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Determinants of risk attitudes using sample surveys: The implications of a high rate of nonresponse



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ABSTRACT

Our purpose is to investigate the determinants of risk attitudes, using willingness to bet in a hypothetical lottery as a proxy variable. A question regarding willingness to bet was submitted to a sample of Italian household heads during the Survey of Household Income and Wealth, conducted by the Bank of Italy in 2010. However, observations are available only for a restricted subset of the sample. Therefore, an analysis of the determinants of willingness to bet must be conducted as a sensitivity analysis in which the nature of the sample selection, random or non-random, is controlled for. Model estimations were performed within a semiparametric modelling framework, enabling flexible modelling of the effects of continuous covariates on outcomes. Our findings suggest that willingness to bet is observed in a restricted, non-randomly selected sample. Thus, biased parameter estimates may result from using statistical models that ignore this issue. Neglecting such bias can affect interpretations of results as well as predictions of willingness to bet (risk attitudes) among non-participants. We also observe that the assumption of a linear relationship between continuous covariates and outcome may obscure the patterns of the relationship investigated.

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1. Introduction

Risk attitude measures are of interest to economists and sociologists who aim to explain interpersonal differences in decision making under conditions of uncertainty. Numerous studies have employed expected utility theory to derive individual measures of risk aversion (for example, the Arrow–Pratt index of absolute risk aversion) by using information on willingness to pay for a risky security or bet on a hypothetical lottery based on microdata from sample surveys (Diaz-Serrano and O'Neill, 2004; Belzil and Leonardi, 2007; Guiso et al., 2002; Guiso and Paiella, 2008). One criticism of studies that use microdata derived from surveys rather than laboratory experiments concerns nonresponse bias; that is, respondents fail to answer specific questions after agreeing to participate in

a survey (Yan and Curtin, 2010). In general, in data from sample surveys, the relationship between risk attitudes and socio-economic factors (such as wealth, consumption, and unemployment) is determined by restricting the analysis to the part of the sample for which it is possible to calculate a measure of risk. To better understand the issue, we focus on a study by Guiso and Paiella (2008), in which an individual's degree of risk aversion is derived from his or her answer to a risky security question.¹ Guiso and Paiella (2008) observed three types of respondents: (a) individuals who reported their willingness to pay a

¹ 'We would like to ask you to answer the question as if the situation were real. You are offered the opportunity to acquire a security permitting you, with equal probability, to either gain 10 million lire or lose all of the capital invested. What is the most that you are prepared to pay for this security?' This question was submitted to a sample of Italian household heads during the Survey of Household Income and Wealth (SHIW), which was conducted by the Bank of Italy in 1995.

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positive maximum price greater than zero for the risky security, (b) individuals who were willing to pay a price of zero euro, and (c) individuals who refused to answer. Only 40% of those interviewed answered the question regarding willingness to pay for the risky security. The low participation rate has typically been attributed to the nontrivial computational ability required to price risk and the abruptness of a question regarding willingness to risk money without preparing respondents with a set of warm-up questions (Guiso and Paiella, 2008). Thus, individuals with weak cognitive computational ability might find the question difficult to understand, which may lead them to refuse to participate or offer a price of zero. Clearly, we cannot exclude the possibility that a lack of real incentives might lead interviewed individuals not to take the question seriously. Based on the available information, individuals who refused to answer or offered a price of zero were classified as non-participants. The consideration of a price of zero as a non-valid response was also adopted by Belzil and Leonardi (2007). Non-participation or participation by offering a price of zero may also be associated with non-standard behaviour similar to narrow framing and loss aversion (e.g., Tversky and Kahneman, 1991; Barberis and Huang, 2008; Guiso and Paiella, 2008). However, as discussed by Guiso and Paiella (2008), the question regarding willingness to pay for a risky security allows respondents to determine their potential loss. Therefore, even certain loss-averse individuals will be willing to pay a positive price to purchase the security.

1.1. Aims of the study and data description

Our study aims to identify the determinants of willingness to pay in a hypothetical risk game as a proxy for risk attitudes. To this end, we use microdata collected through a structured questionnaire from the Italian SHIW, conducted by the Bank of Italy in 2010.² The survey involved a sample of 7,951 Italian households. In contrast to the study proposed by Guiso and Paiella (2008), the survey conducted in 2010 included a section on willingness to pay for a hypothetical lottery rather than for a hypothetical risky security. Specifically, the question asked, 'Suppose you have the opportunity to participate in a lottery in the following way: for every euro you bet, you can double (by winning one euro) or halve the amount (by losing 50 cents) depending on the outcome of a toss of a coin with the following parameters: heads, you win; tails, you lose. What is the most you are willing to pay?'. We observed that 41.98% of respondents reported a positive maximum price that they were willing to bet in the hypothetical lottery, 21.36% reported a bet equal to zero

euro, and the remaining 36.66% refused to respond to the question.

Our investigation of the determinants of willingness to pay is conducted as a sensitivity analysis. First, we assume that individuals who participate in the lottery with a positive bet do not differ significantly from the sample of non-participants. Based on this assumption, we restrict the investigation of the determinants of willingness to pay for the hypothetical lottery to the subset of the sample that answered with a positive price. This aim is achieved using an additive model (e.g., Wood, 2006). The advantage of employing a flexible modelling method compared with a fully parametric approach is that a flexible model allows us to relax the assumptions of specific functional forms on continuous covariates included in the model and thereby minimise specification errors by allowing the data to determine whether the relationship is linear or non-linear (e.g., Zanin and Marra, 2012a,b).

A preliminary descriptive analysis, however, highlights that respondents differ from non-respondents in certain socio-economic and demographic characteristics. Table 1 reports descriptive statistics for the sub-samples of interest, that is, the respondents willing to pay for the hypothetical lottery and the non-participants (i.e., individuals who refused or offered a price of zero). Notably, individuals who answered the question on willingness to pay for the hypothetical lottery were, on average, 4–5 years younger and better educated than non-participants. This analysis suggests that non-response might not be fully random. Therefore, the use of standard modelling methods may have detrimental effects on parameter estimation and, as a consequence, on the prediction of willingness to bet among non-participants. Generally, studies that assume that non-participation is non-random have used Heckman-type selection models (Heckman, 1979) that correct for selection bias when non-participation is affected by both observed and unobserved confounders. However, a limitation of this approach is that it requires the imposition of *a priori* assumptions regarding the patterns of the continuous covariates included in the model. To overcome this limitation, the hypothesis of non-random sample selection is investigated using a flexible modelling approach, as recently proposed by Marra and Radice (2013a). This approach represents an extension of Heckman's (1979) two-step procedure and involves the simultaneous estimation of two regressions: the selection equation (i.e., participation in the hypothetical lottery) and the outcome equation (i.e., the maximum positive price that an individual is willing to bet).

2. Modelling strategy

In the presence of a large part of the sample classified as non-participants in the hypothetical lottery, the aim of investigating the determinants of the willingness to bet can be a challenging task primarily because of the suspicion of the nature of sample selection (random or non-random).

² The microdata are available on the website of the Bank of Italy: <http://www.bancaditalia.it>. The questionnaire was addressed to the person of reference (typically the household head), who responded on behalf of all members. The survey concerns socio-demographic characteristics regarding household members, wealth composition, income sources, and debts, among others.

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