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Abstract:

This paper aims, through laboratory-based economic experiments, to shed light on the decision-making process in SRI and how it differs from decision making by other types of investors. We asked subjects to make decisions regarding stock investments on the basis of the three attributes of return, variance, and CSR, and we estimated their utility function to classify the types of investors. We also conducted a dictator game and lottery-choice experiments to measure subjects' heterogeneity in regard to three psychological factors: altruism, risk aversion, and time preference. We used psychological factors to apply a latent class model and we examined whether these factors affect investment in the stock of companies that actively promote CSR.

The main finding of this study is that there is heterogeneity among investors, even among SRI investors. With the latent class model, we found conventional investors, SRI investors, and risk-loving SRI investors among our subjects. We hypothesised three psychological factors behind this heterogeneity. While the results support our altruistic hypothesis, the results under the risk-averse hypothesis and lower time preference hypothesis depend on which investor group is treated as SRI investors and also on the model specification. Although previous studies also found heterogeneity among SRI investors, no studies have tried to reveal the psychological background of the heterogeneity.

Keywords: Behavioural Finance; Economic Experiment; Socially Responsible Investment

JEL Classification: M14; G02; C91

1. Introduction

The market size of Socially Responsible Investment (SRI) amounts to about 10 per cent in the US and Europe, enough to have a potentially considerable impact on the whole financial market (US SIF, 2012; Eurosif, 2010). Despite the importance of SRI, what motivates people to invest in socially responsible companies has yet to be identified. While many studies have compared the performances of SRI funds and conventional funds, they have found no statistically significant difference between them (Hamilton et al., 1993; Gregory et al., 1997; Goldreyer et al., 1999; Bauer et al., 2005; Kreander et al., 2005; Bauer et al., 2006; Bauer et al., 2007; Ziegler et al., 2007; Galema et al., 2008; Ziegler, 2009; Gil-Bazo et al., 2010; Climent and Soriano, 2011). This means that economic gain cannot explain why people invest in SRI funds.

Several studies on investment flow found that SRI investors do not follow economically rational behaviour, which chooses assets that can maximise return on investment given a certain risk. Bollen (2007), for example, examined the relationship between fund flows and returns, using data on US mutual funds for the period 1980 through 2002. He found that even though lagged returns were negative, SRI investors did not sell as many funds as conventional investors rationally did. Benson and Humphrey (2008) provided a further insight into an SRI investor behaviour by incorporating both monthly and annual returns to see if investors react to current and/or past information and by incorporating lagged flow to take into account the persistence of fund flow, using data from January 1991 to September 2005. They found that SRI fund flows were less sensitive to returns than conventional funds, and SRI investors were more likely to invest in a fund they already own. In line with the previous studies, Renneboog et al. (2011), by using fund data from around the world, confirmed that SRI investors seemed to be more inelastic regarding returns than conventional investors.

While findings of these studies suggest that the behaviour of SRI investors is different from that of rational investors as defined by classical economics, how different is still unclear. SRI investors do not seem to make random decisions regarding investment, but they do seem to have a certain investment decision-making process that evaluates both financial and non-financial factors. Recent developments in behavioural finance suggest that psychological aspects might play a critical role in investor behaviour (Pompian, 2012). Focusing on these psychological aspects of investors would help in understanding the behaviour of the SRI investor.

This paper aims to uncover the decision-making process in SRI and how it differs from that in other types of investment by using laboratory experiments. We asked subjects to make decisions on stock investments with regard to three attributes: return, variance, and CSR (corporate social responsibility), so

that we could estimate their utility function. We also conducted a dictator game and lottery-choice experiments to measure subjects' heterogeneity in regard to three psychological factors: altruism, risk aversion, and time preference. We used the psychological factors to apply a latent class model and examine the following hypotheses about the decision-making process of SRI investors. *Hypothesis 1: Investors who are more altruistic are more likely to obtain higher utility from the attribute of CSR since they would expect CSR activities to contribute more to society. Hypothesis 2: Investors who are more risk averse are more likely to obtain higher utility from the attribute of CSR since they would expect CSR activities to bring lower risk to their stocks. Hypothesis 3: Investors who have a lower time preference are more likely to obtain higher utility from the attribute of CSR since they would expect CSR activities to lead to greater corporate profit in the long run.*

The main finding of this study is that there is heterogeneity among investors, and even among SRI investors. Using the latent class model, we found conventional investors, SRI investors, and risk-loving SRI investors among our subjects. We hypothesised that there are three psychological factors behind this heterogeneity. While the results support the altruistic hypothesis, results under the risk-averse hypothesis and the lower time preference hypothesis depend on which investor group is treated as SRI investors and also on model specification. Although some previous studies likewise found heterogeneity among SRI investors (Nilsson, 2008; Nilsson 2009; Bauer and Smeets, 2010; Cheah et al., 2011), no studies have tried to reveal the psychological background of the heterogeneity. To the best of our knowledge, our paper is the first attempt to identify the mechanism of diversities in investor behaviour, including among SRI investors.

The rest of this paper is composed as follows. Section 2 reviews relevant literature. Section 3 explains our hypotheses. Section 4 presents our methodology, including our data, experimental design, and theoretical framework. The empirical results follow in Section 5. The implication of these estimation results is discussed in Section 6. We then summarise our findings in Section 7.

3

2. Literature Review

There are many papers that analyse why some people invest in SRI and others do not. The majority of existing studies concerning this matter focus on comparing the demographic attributes of SRI and conventional investors. Some of these studies conclude that demographic information can explain the difference between these two types of investors. Rosen et al. (1991) conducted a mail survey of 1,493 individual SRI investors in the United States and compared their demographic characteristics with those of conventional investors. Their findings were that SRI investors were younger and better educated but had less income than general mutual fund investors. Similar results were obtained from a survey conducted by Tippet and Leung (2001) of Australian investors, including 99 ethical investors. In addition, they found that SRI investors in Australia were less likely to be retired investors, tended to be part-time workers, owned fewer stocks, and invested less money than conventional investors. Junkus and Berry (2010) conducted a large survey that had 5,391 responses from individual investors in the United States. Their findings are also in line with the earlier studies just mentioned above, with the added information that single people were more likely to be SRI investors. On the other hand, McLachlan and Gardner (2004) found, using a sample of Australian investors, that there were no statistically significant differences between 54 SRI investors and 55 conventional investors in such demographic attributes as age, education, and income. Williams (2007) obtained similar results; using a wide survey of investors across five countries, he confirmed that demographics did little to distinguish SRI investors from conventional investors. Although earlier studies suggest that demographic characteristics can explain the difference between SRI investors and conventional investors, the results of more recent studies no longer support such a conclusion.

In contrast to studies that focus on demographic variables, some studies have tried to explain the characteristics of SRI investors from a psychological point of view. McLachlan and Gardner (2004) concluded that differences between SRI and conventional investors were caused by cognitive, personality, and environmental factors. They found that SRI investors rated ethical issues as being more important in their investment decisions than conventional investors did. Although the statistical significance was marginal, it was shown that SRI investors were more altruistic than conventional ones. Owen and Qian (2008) surveyed 1,808 respondents from the United States and found that investors with higher environmental concerns when they shopped were more likely to be SRI investors. Acting on these findings, we focus on psychological factors to explain why some investors choose SRI and others do not.

The contribution of our paper is twofold. First, we examine the diversity of SRI investors by applying a latent class model to an estimation of the utility function of investors. This approach allows us

to capture the whole picture of the investment market, including potential varieties among SRI investors. Second, we use methodologies that have been developed in studies in the field of experimental economics to measure the extent of altruism, risk aversion, and time preference. Methodologies that have been used in such studies are theoretically rigorous, thereby providing a more consistent estimate of the characteristics of investors.

3. Hypothesis Development

This section discusses our hypotheses, their backgrounds, and the literature that supports them. Andersen et al. (2008) characterised utility functions in three dimensions, reflecting preferences over goods, time, and uncertainty. Following this line of discussion we hypothesise that three psychological factors might play a significant role in decision making in regard to SRI: altruism, risk aversion, and time preference.

Altruism

Hypothesis 1: Investors who are more altruistic are more likely to obtain higher utility from the attribute of Corporate Social Responsibility; in other words, more altruistic people tend to be SRI investors since they would expect CSR activities to contribute more to society.

The first hypothesis is intuitive and straightforward. Since the aim of CSR activities is to take responsibility to society as a whole, this fact is expected to have a positive impact on members of the local and global community. Whether this attitude attracts potential investors depends on the extent to which the investors care about the wellbeing of society as a whole. Therefore, investors with higher altruism would have a higher tendency to be SRI investors.

As far as we know, no study comparing the degree of altruism of SRI investors and conventional investors has yet been published. However, Rosen et al. (1991) showed that SRI investors could be a group of people who are altruistic. They conducted a mail survey of 1,493 individual SRI investors in the United States and found that more than 80 per cent of their sample belonged to or donated money to charitable causes. Even though they did not compare the percentages of similar people among non-SRI investors, the results suggested that SRI investors were altruistic. Nilsson (2009) examined the difference in degree of altruism among SRI investors by means of a survey of 563 individual SRI investors in Sweden. He found that respondents who have higher proportions of SRI funds in their financial assets are more altruistic than those who have fewer SRI funds. Although these studies did not establish whether or not SRI investors are more altruistic than conventional counterparts, they confirmed that altruism is associated in some way with being an SRI investor.

Risk aversion

According to the modern portfolio theory (Markowitz, 1952), investors attempt to minimise risk for a given level of expected return. In other words, lower risk is one of the important factors in determining investment. Researchers have discussed whether or not implementing CSR activities could reduce management risk, which leads to a lower risk of stock values plunging (Heal, 2005). Hamilton (1995), for example, examined how an announcement of the Toxics Release Inventory (TRI) by the US Environmental Protection Agency impacted on the stock values of TRI firms, using event study methodology. The results showed that investor reactions to the news of the environmental pollution caused by those firms was significantly negative; following a drop in their stock prices, an average loss in stock value of $4.1 million was incurred by TRI firms. Flammer (2012) also showed that environmentally unfriendly actions by firms led to negative impacts on the stocks of such firms. These findings show that firms' socially irresponsible behaviour is assessed negatively in the financial market. Therefore, there is a possibility that investors might avoid investing in such firms, or be likely to invest in socially or environmentally responsible firms because they are less risky investments. Indeed, Nakai et al. (2011) found that funds holding stocks of firms actively engaged in CSR suffered less than conventional funds from the global financial crisis. They examined the negative impact of the Lehman Brothers bankruptcy on SRI funds and conventional funds in the Japanese market and found the drop in performance was less in SRI funds on average—a result that showed SRI funds were less risky than conventional funds. These findings lead to our hypothesis that SRI investors appreciate CSR activities because they contribute to lower risk in their investment. Rosen et al. (1991) also showed that SRI investors were somewhat risk averse—a conclusion that they arrived at via a Likert-scaled statement (though they carried out no comparison with conventional investors). Prompted by these findings, we hypothesise that SRI investors appreciate CSR activities because they contribute to making their investment less risky.

Hypothesis 2: Investors who are more risk averse are more likely to obtain higher utility from the attribute of CSR; in other words, people with higher risk aversion tend to be SRI investors since they would expect CSR activities to bring lower risk to their stocks.

Time preference

Another advantage of CSR sometimes discussed is that such activities by a firm sets its goods or services apart from those of other firms, and this might contribute to better profits in the long run.

While companies are required to make significant investments in the short run when pursuing CSR, they could gain financial return in the long run through improved corporate governance and competitiveness. Thus one of the potential benefits of investing in a company with a higher CSR orientation can be such a return in the long run if the investors have enough patience to wait until the gain is realised.

Cox et al. (2004) investigated the pattern of institutional investors in the UK and how it related with CSR activities by companies, using a sample of over 500 UK companies. They found that the proportion of a company owned by long-term investors (e.g., pension funds, life insurance funds, and charitable funds) was significantly and positively related to company social performance. Benson and Humphrey (2008) showed that SRI fund investors were prone to invest longer than conventional fund investors. Winnett and Lewis (2000) examined popular models of financial markets in financial journalism and concluded that much of the discussion suggests that ethical financial decisions were linked to long-term prospects rather than to irresponsible short-term prospects. If SRI investors appreciate the advantage of long-term investment, it can be concluded that they have a lower time preference.

Hypothesis 3: Investors who have a lower time preference are more likely to obtain higher utility from the attribute of CSR, since they would expect CSR activities to lead to greater corporate profit in the long run.

4. Methodology

4.1 Data and Experimental Design

We conducted laboratory experiments on 22 December 2012 and 16 January 2013 at Kyoto Sangyo University with 28 and 22 subjects, respectively. Those who participated in our experiments were undergraduate students at Kyoto Sangyo University who were recruited through a website. The experiments were carried out through a paper-based system on 22 December, and through a computer-based system on 16 January; what the subjects were asked to do were much the same on each date except for the donation settings (discussed in more detail in Section 6.2). In the computer-based system we used "SurveyMonkey"[1] to have our subjects answer the questions and to collect their answers immediately. Once subjects accepted the terms of the experiment and signed their consent forms, the experimenters explained to them the schedule and the rewards the subjects were going to receive at the end of the entire experiment. Each subject received 1,000 Japanese yen (equivalent to US$10.03 as of 10 September 2013) for showing up and an additional amount of money that was dependent on their performance in the experiment. Each session included four experiments, the first of which was a choice experiment to elicit subjects' preferences regarding the return, risk, and CSR attributes of stock investment. The other three were a dictator game and two lottery-choice experiments to estimate subjects' psychological characteristics. We set a preparatory exercise for the choice experiment to ensure that subjects fully understood what to do and how to answer. The experimenters had randomly selected in advance two experiments out of four to determine participants' rewards; the subjects, however, did not know which two had been selected until all experiments were completed. The session took approximately an hour and a half.

Our choice experiment was aimed at estimating people's preferences over a set of alternatives expressed as a bundle of attributes, called a choice set (Lancaster,1966; Rosen, 1974; McFadden, 1974); an example is shown in Table 1. Each attribute has levels (presented in Table 2), so this makes a profile different over alternatives. Subjects faced three alternatives and were asked to choose the one they preferred the most. Through seeing their choices, we note how changes in the attribute levels affect their choices, and so we can estimate their utility functions.

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[1] SurveyMonkey is the world's most popular online survey tool; it enables its users to send free surveys, polls, questionnaires, customer feedback, and market research. (https://www.surveymonkey.com)

Table 1: An Example of a Choice Set in the Choice Experiment

	Stock A	Stock B	
Possible Return on Investment	0 points 20 points	-10 points 0 points 20 points 30 points	I invest in neither Stock A nor Stock B.
Corporate Social Responsibility	10 points	0 points	

Choose one and tick box   ☐   ☐   ☐

Each respondent was asked to invest 100 points in one of the first two options (Stock A, Stock B); or, if they choose the third option ("I invest in neither Stock A nor Stock B"), they would be saving 100 points. They were to make such a choice 12 times. In our study, we calculated the rewards (one point was regarded as one Japanese yen). The amount of money that subjects earned or lost by investment in each choice could not carry over to the next choice. We have three attributes: "Possible Return on Investment", "Variance", and "Corporate Social Responsibility". Possible return on investment is the measure of the profit earned from each investment, and it has four patterns as shown in Table 3. Its expected return is highest in Pattern A and lowest in Pattern D. Variance is a measure of risk, in that it looks at which return will be forthcoming with how much likelihood. Although it was not shown explicitly as an attribute in a choice set (see Table 1), subjects could know the event possibility for each possible return. If there are two possible returns appearing in a choice set (see Stock A in Table 1), each of the two appears with a 50 per cent chance, which we regard as *low risk*. On the other hand, four possible returns shown in a choice set (Stock B in Table 1) means a *high risk*, since each of the four returns appears with a 25 per cent chance. The "Corporate Social Responsibility" attribute shows the amount of money that a firm donated to a non-governmental organisation. We specified the non-governmental organisations in this experiment to be WWF Japan, UNESCO Japan, and Plan Japan

(hereafter WWF, UNESCO, and Plan, respectively). A higher amount of donation by a company can be interpreted as a greater effort directed toward environmental or social issues. With the settings such that the experimenters actually paid those amounts of donations to those organisations, subjects obtained utility from investing in such firms. The point we should note here is that even though a subject chooses to invest in a firm with a donation, his or her possible return is not reduced by the amount of donation; this simplifies the interpretation of estimation results and reflects what normally happens: investment return is not deducted even though people invest in firms implementing CSR activities.

We used all combinations of the attribute levels (4 * 2 * 3 = 24 combinations) as a profile and two of them were randomly selected, which became a choice set by adding the third option, which is "I invest in neither Stock A nor Stock B".

Table 2: Attributes, their Definitions, and Levels

Attribute	Definition	Levels
Possible Return on Investment	The measure of the profit earned from each investment	4 patterns (see Table 3)
Variance	The variance of possible return on investment	None = 0 Low = 100 High = 250
Contribution to Environmental Group	The amounts of money that a firm donated to WWF Japan, UNESCO Japan, or Plan Japan (return for a subject is NOT lowered due to a contribution)	0 points 1 points 10 points

Table 3: Possible Return on Investment

Pattern	Possible Return on Investment			
A	10 points	20 points	40 points	50 points
B	0 points	10 points	30 points	40 points
C	-10 points	0 points	20 points	30 points
D	-20 points	-10 points	10 points	20 points

11

4.2 Latent Class Model

We use a latent class model in which respondents are classified into several groups according to their utility functions; this captures their heterogeneity. This model enables us to explore which factors make respondents' utility functions different. It is a suitable methodology for our study since we would like to know why some people prefer investing in CSR firms while others do not. The theoretical framework of our latent class model is as follows. Respondent i who belongs to class $s \in \{1, 2, ..., S\}$ chooses one of several alternatives in choice set $j \in \{1, 2, ..., J\}$, and he repeats making choices T_i times. Under these circumstances, respondent i obtains the utility

$$U_{ij|s} = \beta_s X_{ij} + \varepsilon_{ij|s} , \tag{1}$$

where β_s is a unique parameter depending on class s, which captures the preference heterogeneity; X_{ij} is an attribute vector that includes possible return on investment, variance, and CSR; $\varepsilon_{ij|s}$ is the error term and is identically independently distributed; it follows a Gumbel distribution. The probability of alternative j chosen out of h alternatives by a respondent i in class s can be shown by

$$P_{ij|s} = \frac{\exp\left(\beta_s X_{ij}\right)}{\sum_{h=1}^{J} \exp\left(\beta_s X_{ih}\right)} . \tag{2}$$

Next, we define a membership function as classifying investors into one of the latent classes with probability P_{is} (see Equation 4, below). Thus,

$$M_{is}^* = \lambda_s Z_i + \xi_{is} , \tag{3}$$

where Z represents the observed attributes that explain the reason for heterogeneity in the utility function. In our study, they are psychological factors: altruism, risk aversion, and time preference; ξ is the error term that again is identically independently distributed across respondents and classes and follows a Gumbel distribution. Hence, the probability that a respondent i belongs to class s can be expressed as

$$P_{is} = \frac{\exp\left(\lambda_s Z_i\right)}{\sum_{k=1}^{R}\left(\lambda_k Z_i\right)}, \tag{4}$$

where $\lambda_k\left(k \in \{1,2,...,R\}\right)$ is a unique parameter estimated to explain why a respondent is classified into a particular class. If λ is estimated significantly positive, the observed attribute Z_i increases the probability that a respondent i will be classified into class s. On the other hand, negative λ implies that Z_i decreases the probability of a respondent i belonging to class s. The joint probability of a respondent i choosing the alternative j in class s can be given by combining equations (2) and (4) thus:

$$P_{ijs} = \left(P_{ij|s}\right)*\left(P_{is}\right) = \left\{\frac{\exp\left(\beta_s X_{ij}\right)}{\sum_{h=1}^{J}\exp\left(\beta_s X_{ih}\right)}\right\} * \left\{\frac{\exp\left(\lambda_s Z_i\right)}{\sum_{k=1}^{R}\exp\left(\lambda_k Z_i\right)}\right\}. \tag{5}$$

We use altruism, risk aversion, and time preference as variables of a membership function that characterises a different class of utility function. We followed Forsythe et al. (1994) to measure altruism by asking subjects to answer how much out of 500 Japanese yen they would give their partners (see further details in Experiment B of Appendix A). They do not know who their partners are, even after the experiment. We used the amount of money they gave their partners as the measure of their altruism: the more money they gave, the more altruistic they were. To measure their attitude toward risk, we presented subjects with ten paired lottery-choice decisions (shown in Table 4) and asked them to choose Lottery A or Lottery B in each of the ten options (Experiment C of Appendix A; Holt & Laury, 2002). In both Lottery A and Lottery B, greater rewards are possible in the later options. Lottery A was defined as a safe choice, so people with more Lottery A choices can be considered to be more risk averse. See Table 5 to better understand the relationship between the number of safe choices and the risk preference classification. We announced to the subjects that after the lottery-choice experiment we were going to randomly choose a number to decide which numbered option was going to be used to determine their rewards, and then choose another number to determine how much the prize would be; by doing this, we gave subjects an incentive to choose all options carefully.

Table 4: Ten Paid Lottery-Choice Decisions

Option	Lottery A	Lottery B	Your Choice
1	1/10 of 200 yen, 9/10 of 160 yen	1/10 of 385 yen, 9/10 of 10 yen	
2	2/10 of 200 yen, 8/10 of 160 yen	2/10 of 385 yen, 8/10 of 10 yen	
3	3/10 of 200 yen, 7/10 of 160 yen	3/10 of 385 yen, 7/10 of 10 yen	
4	4/10 of 200 yen, 6/10 of 160 yen	4/10 of 385 yen, 6/10 of 10 yen	
5	5/10 of 200 yen, 5/10 of 160 yen	5/10 of 385 yen, 5/10 of 10 yen	
6	6/10 of 200 yen, 4/10 of 160 yen	6/10 of 385 yen, 4/10 of 10 yen	
7	7/10 of 200 yen, 3/10 of 160 yen	7/10 of 385 yen, 3/10 of 10 yen	
8	8/10 of 200 yen, 2/10 of 160 yen	8/10 of 385 yen, 2/10 of 10 yen	
9	9/10 of 200 yen, 1/10 of 160 yen	9/10 of 385 yen, 1/10 of 10 yen	
10	10/10 of 200 yen, 0/10 of 160 yen	10/10 of 385 yen, 0/10 of 10 yen	

Table 5: Risk Aversion Classifications Based on Lottery Choices

Number of Safe Choices	Range of Relative Risk Aversion for $U(x) = x^{1-r}/(1-r)$	Risk Preference Classification
0-1	$r < -0.95$	Highly Risk Loving
2	$-0.95 < r < -0.49$	Very Risk Loving
3	$-0.49 < r < -0.15$	Risk Loving
4	$-0.15 < r < 0.15$	Risk Neutral
5	$0.15 < r < 0.41$	Slightly Risk Averse
6	$0.41 < r < 0.68$	Risk Averse
7	$0.68 < r < 0.97$	Very Risk Averse
8	$0.97 < r < 1.37$	Highly Risk Averse
9-10	$1.37 < r$	Stay in Bed

We conducted another lottery experiment suggested by Coller and Williams (1999) to measure the time preference of subjects (Experiment D of Appendix A). Subjects were given the opportunity to obtain either 5,000 yen in one month or somewhat more in three months. They needed to choose which payment they preferred in each of a total of 15 options (Table 6). The amount given in three months varied but

would always be greater than 5,000 yen. Again we told subjects that a random number would be chosen to decide which option would determine their rewards, and another number would be randomly chosen to determine who the winner was. (Unlike the other experiments, for this experiment there would be only one winner among the subjects.) Table 7 shows the relationship between the option at which subjects switch from payment option A to payment option B and their rate of time preference. The less money that people are willing to give up by obtaining payment in one month, the lower time preference they have.

We were concerned about possible significant correlations between variables in the membership function we used. Some studies (for example, Anderhub et al., 2001) showed a significant negative relationship between risk aversion and time preference. We therefore examined correlations among the three variables. The correlation coefficients between altruism and risk aversion, altruism and time preference, and risk aversion and time preference turned out to be -7.1 per cent, -28.0 per cent, and 7.1 per cent, respectively. Hence we concluded that no serious multicollinearity exists in our estimation.

Table 6: Fifteen Payment-Option-Choice Decisions

Option	Payment Option A (pays amount below in one month)	Payment Option B (pays amount below in three months)	Your Choice
1	5,000 yen	5,016 yen	
2	5,000 yen	5,025 yen	
3	5,000 yen	5,033 yen	
4	5,000 yen	5,041 yen	
5	5,000 yen	5,062 yen	
6	5,000 yen	5,082 yen	
7	5,000 yen	5,103 yen	
8	5,000 yen	5,125 yen	
9	5,000 yen	5,144 yen	
10	5,000 yen	5,164 yen	
11	5,000 yen	5,205 yen	
12	5,000 yen	5,288 yen	
13	5,000 yen	5,411 yen	
14	5,000 yen	5,616 yen	
15	5,000 yen	5,822 yen	

Table 7: Time Preference Classification based on the Experiment

Option Where Switch Occurs	Rate of Time Preference
1	2.0%
2	3.0%
3	4.0%
4	5.0%
5	7.5%
6	10.0%
7	12.5%
8	15.0%
9	17.5%
10	20.0%
11	25.0%
12	35.0%
13	50.0%
14	75.0%
15	100.0%

5. Estimation Results

There are a few types of criteria to decide the optimal number of classes for discussing estimated results in the latent class approach. The statistical criterion is one of them, and Table 8 involves three such criteria: the McFadden pseudo R-squared, AIC (the Akaike Information Criterion), and BIC (the Bayesian Information Criterion). McFadden's pseudo R-squared signals a better fit when it is higher, while a smaller value indicates a better fit in AIC and BIC. When AIC and BIC show different results, BIC is often adopted, since AIC tends to overestimate the number of classes. The calculated results in Table 8 suggest that a 2-Class model is optimal as its ρ^2 is highest, and values in AIC and BIC are lowest in three alternatives. However, when SRI investors are defined as subjects obtaining utility from the attribute of CSR, all subjects could be SRI investors in a 2-Class model (see the estimation results of 2-Class, 3-Class, and 4-Class models presented in Table 9 and Appendix B). When we are dealing with the real investment market, it is not reasonable to think all investors are SRI investors. On the other hand, Swait (1994), Boxall and Adamowicz (2002), Scarpa and Thiene (2005), and Hynes et al. (2008) suggest that it is also important to decide the optimal number of classes by having a regard for theoretical consistency. If we use a 2-Class model, it would mean that all investors in the financial market are SRI investors, which is unlikely to reflect reality. In terms of statistical criteria, a 4-Class model does not seem to be the proper model to employ. For these reasons, we use a 3-Class model for interpretation in our study, as shown in Table 9. For the estimation results of a 2-Class and a 4-Class model, see Appendix B.

Table 8: Comparison of Models with Different Number of Classes

Number of Classes	Number of Parameters	Log-likelihood at Convergence	ρ^2	AIC	BIC
2	12	-180.858	0.702	385.716	394.619
3	21	-185.141	0.695	412.282	427.862
4	30	-202.486	0.666	464.972	487.230

Table 9: Estimation Results in a 3-Class Model

Variable	Conventional Investors Class 1		SRI Investors Class 2		Risk-loving SRI Investors Class 3	
	Coefficient	Standard Error	Coefficient	Standard Error	Coefficient	Standard Error
Utility Function						
Return	.227*	.125	.193***	.035	.748	3.613
Variance	-.006	.006	-.004	.004	.009***	.003
CSR	-.223	.287	.169***	.056	.199***	.062
Membership Function						
Constant	-	-	-.021	4.555	.034	2.959
Altruism	-	-	.030	.036	.031	.036
Risk Aversion	-	-	-.011	3.090	.009	2.540
Time Preference	-	-	-.006	4.868	.012	2.576
D_Female	-	-	-.008	2.800	.006	1.882
D_Econ	-	-	-.007	3.333	.012	1.987
Latent Class Probability	.224		.362		.414	
Log-likelihood	-185.141					

*** Statistically significant at the 1% level

* Statistically significant at the 10% level

We define Class 1 as *Conventional Investors* since they obtain positive utility from return, and negative utility from variance and CSR. As we used this group as a baseline, their membership function has no value. Class 2 is defined as *SRI Investors* since they gain positive utility from return and CSR, and negative utility from variance. Compared with *Conventional Investors*, the *SRI Investors* group is more altruistic, is less risk averse, and has a lower time preference. Class 3 is regarded as *Risk-loving SRI Investors* as they obtain positive utility from all attributes including variance. Compared with *Conventional Investors*, they are more altruistic, are more risk averse, and have a higher time preference.

We used two dummy variables as control variables: an economics student dummy and a female dummy. Many studies (for example, Simmons and Emanuele, 2007) state that females are more altruistic than males, hence we need to control gender effects on the altruism attribute. In the results of the

SRI Investors group, both dummy variables show negative, which means that students not studying economics and males are more likely to be SRI investors.

The existence of heterogeneity among SRI investors in our sample is confirmed, since there are two SRI groups with different preferences linked with membership function (except for altruism), which is in line with earlier findings (Nilsson, 2008; Nilsson 2009; Bauer and Smeets, 2010; Cheah et al., 2011). However, the estimation results shown in Table 9 do not show any statistical significance in the coefficients of any membership function. This may be because we lose considerable freedom by using a latent class model. For this reason we applied a discrete logit model requiring less degrees of freedom:

$$
\begin{aligned}
U = {} & \beta_0 + \beta_1 \text{Return} + \beta_2 \text{Variance} + \beta_3 \text{CSR} + \beta_4 \text{CSR*Altruism} \\
& + \beta_5 \text{CSR*Risk Aversion} + \beta_6 \text{CSR*Time Preference} \qquad (6) \\
& + \beta_7 \text{CSR*Economics Student} + \beta_8 \text{CSR*Female}
\end{aligned}
$$

Variances of β_4 to β_8 in equation 6 are all interaction terms. If β_4 is positive and statistically significant, it can be interpreted that people with higher utility from CSR tend to obtain higher utility from altruism. We can interpret β_5 to β_8 the same way. In this estimation, we obtain statistical significance in altruism and time preference. From the estimated results obtained by the discrete logit model, we can conclude that people who are more altruistic and have a higher time preference are more likely to be SRI investors.

Table 10: Estimation Results from Discrete Logit Model

Variable	Coefficient	Standard Error
Return	.221***	.015
Variance	-.001	.001
CSR	-.041	.050
CSR*Altruism	.001***	.000
CSR*Risk Aversion	.005	.043
CSR*Time Preference	.125**	.049
CSR*Economics Student	.003	.040
CSR*Female	-.011	.043

*** Statistically significant at the 1% level

** Statistically significant at the 5% level

6. Discussion

6.1 Hypothesis Testing

We now turn to compare the results estimated in the latent class model and the discrete logit model. In the case of the first hypothesis, the two SRI groups (*SRI Investors* and *Risk-loving SRI Investors*) studied with the latent class model and the discrete logit model show a positive value for the altruism variable, although only the result estimated by means of the discrete logit model obtains statistical significance at one per cent. For the second hypothesis, the *SRI Investors* group reveals less risk aversion, while *Risk-loving SRI Investors* and SRI investors in the discrete logit model exhibit more risk aversion. However, none of them are statistically significant. In the third hypothesis, the results in the latent class model suggest that *SRI Investors* have a lower time preference, whereas *Risk-loving SRI Investors* and SRI Investors in the discrete logit model have a higher time preference. Only the discrete logit model shows a statistical significance at five per cent. For the control variables we have mixed results, and none of them are statistically significant. While our specification of the membership function does not show a strong statistical significance, the overall results suggest that there is heterogeneity among SRI investors, as pointed out in earlier studies (Nilsson, 2008; Nilsson 2009; Bauer and Smeets, 2010; Cheah et al., 2011).

6.2 Choice of Destination for Donation

As was discussed in 4.1, when subjects decided to invest some money in a stock involving CSR, the experimenters actually made that amount of donation to one of the environmental or social projects carried out by WWF, UNESCO, or Plan.[2] We assumed that a higher amount of points meant greater efforts for CSR by that firm. We chose to donate to those three particular organisations because this enabled subjects to choose from a variety of social activities. WWF is especially known for their environmental activities, UNESCO has engaged in activities for further development and promotion of culture, and Plan has been involved in social activities aimed at encouraging children's rights and extending children's potential. Plan has also recently been active in programmes to help girls in developing countries receive a proper education so that they can obtain stable employment.

To investigate whether the possibility of choosing the destination of a donation affects the

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[2] The list of projects to which we chose to make a donation is available upon request.

investor utility, we designed different donation settings in our experiment. In the first session conducted on 22 December 2012, subjects were able to choose which project in which organisation their donation would go to if they invested in stocks containing donations. We provided them with a list of projects in an appendix attached to their instructions. When the experiment on investment choice was over, subjects were asked to indicate on the sheet with their investment choices the name of one project to which they would like their donations to be made. In the January session, however, we did not allow subjects to choose a project, although they knew that their donations would go to one of the organisations. In order to examine whether the different setting for donation led to greater or lower utility from CSR, we used the following equation:

$$U = \beta_0 + \beta_1 \text{return} + \beta_2 \text{variance} + \beta_3 \text{CSR} + \beta_4 (CSR * dummy) + u$$
$$\text{where dummy} = 1 \text{ if 1st session}$$
$$\text{dummy} = 0 \text{ if 2nd session} \tag{7}$$
$$E[U|D=0] = \beta_0 + \beta_1 \text{return} + \beta_2 \text{variance} + \beta_3 \text{CSR}$$
$$E[U|D=1] = \beta_0 + \beta_1 \text{return} + \beta_2 \text{variance} + (\beta_3 + \beta_4) \text{CSR}$$

Table 11: Estimation Results with Dummy Variable Distinguishing between 1st and 2nd Sessions

Variable	Coefficient	Standard Error
Return	.218***	.014
Variance	-.000	.001
CSR	.010	.026
CSR*dummy	.076**	.035

*** Statistically significant at the 1% level

** Statistically significant at the 5% level

We pooled all data from the first and second sessions and estimated with a discrete logit model. There is an interaction dummy variable shown as *CSR*dummy* equal to one if subjects participated in the first session, and zero otherwise. The coefficient of CSR shows the utility obtained directly from CSR, since *CSR*dummy* controls possible distinctions caused by the difference in option to choose the destination. The coefficient of *CSR*dummy* tells us whether the design allowing subjects to choose their donation destination changes their utility; since *CSR*dummy* has a positive coefficient with statistical significance, the design that enables people to choose the donation projects actually increases their utility, as we see in Table 11. This suggests that reflecting investors' preferences in CSR activities would lead to a higher evaluation of CSR efforts.

7. Conclusion

The aim of this paper was to reveal the decision-making process in individual investors, especially focusing on SRI investors, by using economic experiments. We conducted an investment experiment with undergraduate students to estimate their utility function and also conducted three experiments to measure three psychological factors: altruism, risk aversion, and time preference. We used these psychological factors to apply a latent class model, and we examined whether these factors affect investment in the stock of companies that are actively promoting CSR, and how SRI investors differ from other types of investors.

The findings of this paper can be summarized as follows. First, we confirm that there is heterogeneity among SRI investors, as previous studies found (Nilsson, 2008; Nilsson 2009; Bauer and Smeets, 2010; Cheah et al., 2011). We obtained a consistent result only for the first of our three hypotheses, which is that more altruistic subjects are more likely to be SRI investors—although a statistical significance is found only with a discrete logit model. The estimation results of the second and third hypotheses depend on which investor group is treated as SRI investors, and also on model specification. Second, we find that there exist stronger demands for SRI than its real market size. Our estimation with a 3-Class model revealed that about 75 per cent of subjects are SRI investors, while the percentage of SRI in the entire financial market in Japan is less than 1 per cent. While this implies a potential for further development of the Japanese SRI market, it also prompts the research question, "Why is the potential not realised yet?" Finally, when subjects were allowed to choose the project for their donation, they obtained significantly higher utility from the CSR attribute. This suggests that reflecting investors' preferences in CSR activities would lead to a higher evaluation of CSR efforts.

We can point out some limitations of our study and important tasks for further research. First of all, even though our aim was to know more about investor behaviour in the financial market, our experiments were conducted with undergraduate students who might have less experience in investment activities than investors, so perhaps their decision making does not accurately reflect that of active investors. Second, the number of subjects for our experiments may have been insufficient since a latent class model requires considerable degrees of freedom, for which a greater number of subjects would be preferable. Third, we tried to identify fundamental psychological mechanisms behind SRI investment; while we believe that this attempt partially succeeded, statistical support for our membership function is not strong. Further investigation of these points remains to be done.

Acknowledgements

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26

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Appendix A –Instructions for the Experiment

Thank you very much for your participation in this economic experiment. You are kindly requested to note the following important reminders:

1. You are not permitted to use your mobile phone during the experiment.

2. You are not to have any conversation with other participants in this room. If you have any questions, please raise a hand and one of the experimenters will come to your desk to answer the question.

3. You will find a letter of consent on your desk. Please read and sign it if you accept the terms and conditions. If you cannot accept them, you are asked to leave the room now.

4. You are not permitted to have anything on your desk except materials provided by the experimenters.

5. You are not to leave the room until the experiment is over. But please raise your hand if you need a restroom break.

Your personal data, including the results of your experiment, will be kept completely confidential and aggregated only for research purposes. They will not be used for any other purpose than this experiment. Your name will not be linked with your decisions when the results of the experiment are published. You will be personally informed of the amount of your earnings and paid at the end of the experiment. The reward consists of two parts: a 1,000-yen show-up bonus and an additional sum of money that is dependent on your choices during the experiments. The experimenters have randomly selected in advance two experiments out of the four (Experiment A, Experiment B, Experiment C, and Experiment D), as the basis for calculating participants' rewards. Which two experiments were selected will not be divulged until the end of all experiments. The whole session will take two hours at most.

Experiment A (Investment Choice)

In Experiment A you are to make decisions on stock investment. As the diagram below indicates, you can choose between "Stock A" and "Stock B", or, if you prefer, you can choose "I invest in neither Stock A nor Stock B."

Sample Question

	Stock A	Stock B	
Possible Return on Investment	-20 points with 25% -10 points with 25% +10 points with 25% +20 points with 25%	±0 points with 50% +20 points with 50%	I invest in neither Stock A nor Stock B.
Corporate Social Responsibility	10 points	1 point	

Choose one and tick box ☐ ☐ ☐

You will be presented with twelve such choices to make. Here we introduce "point" as a hypothetical currency, as you can see in the sample question. In each question, you are provided with 100 points for your decision making. If you choose "I invest in neither Stock A nor Stock B", 100 points will be given to you for certain, but you cannot carry over those points to the next investment choice. Also, when you invest in either Stock A or Stock B, all 100 points will be invested (that is, you cannot invest partially in Stock A and the rest in Stock B). All stocks differ in terms of "Possible Return on Investment" and "Corporate Social Responsibility". Everything else is identical in Stock A and Stock B.

"Possible Return on Investment" is the expected return from your investment of 100 points. If two returns are shown, as under Stock B in the sample question, one of the two appears with a 50 per cent chance. On the other hand, if four possible returns are shown, as under Stock A in the sample, one of four returns appears with a 25 per cent chance.

"Corporate Social Responsibility" shows the amount of points that the firm you would invest in donates to one of the following organisations: WWF Japan, UNESCO Japan, and Plan Japan. Even though you decide to invest in a firm with CSR activities, your investment return will not be deducted. A stock with zero points for CSR indicates that the firm does not implement any CSR activities, and so does not donate to any of the above three organisations.

Once we make sure that all participants have finished making all twelve choices, the actual investment returns are decided on the basis of random selection using a bingo cage containing balls. Your profits from Experiment A will be translated into real rewards using a translation rate of 1 point =1 yen. If you choose any stocks involving one point or more for the attribute "Corporate Social Responsibility", the firm you invested in would donate that sum of money. In this experiment, however, instead of the firm it will be the experimenters who will make donations in accordance with your investment after translating points into real money using a translation rate of 1 point =1 yen. You can decide which organisation/project the donation will go to. Please choose ONE of the projects listed in the appendix to these instructions. If you are unable to select which project the donations should go to, select "Leave entirely up to experimenters". You can make sure that the experimenters have indeed donated money to the project/organisation you choose by visiting our homepage, whose URL is enclosed in the envelope containing the rewards you will be given at the end of the experiment.

You have a practice session for Experiment A. While you will face twelve choices in the real experiment, you have three investment choices in this practice exercise. If you have any questions about Experiment A, please raise your hand before the experiment begins.

Experiment B (Decision-making)

You're paired with a partner whose identity you will not know, neither during nor after the experiment. 500 yen is provided to each of you, and you can give your partner none, some, or all of this sum. Decide how much of the 500 yen you will keep for yourself, and give your partner the rest.
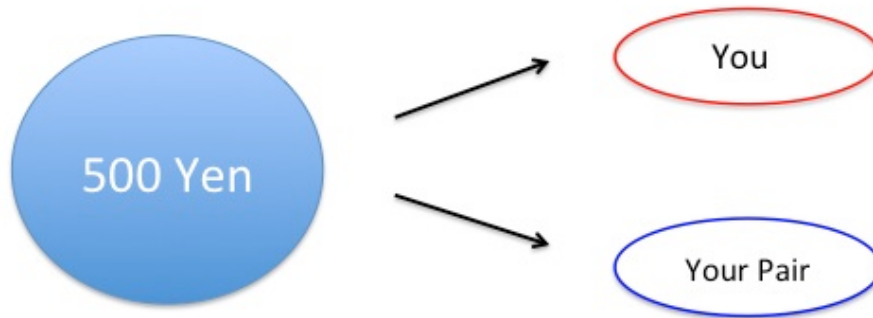
Sample Question

	The Amount of Money
(1) The amount of money you keep for yourself	yen
(2) The amount of money you give your partner	yen
(3) Total	yen

Please write down the amount of money that you would like to keep for yourself on line (1) in the table, and the amount of money that you will give your partner on line (2). Make sure the sums add up to 500 yen. In Experiment B, your reward will be (1) plus the amount of money that your partner gives you. If you have any questions about this experiment, please raise your hand now.

Experiment C (Lottery-Choice Decisions 1)

You are required to choose either Lottery A or Lottery B in each of the ten options given. Depending on your choices, the amount of the reward that you are going to obtain will differ.

Sample Question

Option	Lottery A	Lottery B	Your Choice
1	1/10 of 200 yen, 9/10 of 160 yen	1/10 of 385 yen, 9/10 of 10 yen	○Lottery A ○Lottery B
2	2/10 of 200 yen, 8/10 of 160 yen	2/10 of 385 yen, 8/10 of 10 yen	○Lottery A ○Lottery B
3	3/10 of 200 yen, 7/10 of 160 yen	3/10 of 385 yen, 7/10 of 10 yen	○Lottery A ○Lottery B
4	4/10 of 200 yen, 6/10 of 160 yen	4/10 of 385 yen, 6/10 of 10 yen	○Lottery A ○Lottery B

Choose either Lottery A or Lottery B in options 1 to 10. Note that the reward increases in the later options of both Lottery A and Lottery B; that is, the later options will give you more possibilities to obtain 200 yen in Lottery A and 385 yen in Lottery B. Once we are sure that all participants have completed making choices for the ten questions, an experimenter will randomly produce a number from a bingo cage to decide which option is going to be used for your reward, and produce a second number to determine how much the prize will be. Raise your hand now if you have a question.

Experiment D (Lottery-Choice Decisions 2)

All of you have an opportunity to obtain 5,000 yen in Experiment D. Depending on whether you are paid in one month (Option A) or in three months (Option B), the amount you are going to receive will differ.

Sample Question

Option	Payment Option A (pays amount below in one month)	Payment Option B (pays amount below in three months)	Your Choice
1	5,000 yen	5,016 yen	
2	5,000 yen	5,025 yen	
3	5,000 yen	5,033 yen	
4	5,000 yen	5,041 yen	

Choose Option A or Option B according to your preference. You are required to make such a decision 15 times. Please note that you will receive the Option B payment two months later than if you choose the Option A payment, and that the amount of payment for Option A is always smaller than the one for Option B. When all participants finish all 15 options, an experimenter will randomly produce a number from a bingo cage to decide which option is going to be used for the reward, and produce a second number to determine who the winner will be (in this experiment only one participant will be chosen to be rewarded). Each of you has the same possibility to be the winner, so select each option carefully. Also, the reward for Experiment D will not be given to the winner at the end of the experiment today. Rather, he/she will be paid in either one month or in three months, in accordance with the winner's actual choice in this experiment. If you have any questions, please raise your hand now.

Appendix B - Estimation Results in 2-Class Model and 4-Class Model under Latent Class Model

Table a: Estimated Results in 2-Class Model

	Class 1		Class 2	
Variable	Coefficient	Standard Error	Coefficient	Standard Error
Utility Function				
Return	.112***	.022	.615***	.159
Variance	.003**	.002	-.004	.002
CSR	.078**	.031	.169***	.036
Membership Function				
Constant	-	-	3.907*	2.216
Altruism	-	-	-.009	.008
Risk Aversion	-	-	-1.968**	.977
Time Preference	-	-	-1.223	2.170
D_Female	-	-	-.532	1.307
D_Econ	-	-	-.773	1.165
Latent Class Probability	.271		.729	
Log-likelihood	-180.858			

*** Statistically significant at the 1% level

** Statistically significant at the 5% level

* Statistically significant at the 10% level

Table b: Estimated Results in 4-Class Model

Variable	Class 1 Coefficient	Class 1 Standard Error	Class 2 Coefficient	Class 2 Standard Error	Class 3 Coefficient	Class 3 Standard Error	Class 4 Coefficient	Class 4 Standard Error
Utility Function								
Return	.45026	73.667	.28814	2.67491	.1924***	.01570	.78209	9.1017
Variance	-.02124	1.6862	.00242	.09048	-.00034	-.17	.03930	.15612
CSR	-.62071	166.62	.12330	3.73968	.0753***	.02487	.00936	.6.703
Membership Function								
Constant	-	-	.746	62.847	.445	124.540	.787	169.55
Altruism	-	-	-.015	3.337	.062	6.203	-.112	10.210
Risk Aversion	-	-	.789	61.349	.954	67.159	.132	94.615
Time Preference	-	-	.655	39.932	.737	46.596	.126	50.876
D_Female			.064	52.982	.447	94.676	.557	58.156
D_Econ			.324	32.982	.0258	37.540	.131	42.853
Latent Class Probability	.045		.247		.579		.128	
Log-likelihood	-202.486							

*** Statistically significant at the 1% level