed high-school, 26% reported a completed bachelor degree, 18.6% had some college or university experience, and 17.6% had at least some graduate education. Two percent of the participants reported that either they did not have a high school degree or that they had a different education level.

On average, participants reported household income of $82,000 CAD and a net worth of $213,000 CAD. Additionally, when asked about the stability of their income, 4.9% responded that they considered it unstable, 38.2% somewhat stable and 56.9% stable. When asked about their financial situation, 4.4% reported they had no savings and significant debt, 18.1% little savings and a fair amount of debt, 39.2% some savings and some debt, 27.4% some savings and little or no debt, and 10.8% significant savings and no debt. A full 76.5% were homeowners. Among the homeowners, 80.1% had a mortgage that, on average, was 54.7% unpaid. Employment was high: 95% were employed and four were students. Fourteen participants had worked in the financial sector.

3.2 Know-Your-Client Form Responses

In this section we report the distribution of responses from the Know-Your-Client (KYC) form, which is designed to help the financial advisor determine the best investment strategy for the client. Recall that Figure 1 replicates the KYC form and Table 1 categorizes each of the seven questions with a short summary.[4]

Responses to Question 1, labeled "Portfolio Goal", show a modal response of "balanced", with a clear majority of responses either "balanced" or "growth". This result is presented in Figure

[4]The full survey contained forty-five questions. In this paper we focus on the seven know-your-client questions. The remaining information collected in the experiment is reported in Engle-Warnick et al. (2017).

5, where the horizontal axis represents the responses and the vertical axis shows the percentage of subjects making each response. Question 2 elicited a "Descriptive Risk Preference. Figure 6 shows a modal response of "Conservative", with the distribution approximately centered between "Very Conservative" and "Moderately Risky". There were very few "Aggressive" responses. For "Loss Tolerance", Question 3, responses shown in Figure 7 show a somewhat surprising response distribution centered on a mode of -10%. Related to this, in Figure 8 the modal concern about "Loss or Gain" is squarely on "Usually Losses".

Question 5 was framed as a "Risk Preference" elicitation instrument, and the response distribution in Figure 9 reveals at most moderate risk aversion. We will return to this in our comparison with the lottery task in the experiment. The "Buy, Sell or Hold" Question 6 is also surprising: the modal response claims to Hold the portfolio position in the face of a large loss (Figure 10). Finally, we see the responses to the "Historical Performance Preference" Question 7 is consistent with that in Question 6, showing also at most moderate risk aversion.

Taken as a whole, responses to the Know-Your-Client form paint a picture of fairly knowledgable investors who would not sell their portfolios low, who do not appear strongly risk averse, and who are not obsessed with losses. We will see how these responses compare with the behavioral instruments in a later section.

3.3 Incentivized Instrument Results

Risk Preference: The distribution of choices in the risk preference instrument is shown in Figure 12. The figure shows the percentage of participants who made 0, 1, 2, 3, 4, and 5 relatively safe choices, a standard metric for this instrument. Note that risk aversion is increasing along the horizontal axis. The modal number of safe choices is one, indicating at most moderate levels of risk aversion. The fitted line in the graph shows what to expect if decisions are random according to a binomial distribution. For an idea of how risk averse the aggregate data appear, Figure 13 breaks the data into each of the five consecutive individual decisions made by the participants. Recall that as the decision-maker moves down the rows of Table 2 at some point s/he will switch from the risky lottery to the safe lottery. In our data, in the aggregate, this occurs between Decisions 4 and 5, which implies a moderately risk averse CRRA utility function parameter between 0.71 and 1.16.

Prudence: The distribution of choices in the prudence instrument is shown in Figure 14. The

figure shows the percentage of participants who made 0, 1, 2, 3, 4, and 5 prudent choices, a standard metric for this instrument. Note that prudence is increasing along the horizontal axis. Recall that choices are either prudent or not in this instrument, thus responses are taken as a measure of the consistency of the preference rather than an estimate of a parameter. The result is strong: nearly half the participants made all five prudent choices. Roughly two-thirds of the participants made all consistent choices of either zero or five prudent choices. Figure 15 reinforces the notion of consistency of choices: there is no switchpoint in these data as there was with the risk instrument.

Temperance: The distribution of choices in the temperance instrument is shown in Figure 16. The figure shows the percentage of participants who made 0, 1, 2, 3, 4, and 5 temperate choices, a standard metric for this instrument. Note that temperance is increasing along the horizontal axis. Recall that choices are either temperate or not in this instrument, thus responses are taken as a measure of the consistency of the preference rather than an estimate of a parameter. The result is again strong: just over 30% of the participants are not temperate, and just under 30% are fully temperate. The remaining roughly 40% are distributed across the inconsistent choice measures, skewing the distribution slightly towards intemperance. Figure 17 again reinforces the notion of consistency of choices: there is no switchpoint in these data as there was with the risk instrument.

Ambiguity Preference: The distribution of choices in the ambiguity preference instrument is shown in Figure 18. The figure shows the percentage of participants who made 0, 1, 2, 3, 4, 5, and 6 choices to pay to avoid ambiguity, a standard metric for this instrument (we control for risk preferences in the following analysis). Note that ambiguity aversion is increasing along the horizontal axis. Most subjects are either not ambiguity averse at all, or maximally averse, either never paying or always paying to avoid ambiguity. For an idea of how ambiguity averse the aggregate data appear, Figure 19 breaks the data into individual decisions. In our data, in the aggregate, there is roughly a switch point (as there should be) from paying to not paying to avoid ambiguity that occurs gradually by the sixth decision.

Myopic Loss Aversion: We tested the difference in mean share of the endowment invested in the lottery between the one-period and three-period games three different ways. The results are presented in Table 7 for the risk version and in Table 8 for the ambiguity version. In the tables, the first column represents the period or group of periods over which we conduct the analysis. The second and third columns show the percentage of the endowment invested in the lottery

for treatments T9 and T3 respectively. The last column shows the p-value of a t-test with the alternative hypothesis of myopic loss aversion, i.e., that the investment level was higher in T3 than in T9. Low p-values provide evidence for MLA.

First, note that there is no statistical difference between treatments overall (first row of the table representing an average of periods 1-9). Second, notice that when analyzed in period groups of three, myopic loss aversion approached statistical significance in the final third of the risk game and the final two-thirds of the ambiguity game. An inspection of the period-by-period analysis is consistent with this finding as well. Thus after learning has had a chance to occur, behavior consistent with a small amount of myopic loss aversion is evident in the data. Since the unit of play is three periods in T3, in what follows, we will utilize the data from the final three periods of these games to compare with the survey responses.

3.4 Conjecture 1: Correlation Between KYC Risk Questions Loss Questions

Results from both the KYC form and the behavioral instruments suggest thoughtful and systematic responses in both cases. We now turn to the relationship between responses from these two different methods of eliciting preferences under risk.

Conjecture 1 simply stated that the risk question responses should be correlated with each other, as should be the loss questions, and Table 9 emphatically confirms that this is true. The table is divided into two sections, one for risk and one for loss: the results for the risk questions are found in the upper-left quadrant of the table and in the lower-right for loss. For every pairwise test, for both types of questions, responses are positively and significantly correlated. Correlation coefficients for risk range from 0.28 to 0.59; all are statistically significant. Correlation coefficients for loss range from 0.13 to 0.39; lower than for risk, but all statistically significant. The tables confirm that participants indeed respond to these two groups of questions in similar fashion. Notice the lower left quadrant reveals statistically significant correlation among all questions, regardless of category, a phenomenon that we will return to later.

We added Table 10 to investigate the degree to which the incentivized instruments are correlated with each other. The results are very different from the KYC correlation results. First, taking risk, prudence, temperance, and ambiguity, not a single instrument is significantly correlated with any other. To the extent that there is correlation between instruments, it is the myopic loss aversion

instruments that have this quality. Although the effect is small, the risky loss aversion instrument is correlated with temperance and ambiguity, while the ambiguity loss aversion instrument is correlated with risk and temperance. The two MLA instruments are correlated with each other, though all of the MLA correlation coefficients are small: none is greater than 0.07 in absolute value.

Thus the KYC questions are highly correlated, suggesting a common factor of elicitation. By contrast, the incentivized instruments behave quite differently. The four risk instruments appear to be eliciting specialized information, while the loss aversion instruments are somewhat correlated with some of the risk instruments. Even these correlation coefficients, however, are rather small.

3.5 Conjecture 2: Correlation Between Experimental Instruments and Survey Questions

Table 11 displays results from ordered logit models investigating the correlation between behavioral instruments risk, prudence, temperance, and ambiguity and the KYC form. The question is to what extent the instruments predict answers to the KYC questions. Note that myopic loss aversion is omitted due to collinearity; MLA will be investigated with a separate regression.[5] In the table, the first column details the incentivized instrument providing the explanatory variable. The next four columns contain results for models with dependent variables involving risk questions. The final three columns contain results for models for the loss questions. The rows represent the instruments functioning as independent variables.

Taking the questions in turn, Question 1 eliciting a "Portfolio Goal" is predicted by all the instruments except for ambiguity preferences. Specifically, as expected, the coefficient on risk preference is negative and significant (note that the responses to the KYC question were decreasing in risk aversion while the risk preference measure is increasing in risk aversion, hence the negative coefficient). The negative coefficient on temperance is significant at the 10% level, and the positive coefficient on prudence at the 5% level. This suggests that prudence and temperance have the ability to explain the KYC question in dimensions other than that represented by risk aversion.

Question 2 elicited a "Descriptive Risk Preference", and it is appropriately associated, negatively and significantly, with the risk preference instrument alone. Question 5, which is most like a

[5] In each model, the dependent variable is the answer to one of the survey question and the covariates are the four measures of risk attitudes. In our results, we are reporting the p values derived using the robust, Huber and White (**?**, White (1980) sandwich variance estimators.

risk preference elicitation instrument, causes responses exactly as expected: it is negatively and significantly correlated with only the risk preference instrument. This result is a nice check on the validity of both instruments. Note that it has been found that hypothetically administered instruments elicit similar information as incentivized instruments when the stakes are higher in the hypothetical question and when there are several questions as in the instrument, a situation similar to this one (Holt and Laury (2014)).

Finally, Question 7 is the "Historical Performance Preference" question. It presents four time-series of financial returns of differing variance, the only question containing the element of time. Perhaps this is relevant with regard to the fact that, unlike the other three questions involving risk, no instruments help predict responses in this question, and the regression itself is not significant. This provides a cautionary tale about the precision needed for eliciting required information, and it suggests that it might be worthwhile in the future to investigate whether a time preference instrument would help predict responses to this question.

For a preview of the determinants of the loss questions, note that of the three models investigating those questions (last three columns of Table 11), two of the three regressions are significant: "Loss Tolerance" and "Buy, Sell, Hold". Risk and ambiguity instruments both are negatively associated with the loss tolerance questions, a fact that strongly suggests that this question has more to do with risk than losses. And all four instruments help to determine the response to the buy, sell hold question. "Loss or Gain" is not explained by these instruments.

Investigating the loss questions further with the myopic loss aversion instruments, Tables 12 and 13 display results from fixed effects ordered logit regressions. In the regressions, the dependent variable is the difference between average investment levels in the T3 and T9 treatment averaged over the final three periods of the game. The independent variables are the responses to the seven KYC questions.[6] The columns represent different models that each contain a single KYC response. The question is to what extent the question responses predict the behavior in the instrument.

The answer is: they do not. Notice that only the period number (indicating a learning trend) is significant in any model in both tables, and that not a single KYC response, whether it be a loss question or a risk question, significantly enters any regression. By contrast with the risk questions

[6]In our results, we are reporting the p values derived using the robust, Huber and White (**?**, White (1980) sandwich variance estimators.

and instruments, these measures are not related to each other. Based on our results in Table 11, we conclude that the loss questions for the most part appear to be eliciting risk preferences.

4 Conclusion

This paper describes the results from an online economics decision-making experiment with heads of households of investment age that studies the association between seven survey questions on the Know-Your-Client form used to elicit financial risk tolerance and incentivized instruments designed to measure risk attitudes and loss aversion. Two hundred and four heads of households, of working age, took part in the experiment.

We divided the survey between questions about risk attitudes and questions about attitudes toward losses. We showed that the responses to the questions were highly correlated, suggesting that they elicit similar information. By contrast, the risk instrument behavior was not intercorrelated, but the loss aversion measures were.

We found that in general the risk instruments had predictive power for the responses to the risk questions: a comforting finding for the validity of the survey. The lone exception was the question that included time in its elicitation of a preferred portfolio among choices with different variances over time. We speculated that time preferences may help predict this response. We also found that risk measures, and not loss measures, help to explain two of the three loss questions. This finding suggests that again in general, the loss questions may be eliciting information about risk attitudes.

Most financial professional are taught to summarize risk preferences with risk aversion, following a mean-variance analysis, for guiding a financial advisor in making decisions for a client. Our evidence suggests that this form appears to accomplish this goal. Note, however, that the higher moments of the return distribution are usually disregarded in forms such as the KYC. Nonetheless, this could lead to suboptimal decisions. For instance, as explained by Cvitani et al. (2008) in his analysis using CRRA utility functions, if higher moments are disregarded, over-investment in risky securities, especially under high volatility, could result.

Our evidence thus further suggests that higher moment elicitation may indeed be called for. While they do help to predict risk responses, as they should, they also vary in different dimensions, providing more information. Since the risk questions correlate with the higher order risk

instruments, perhaps survey questions on the higher moments would be useful as well.

Finally, we found little evidence that loss aversion is being elicited in the survey. This could be due to the questions themselves, or the instrument performance in the experiment. The evidence suggests, however, that since the majority of these questions are correlated with the risk instruments and furthermore, since the loss aversion instrument is correlated with several risk instruments as well, but not the loss questions, these questions may not be invoking loss aversion at all.

At any rate, because experiments may not always be feasible in practice, designing survey questions specifically design to measure each risk dimension is useful. Our experimental results suggest that the form does bring important and vital information to bear on the client-investor relationship.

References

Binswanger, H. P. (1981). Attitudes toward risk: Theoretical implications of an experiment in rural india. *The Economic Journal*, 91(364):867–890.

Charness, G. and Gneezy, U. (2012). Strong evidence for gender differences in risk taking. *Journal of Economic Behavior & Organization*, 83(1):50–58.

Chiu, W. H. (2005). Skewness preference, risk aversion, and the precedence relations on stochastic changes. *Management Science*, 51(12):1816–1828.

Cvitani, J., Polimenis, V., and Zapatero, F. (2008). Optimal portfolio allocation with higher moments. *Annals of Finance*, 4(1):1–28.

Deck, C. and Schlesinger, H. (2014). Consistency of higher order risk preferences. *Econometrica*, 82(5):1913–1943.

Ding, X., Hartog, J., and Sun, Y. (2010). Can we measure individual risk attitudes in a survey? *IZA Discussion Paper Series*, (Discussion Paper No. 4807).

Dohmen, T., Falk, A., Huffman, D., Marklein, F., and Sunde, U. (2009). Biased probability judgment: Evidence of incidence and relationship to economic outcomes from a representative sample. *Journal of Economic Behavior & Organization*, 72(3):903–915.

Dohmen, T., Falk, A., Huffman, D., Sunde, U., Schupp, J., and Wagner, G. G. (2011). Individual risk attitudes: Measurement, determinants, and behavioral consequences. *Journal of the European Economic Association*, 9(3):522–550.

Eckel, C. C. and Grossman, P. J. (2002a). The relative price of fairness: gender differences in a punishment game. *Journal of Economic Behavior & Organization*, 30(2):143–158.

Eckel, C. C. and Grossman, P. J. (2002b). Sex differences and statistical stereotyping in attitudes toward financial risk. *Evolution and Human Behavior*, 23(4):281–295.

Eeckhoudt, L. and Schlesinger, H. (2006). Putting risk in its proper place. *American Economic Review*, 96(1):280–289.

Engle-Warnick, J., Escobal, J., and Laszlo, S. (2011). Ambiguity aversion and portfolio choice in small-scale peruvian farming. *The B.E. Journal of Economic Analysis & Policy*, 11(1):1–56.

Engle-Warnick, J., Pulido, D., and De Montaignac, M. (2017). A comparison of survey and incentivized-based risk attitude elicitation.

Gneezy, U. and Potters, J. (1997). An experiment on risk taking and evaluation periods. *The Quarterly Journal of Economics*, 112(2):631–645.

Guiso, L. and Jappelli, T. (2008). Financial literacy and portfolio diversification. *EUI Working Papers*, (ECO 2008/31).

Hey, J. D. (2014). *Chapter 14 - Choice Under Uncertainty: Empirical Methods and Experimental Results*, In Mark, M. and Kip, V., editors, *Handbook of the Economics of Risk and Uncertainty*, volume 1, pages 809–850. North-Holland.

Holt, C. A. and Laury, S. K. (2002). Risk aversion and incentive effects. *The American Economic Review*, 92(5):1644–1655.

Holt, C. A. and Laury, S. K. (2014). *Chapter 4 - Assessment and Estimation of Risk Preferences*, In Mark, M. and Kip, V., editors, *Handbook of the Economics of Risk and Uncertainty*, volume Volume 1, pages 135–201. North-Holland.

Kimball, M. S. (1992). *Precautionary Motives for Holding Assets*, In Milgage, M. and Falwell, J., editors, *The New Palgrave Dictionary of Money and Finance*. MacMillan, London.

Klibanoff, P., Marinacci, M., and Mukerji, S. (2005). A smooth model of decision making under ambiguity. *Econometrica*, 73(6):1849–1892.

Leland, H. E. (1968). Saving and uncertainty: The precautionary demand for saving. *The Quarterly Journal of Economics*, 82(3):465–473.

Mandal, B. and Roe, B. E. (2014). Risk tolerance among national longitudinal survey of youth participants: The effects of age and cognitive skills. *Economica*, 81(323):522–543.

Menegatti, M. (2014). New results on the relationship among risk aversion, prudence and temperance. *European Journal of Operational Research*, 232(3):613–617.

Menkhoff, L., Schmidt, U., and Brozynski, T. (2006). The impact of experience on risk taking, overconfidence, and herding of fund managers: Complementary survey evidence. *European Economic Review*, 50(7):1753–1766.

MFDA (2014). Mfda discussion paper of the use of investor questionnaires. *MFDA Bulletin series*, (BULLETIN 0611 - C).

OSC (2009). National instrument 31-103 registration requirements and exemptions. *OSC*.

Outreville, J. F. (2015). The relationship between relative risk aversion and the level of education: A survey and implications for the demand for life insurance. *Journal of Economic Surveys*, 29(1):97–111.

White, H. (1980). A heteroskedasticity-consistent covariance matrix estimator and a direct test for heteroskedasticity. *Econometrica*, 48(4):817–838.

Yao, R. and Curl, A. (2011). Do market returns influence risk tolerance? evidence from panel data. *Journal of Family and Economic Issues*, 32(3):532–544.

Table 1: Know-Your-Client Question Categories

Category	Question # in survey	Topic	Abbreviation
Risk Aversion	1	Portfolio Goal	Goal
	2	Descriptive Risk Preference	DescPref
	5	Risk Preference	RiskPref
	7	Historical Performance Preference	HistPref
Loss Aversion	3	Loss Tolerance	LossTol
	4	Loss or Gain	LossGain
	6	Buy, Sell or Hold	BuySellHold

The first questions elicits the primary goal for the client's portfolio, with responses ranging from safety to growth: we call this "portfolio goal". The second question elicits a "descriptive risk preference" using language ranging from conservative to aggressive, and the third question attempts to obtain a "loss tolerance" in the form of a maximum acceptable loss for a twelve month period. Question 4 asks whether the client is more concerned with a "loss or gain". Question 5 presents a graphical depiction of investments with different variances and expected value in the form of a "risk preference" elicitation instrument and asks the client to choose her most preferred hypothetical investment. The sixth question asks what the client would do, "buy, sell or hold", with an investment that lost 30

Table 2: Incentivized Instrument Measuring Risk Aversion

Decision	Description	Lottery 1	Lottery 2
1	Event A (50%)	\$28	\$24
	Event B (50%)	\$28	\$36
	E.V.	28	30
	S.D.	0	8
	Implied CRRA	$3.46 < \gamma$	$1.16 < \gamma < 3.46$
2	Event A (50%)	\$24	\$20
	Event B (50%)	\$36	\$44
	E.V.	30	32
	S.D.	8	17
	Implied CRRA	$1.16 < \gamma < 3.46$	$0.71 < \gamma < 1.16$
3	Event A (50%)	\$20	\$16
	Event B (50%)	\$44	\$52
	E.V.	32	34
	S.D.	17	25
	Implied CRRA	$0.71 < \gamma < 1.16$	$0.50 < \gamma < 0.71$
4	Event A (50%)	\$16	\$12
	Event B (50%)	\$52	\$60
	E.V.	34	36
	S.D.	25	34
	Implied CRRA	$0.50 < \gamma < 0.71$	$0 < \gamma < 0.50$
5	Event A (50%)	\$12	\$2
	Event B (50%)	\$60	\$70
	E.V.	36	36
	S.D.	34	48
	Implied CRRA	$0 < \gamma < 0.50$	$\gamma < 0$

Table 3: Incentivized Instrument Measuring Prudence

Decision	Description	Lottery 1	Lottery 2
1	Event A (50%)	\$24	\$24 $\frac{-\$2(50\%)}{+\$2(50\%)}$
	Event B (50%)	\$36 $\frac{-\$2(50\%)}{+\$2(50\%)}$	\$36
	E.V. S.D. Skewness	30 6.2 0.27	30 6.2 -0.27
2	Event A (50%)	\$20	\$20 $\frac{-\$2(50\%)}{+\$2(50\%)}$
	Event B (50%)	\$44 $\frac{-\$2(50\%)}{+\$2(50\%)}$	\$44
	E.V. S.D. Skewness	32 12.1 0.07	32 12.1 -0.07
3	Event A (50%)	\$16	\$16 $\frac{-\$2(50\%)}{+\$2(50\%)}$
	Event B (50%)	\$52 $\frac{-\$2(50\%)}{+\$2(50\%)}$	\$16
	E.V. S.D. Skewness	34 18.1 0.03	34 18.1 -0.03
4	Event A (50%)	\$12	\$12 $\frac{-\$2(50\%)}{+\$2(50\%)}$
	Event B (50%)	\$60 $\frac{-\$2(50\%)}{+\$2(50\%)}$	\$60
	E.V. S.D. Skewness	36 24.0 0.02	36 24.0 -0.02
5	Event A (50%)	\$2	\$2 $\frac{-\$2(50\%)}{+\$2(50\%)}$
	Event B (50%)	\$70 $\frac{-\$2(50\%)}{+\$2(50\%)}$	\$70
	E.V. S.D. Skewness	36 34.0 0.01	36 34.0 -0.01

Table 4: Incentivized Instrument Measuring Temperance

Decision	Event	Lottery 1	Lottery 2
1	Event A (50%)	\$52 −\$2(50%) / +\$2(50%)	\$52
	Event B (50%)	\$52 −\$2(50%) / +\$2(50%)	\$52 −\$4(50%) / +\$4(50%)
	E.V. S.D. Skewness Kurtosis	52 2.0 0 -6	52 1.4 0 1.5
2	Event A (50%)	\$44 −\$2(50%) / +\$2(50%)	\$44
	Event B (50%)	\$44 −\$2(50%) / +\$2(50%)	\$44 −\$4(50%) / +\$4(50%)
	E.V. S.D. Skewness Kurtosis	44 2.0 0 -6	44 1.4 0 1.5
3	Event A (50%)	\$36 −\$2(50%) / +\$2(50%)	\$36
	Event B (50%)	\$36 −\$2(50%) / +\$2(50%)	\$36 −\$4(50%) / +\$4(50%)
	Expected payoff S.D. Skewness Kurtosis	36 2.0 0 -6	36 1.4 0 1.5
4	Event A (50%)	\$28 −\$2(50%) / +\$2(50%)	\$28
	Event B (50%)	\$28 −\$2(50%) / +\$2(50%)	\$28 −\$4(50%) / +\$4(50%)
	E.V. S.D. Skewness Kurtosis	28 2.0 0 -6	28 1.4 0 1.5
5	Event A (50%)	\$20 −\$2(50%) / +\$2(50%)	\$20
	Event B (50%)	\$20 −\$2(50%) / +\$2(50%)	\$20 −\$4(50%) / +\$4(50%)
	E.V. S.D. Skewness Kurtosis	20 2.0 0 -6	20 1.4 0 1.5
6	Event A (50%)	\$12 −\$2(50%) / +\$2(50%)	\$12
	Event B (50%)	\$12 −\$2(50%) / +\$2(50%)	\$12 −\$4(50%) / +\$4(50%)
	E.V. S.D. Skewness Kurtosis	11 1.9 0 -6	12 0.0 0 1.5

Table 5: Incentivized Instrument Measuring Ambiguity

Decision	Description	Lottery 1	Lottery 2
1	Event A Event B	\$27 (50%) \$27 (50%)	\$28 (?%) \$28 (?%)
	Expected value Standard Deviation	\$27 \$0	\$28 \$0
2	Event A Event B	\$23 (50%) \$35 (50%)	\$24 (?%) \$36 (?%)
	Expected value Standard Deviation	\$29 \$8	\$30 \$8
3	Event A Event B	\$19 (50%) \$43 (50%)	\$20 (?%) \$44 (?%)
	Expected value Standard Deviation	\$31 \$17	\$32 \$17
4	Event A Event B	\$15 (50%) \$51 (50%)	\$16 (?%) \$52 (?%)
	Expected value Standard Deviation	\$33 \$25	\$34 \$25
5	Event A Event B	\$11 (50%) \$59 (50%)	\$12 (?%) \$60 (?%)
	Expected value Standard Deviation	\$35 \$34	\$36 \$34
6	Event A Event B	1 (50%) 69 (50%)	2 (?%) 70 (?%)
	Expected value Standard Deviation	\$35 \$48	\$36 \$48

Table 6: Incentivized Instrument Measuring Myopic Loss Aversion

Task	Description	Probabilities		Period Expected Return
		Low Return = −100%	High Return = 250%	
Risky	Only Scenario	65%	35%	22.5%
Ambiguous	Scenario 1 (50%) Scenario 2 (50%) Overall	50% 80%	50% 20%	75% −30% 22.5%

Table 7: Test of Myopic Loss Aversion T9 invest. < T3 invest. (Risk)

Period	Percent Invested T9	T3	H_a : T9<T3 p-value
1-9	52.00%	52.53%	0.3419
1-3	54.63%	51.92%	0.9397
4-6	50.37%	51.81%	0.2198
7-9	51.02%	53.86%	0.0632*
1	57.47%	51.92%	0.9954
2	55.74%	51.92%	0.9788
3	50.67%	51.92%	0.2749
4	49.54%	51.81%	0.1617
5	50.75%	51.81%	0.324
6	50.81%	51.81%	0.3025
7	49.54%	53.86%	0.0205**
8	50.47%	53.86%	0.0602*
9	53.04%	53.86%	0.3524

$p < 0.01$ ** $p < 0.05$ * $p < 0.1$

Table 8: Test of Myopic Loss Aversion: T9 invest. < T3 invest. (Ambiguity)

Period	Percent Invested T9	T3	H_a : T9<T3 p-value
1-9	50.01%	51.67%	0.0616*
1-3	49.81%	49.46%	0.5869
4-6	49.71%	52.72%	0.0367**
7-9	50.52%	52.83%	0.081*
1	51.44%	49.46%	0.8771
2	49.86%	49.46%	0.5858
3	48.14%	49.46%	0.253
4	49.79%	52.72%	0.0599*
5	50.60%	52.72%	0.1363
6	48.72%	52.72%	0.0243**
7	50.19%	52.83%	0.0751*
8	49.44%	52.83%	0.0451**
9	51.93%	52.83%	0.3188

$p < 0.01$ ** $p < 0.05$ * $p < 0.1$

Table 9: Correlation Matrix - KYC Questions

		Risk Aversion				Loss Aversion		
		Goal	DescPref	RiskPref	HistPref	LossTol	LossGain	BuySellHold
Risk Aversion	Goal	1						
	DescPref	0.46^{***}	1					
	RiskPref	0.28^{***}	0.59^{***}	1				
	HistPref	0.29^{***}	0.49^{***}	0.51^{***}	1			
Loss Aversion	LossTol	0.32^{***}	0.55^{***}	0.68^{***}	0.44^{***}	1		
	LossGain	0.16^{**}	0.29^{***}	0.22^{***}	0.27^{***}	0.13^{*}	1	
	BuySellHold	0.44^{***}	0.4^{***}	0.27^{***}	0.29^{***}	0.39^{***}	0.25^{***}	1

$p < 0.01$ ** $p < 0.05$ * $p < 0.1$

Table 10: Correlation Matrix - Incentivized Instrument

	RiskAversion	Prudence	Temperance	AmbAversion	MLA	MLA (amb)
RiskAversion	1					
Prudence	0.07	1				
Temperance	0.11	0.04	1			
AmbAversion	0.02	0.08	0.08	1		
MLA	0.01	0.01	0.04^{*}	0.04^{*}	1	
MLA (amb)	0.06^{**}	-0.01	0.04^{*}	-0.02	0.07^{***}	1

$p < 0.01$ ** $p < 0.05$ * $p < 0.1$

Table 11: Incentivized Instruments Explain KYC Questions

	Risk Aversion				Loss Aversion		
VARIABLES	Goal	DescPref	RiskPref	HistPref	LossTol	LossGain	BuySellHold
RiskAversion	-0.3604***	-0.2018**	-0.2554***	-0.0720	-0.1779**	-0.0710	-0.2138**
	(0.093)	(0.089)	(0.094)	(0.090)	(0.083)	(0.087)	(0.084)
Temperance	-0.1050*	-0.0303	0.0225	-0.0602	0.0509	-0.1128*	-0.1044**
	(0.058)	(0.056)	(0.057)	(0.056)	(0.053)	(0.062)	(0.052)
Prudence	0.1783**	0.0834	-0.0029	0.0359	0.0513	-0.0174	0.2041***
	(0.075)	(0.067)	(0.078)	(0.074)	(0.067)	(0.071)	(0.078)
AmbAversion	-0.0328	-0.0551	-0.0705	0.0099	-0.1665***	-0.1081*	-0.1305**
	(0.060)	(0.059)	(0.064)	(0.061)	(0.059)	(0.062)	(0.059)
Observations	204	204	204	204	204	204	204
p-value	0.000131	0.0364	0.0766	0.672	0.0124	0.149	0.00150

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 12: MLA Risk Instrument Not Explained by KYC Questions

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)
qNumber	0.0175*	0.0175*	0.0175*	0.0175*	0.0175*	0.0175*	0.0175*
	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
Goal	0.0023						
	(0.020)						
DescPref		0.0175					
		(0.023)					
RiskPref			0.0055				
			(0.022)				
HistPref				0.0051			
				(0.022)			
LossTol					-0.0028		
					(0.019)		
LossGain						-0.0102	
						(0.024)	
BuySellHold							-0.0284
							(0.022)
Constant	-0.1750*	-0.2059**	-0.1819*	-0.1813**	-0.1602*	-0.1466	-0.0890
	(0.092)	(0.091)	(0.094)	(0.088)	(0.093)	(0.094)	(0.102)
Observations	612	612	612	612	612	612	612
Number of subject	204	204	204	204	204	204	204
p	0.176	0.123	0.174	0.163	0.187	0.167	0.0749

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 13: MLA Ambiguity Instrument Not Explained by KYC Questions

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)
qNumber	0.0087	0.0087	0.0087	0.0087	0.0087	0.0087	0.0087
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Goal	0.0191						
	(0.020)						
DescPref		0.0073					
		(0.020)					
RiskPref			0.0159				
			(0.022)				
HistPref				-0.0003			
				(0.022)			
LossTol					0.0166		
					(0.014)		
LossGain						0.0228	
						(0.021)	
BuySellHold							0.0298
							(0.022)
Constant	-0.1485	-0.1085	-0.1320	-0.0918	-0.1410	-0.1410*	-0.1759*
	(0.098)	(0.089)	(0.094)	(0.093)	(0.088)	(0.082)	(0.105)
Observations	612	612	612	612	612	612	612
Number of subject	204	204	204	204	204	204	204
p	0.418	0.592	0.489	0.600	0.359	0.312	0.294

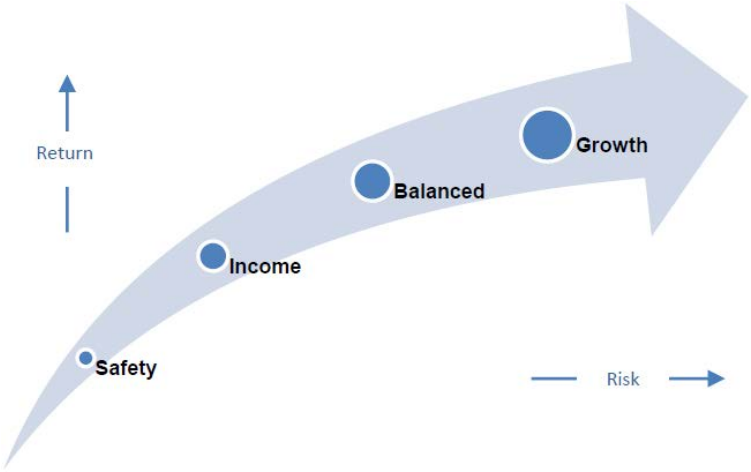
Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Figure 1: Know-Your-Client (KYC) Form

1. What is your primary goal for your portfolio (see Figure 2 below)?
   (a) Safety - I want to keep the money I have invested safe from short-term losses or readily available for short term needs.
   (b) Income - I want to generate a steady stream of income from my investments and I am less concerned about growing the value of my investments.
   (c) Balanced - I want to generate some income with some opportunity for the investments to grow in value.
   (d) Growth - I want to generate long-term growth from my investments.

Figure 2: Figure for KYC Question 1



2. In making financial and investment decisions you are:
   (a) Very conservative and try to minimize risk and avoid the possibility of any loss.
   (b) Conservative but willing to accept a small amount of risk.
   (c) Willing to accept a moderate level of risk and tolerate losses to achieve potentially higher returns.
   (d) Aggressive and typically take on significant risk and are willing to tolerate large losses for the potential to achieving higher returns.
3. The value of an investment portfolio will generally go up and down over time. Assuming that you have invested $10.000, how much of a decline in your investment portfolio could you tolerate in a 12 month period?
   (a) I could not tolerate any loss.
   (b) -$300 (-3%).
   (c) -$1,000 (-10%).
   (d) -$2,000 (-20%).
   (e) More than -2.000(more than -20%)
4. When you are faced with a major financial decision, are you more concerned about the possible losses or the possible gains?
   (a) Always the possible losses.

(b) Usually the possible losses.

(c) Usually possible gains.

(d) Always possible gains.

5. The chart below (see Figure 3 below) shows the greatest one year loss and the highest one year gain on four different investments of $10,000. Given the potential gain or loss in any one year, which investment would you likely invest your money in:

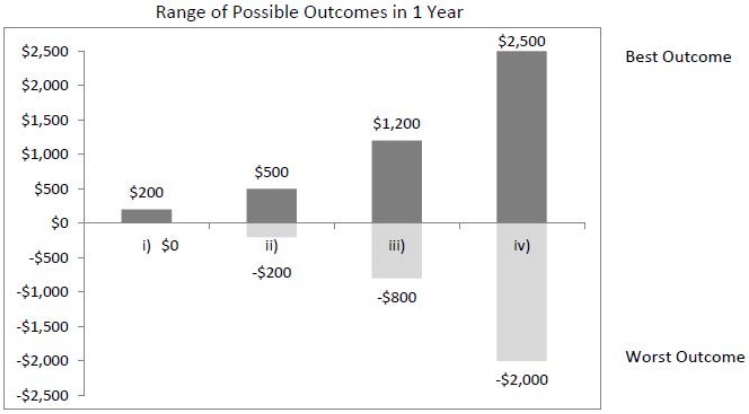
   (a) EITHER a loss of $0 OR a gain of $200.

   (b) EITHER a loss of $200 OR a gain of $500.

   (c) EITHER a loss of $800 OR a gain or $1,200.

   (d) EITHER a loss of $2000 OR a gain or $2,500.

Figure 3: Figure for KYC Question 5



6. From September 2008 through November 2008, North American stock markets lost over 30%. If you currently owned an investment that lost over 30% in 3 months you would:

   (a) Sell all of the remaining investment to avoid further losses.

   (b) See a portion of the remaining investment to protect some of your capital.

   (c) Hold onto the investment and not sell any of the investment in the hopes of higher future returns.

   (d) Buy more of the investment now that the prices are lower.

7. Investments with higher returns typically involve greater risk. The charts below show hypothetical annual returns (annual gains and losses) for four different investment portfolios ovea a 10 year period. Keeping in mind how the returns fluctuate, which investment portfolio would you be most comfortable holding (see Figure 4 below)?

   (a) Portfolio A

   (b) Portfolio B

   (c) Portfolio C

   (d) Portfolio D

Figure 4: Figure for KYC Question 7

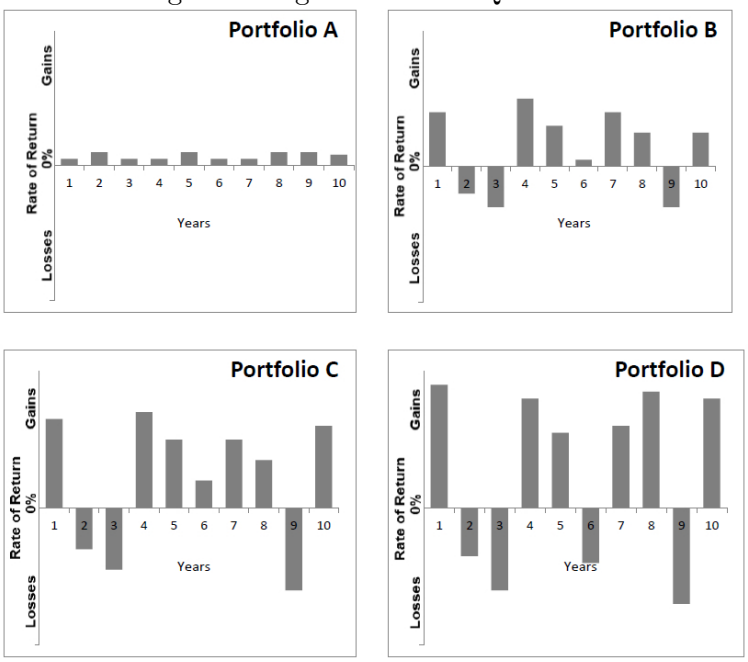


Figure 5: KYC Question 1 "Portfolio Goal" Response Distribution

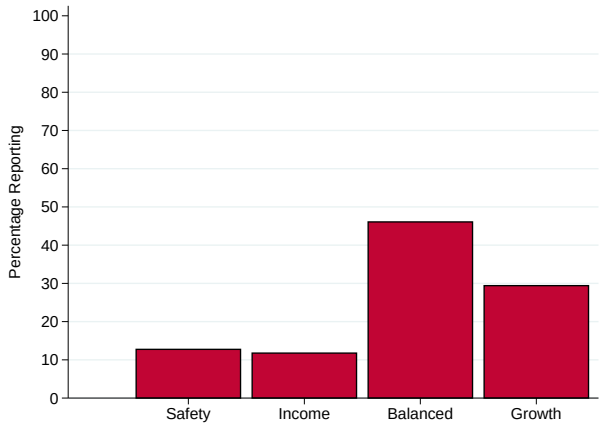


Figure 6: KYC Question 2 "Descriptive Risk Preference" Response Distribution

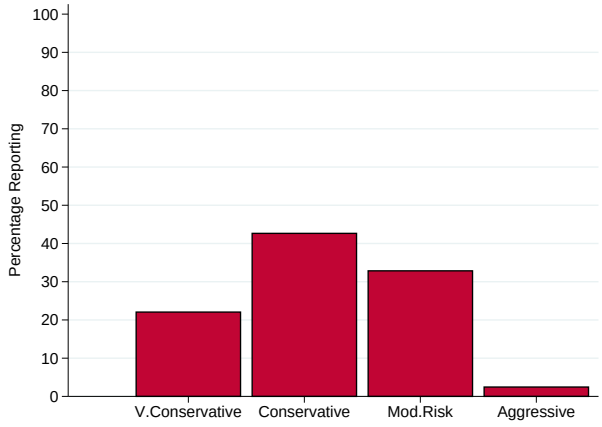


Figure 7: KYC Question 3 "Loss Tolerance" Response Distribution

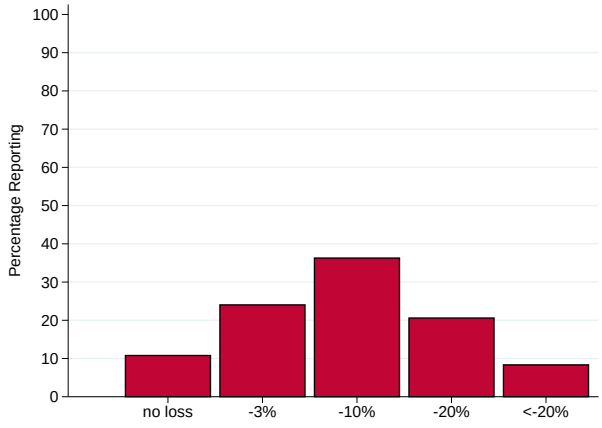


Figure 8: KYC Question 4 “Loss or Gain” Response Distribution

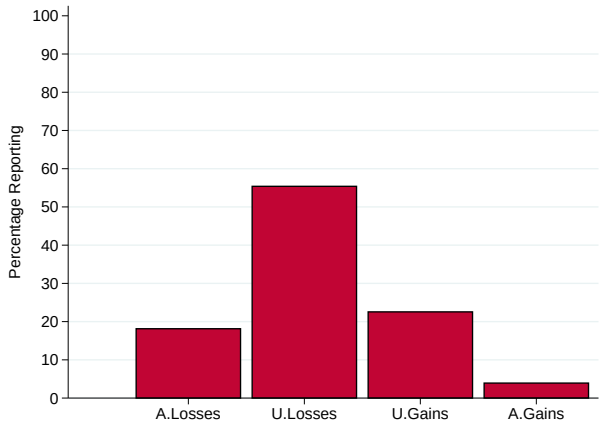


Figure 9: KYC Question 5 “Risk Preference” Response Distribution

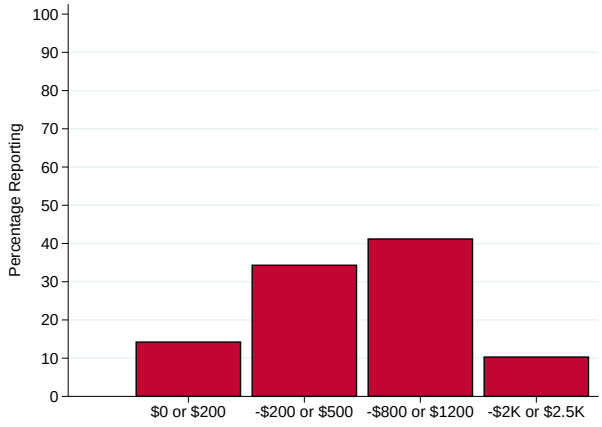


Figure 10: KYC Question 6 “Buy, Sell or Hold” Response Distribution

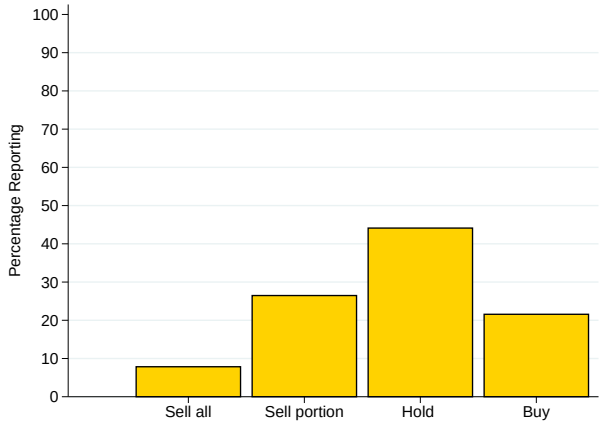


Figure 11: KYC Question 7 “Historical Performance Preference” Response Distribution

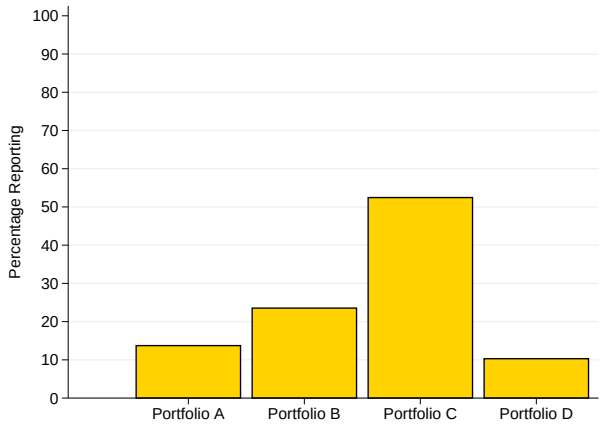


Figure 12: Risk Preference Instrument Distribution of Choices

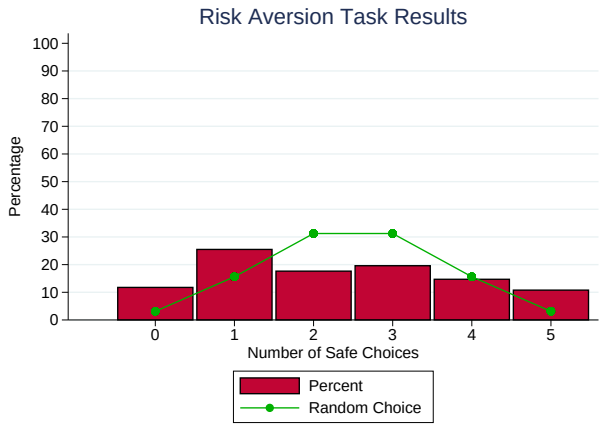


Figure 13: Risk Preference Instrument Results by Decision

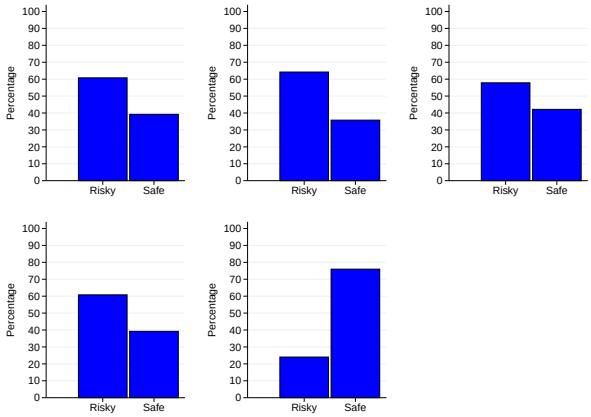


Figure 14: Prudence Instrument Distribution of Choices

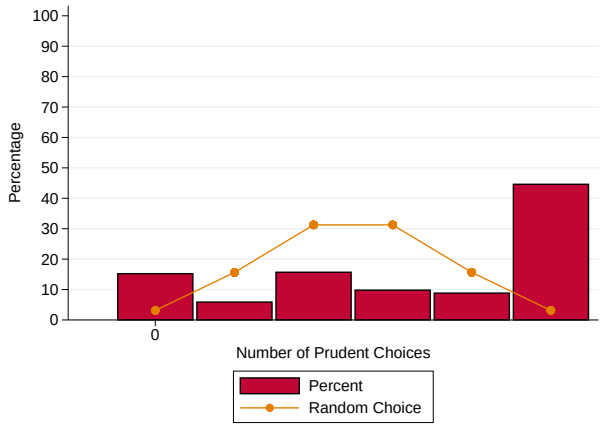


Figure 15: Prudence Instrument Results by Decision

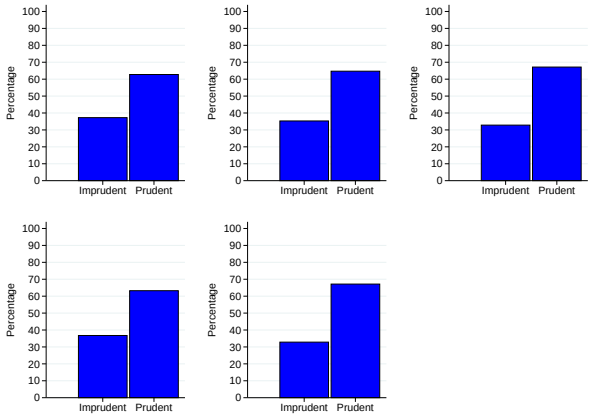


Figure 16: Temperance Instrument Distribution of Choices

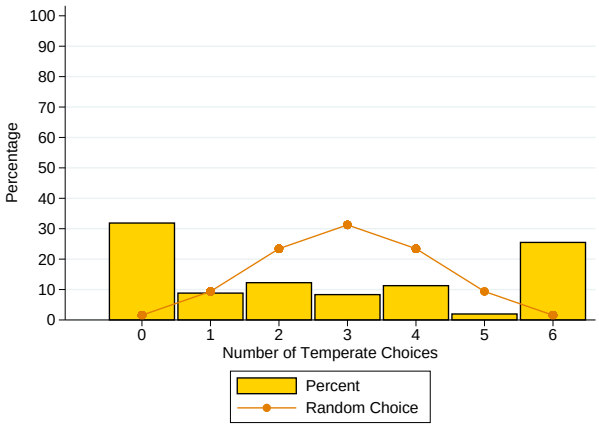


Figure 17: Temperance Instrument Results by Decision

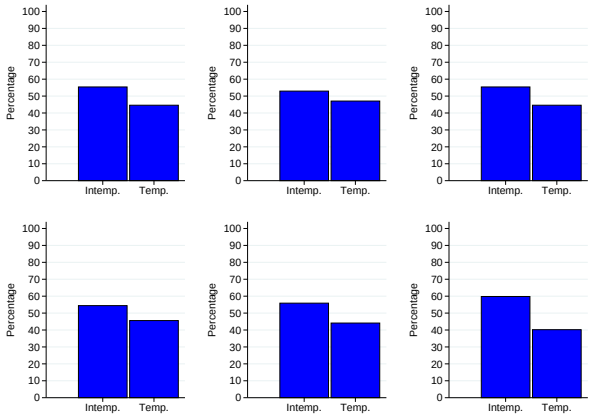


Figure 18: Ambiguity Preference Instrument Distribution of Choices

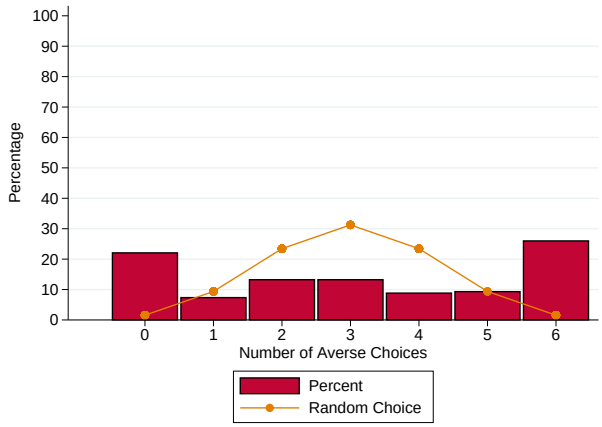


Figure 19: Ambiguity Preference Instrument Results by Decision