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Financial literacy's effect on elicited subjective discount rate

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Abstract

Financial illiteracy is a well-known, international problem. The current study investigates if learning basic fundamentals of cash flow capitalization affects time preference. The findings indicate that this knowledge does dramatically decrease preference for the present.

1. Introduction

Financial illiteracy is a well-known, documented problem in the adult population (Caliendo & Findley, 2013; Van Rooij, Lusardi & Alessi, 2011; Lusardi, Mitchell & Curto, 2010), and also among young students (Seyedian & Yi, 2011; Beal & Delpachitra, 2003). Many countries and international institutions try to address this issue with educational programs and campaigns that aim to broaden awareness about savings and financial understanding, in order to improve financial decision making (e.g. the US project: mymoney.gov; OECD/INFE, 2012). Meier and Sprenger (2013) investigate the relationship between time preferences and the decision to participate in a financial education program. They find that among individuals who were offered a financial education program, those who choose to participate are more future oriented (have a lower subjective discount rate). Seyedian and Yi (2011) show that students who take courses in finance have increased financial literacy.

The current study does not focus on the choice to enter a financial education program, but rather on the effect that financial education has on time preferences. We investigate if learning basic fundamentals of cash flow capitalization contributes to changing the time preference elicited by inter-temporal choice questions. Specifically, we ask if learning about the concept of the time value of money and risk in the capitalization process affects elicited subjective discount rates (SDR). SDR is the rate at which individuals trade current and future values. It is assumed to be higher for individuals who are more focused on the present, and lower for those who are more future oriented (Thaler, 1981). Earlier studies do find that years of education is negatively correlated with SDR in an adult population (Harrison, 2002). In this study we examine a specific concept in financial education that is acquired in a brief period.

Two groups of students were asked to complete a short inter-temporal choice questionnaire either before or after hearing two lectures, which are part of an Introduction to Finance course, in which they learned basic fundamentals of interest rates, time, risk and capitalization of cash flows. The findings indicate that learning basic capitalization concepts dramatically decreases subjective discount rates.

2. Experimental Design

2.1 Participants

The 125 participants in the experiment were undergraduate students in the School of Business Administration of the College of Management in Israel (average age 23.21; ages 19-28; 55 men and 70 women). Students in the business school are divided into separate classes that remain together as a group throughout the program. The division is random, and is not based on prior achievements. They all take Introduction to Finance in the third semester.

To create the two research groups, we randomly choose one class to complete the questionnaire at the end of the second semester, before they began studying finance (the *"before"* group), and had not even seen its syllabus. The *"before"* group included 66 students. We chose two other classes to answer the questionnaire at the beginning of the third lecture of the finance course taken in the third semester (the *"after"* group). There were 59 participants in the *"after"* group. The distribution of men and women is not significantly different in the groups (57.6% and 54.2% women in the *before* and *after* groups, respectively; (z(123)=0.375; p=.707). We chose different classes for the two groups because the experiment was conducted in class, and it would not have been possible to ask half of each class *"before"* and the other half *"after"*. In order to reduce any social desirability effect, participants in the "after" group answered the questionnaire at the beginning of the third lecture of the finance course, rather than at the end of the second lecture. The week between lectures, (and attending lectures in other fields during the week) should have reduced such effect. In addition, one of the researchers, who was previously unknown to the students gave the instructions, supervised and collected the questionnaires. We also emphasized the fact that the questionnaires are anonymous, which should also reduce any social desirability effect or experimenter demand effect.

During the first two lectures in Introduction to Finance (3 academic hours each), the students first learn about interest rates and how they compensate for time and risk. They then learn the basic capitalization process for calculating the future value (FV) and the present value (PV) of an amount of money (For example, calculating the future value of $100 in two years, or calculating the present value of $300 to be received three years from today).

2.2 Procedure

The participants were asked to answer a short questionnaire that included questions regarding time preferences, risk preferences and knowledge regarding interest on bank deposits.

Similar to Thaler (1981) and Lahav, Shavit and Benzion (2011), the time preferences questions asked participants to state the minimum future amount X they are willing to receive instead of receiving a present payment of NIS 5000[1] in a future time (t). The time periods (t=months) were two months and one year.

A sample question:

You are supposed to receive NIS 5000 in your bank account immediately.

Instead, we offer you the option of receiving a sum of money one year from now.

Fill in the amount that you are willing to receive one year from now, instead of

NIS 5000 today. Minimum amount _____

The annual SDR is calculated as follows:

$$SDR = ((\frac{X}{5000})-1)*(\frac{12}{t}) \qquad (1)$$

In order to control for risk preferences, the questionnaire included two lottery questions, similar to questions used in Booij and van Praag (2009), and Shavit, Lahav & Benzion (2013). The first question is:

Suppose you were offered a lottery ticket in a lottery with ten participants (so you

have a 1:10 chance of winning). The prize is NIS 5000 in cash. What is the

maximum amount you are willing to pay for the ticket?

The second lottery question is for five rather than ten participants (*1:5 chance of winning* instead of 1:10). The risk aversion measure is the willingness to pay (WTP) for the lottery. Willingness to pay a lower amount to participate in the lottery indicates a higher risk aversion (Shavit, Rosenboim, & Shani, 2012; Malul, Rosenboim, & Shavit, 2010).

Finally, in order to measure knowledge about the interest paid on savings, the questionnaire asked:

What do you think is the average interest paid on bank deposits? _____%

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[1] 1 NIS equaled approximately USD 3.5 at the time of the experiment.

3. Results

The annual SDR for delaying payment was calculated using equation 1. Table I presents descriptive statistics and the results of T-tests for the null hypothesis that the specified variable is equal before and after the learning of basic capitalization process.

Table I: Mean (STDV) for Variables, for the *before* and *after* groups

Variable	Before (N=66)	After (N=59)	2-tailed T-test (d.f.) ; Sig.
SDR 2 months	161.87%	65.72%	$t(123)=3.08; p=.003$
	(229.22%)	(74.73%)	
SDR 1 Year	86.89%	39.19%	$t(123)=3.63; p=.000$
	(94.70%)	(36.55%)	
Lottery with 10 participants	154.83	173.56	$t(123)=-0.63; p=.532$
	(160.52)	(173.16)	
Lottery with 5 participants	314.77	351.36	$t(123)=-0.63; p=.533$
	(320.89)	(332.90)	
Interest on deposits	1.945%	1.955%	$t(123)=-0.04; p=.970$
	(1.48%)	(1.43%)	

As Table I shows, the SDRs are significantly lower in the *after* group. In both groups, SDRs are very high with high variance, in line with earlier findings (Shavit, Lahav & Benzion, 2013; Thaler, 1981). These results suggest that learning about the basic capitalization process does affect elicited time preferences. No significant differences are found in risk preferences, suggesting that the learning did not change risk aversion, and that risk preference is not the reason for the difference found in SDRs. Interestingly, we also do not find significant differences in knowledge regarding interest on deposits. The mean answer given by participants is quite accurate, consistent with the findings of Beal and Delpachitra (2003) about the relatively high financial

literacy of business administration students. Although most participants have a decent idea of the low interest paid on deposits, they demand very high SDRs (as in other discounting studies), which indicates that SDR is a very subjective measure.

In order to examine the effect of risk preferences and knowledge about bank interest on SDRs in the individual level, we ran a multivariate regression analysis with SDR for one year delay and two months delay as dependent variables. We first computed the variable *Lottery index* (an average of a participant's answers to the two lottery questions), and then used it as an independent variable in the regression to control for risk preferences. We also computed the dummy variable *after learning capitalization* (0=before; 1=after), to present the two levels of financial literacy.

Table II: Regression analysis for SDRs+

Independent variables	2 Months SDR*	1 year SDR*
(Constant)	1.773	.915
	(0.00)	(0.00)
After learning capitalization	-.920	-.464
	(0.00)	(0.00)
Female	.280	.128
	(0.39)	(0.36)
Lottery Index	-.001	.000
	(0.09)	(0.27)
Interest on deposits	-.022	-.024
	(0.84)	(0.60)
R- Square	**.108**	**.119**
Model Sig.	**.008**	**.004**

+The dependent variable is SDR for the relevant delay.

*Significance levels are in parentheses.

The results presented in Table II are in line with the T-test analysis, indicating that learning basic capitalization concepts dramatically decreases SDRs. Knowledge about interest rates for deposits did not have a significant correlation with SDR. This might suggest that the participants did not use their estimates of the interest rate as an anchor

for the future amount they requested in the inter-temporal choice questions. Risk preference is not significantly correlated with SDR. Finally, gender has no significant correlation with SDRs, in line with Harrison (2002) and Lahav et al. (2011)[2].

4. Summary and Conclusion

In the current paper, we investigate the effect that financial literacy about capitalization has on participants' elicited time preferences. We find that attending two lectures that teach the concepts of interest, time, risk and capitalization can dramatically decrease SDRs, while elicited risk preference does not change.

In the current paper we did not incentivize the participants with monetary rewards, rather we used hypothetical questions in line with many earlier papers (e.g. Courtemanche et al., 2014; Weatherly et al. 2014; Daugherty & Brase, 2009; Hardisty & Weber, 2009). The issue of the effectiveness of using hypothetical questions has been discussed in earlier papers (Bickel et al., 2009; Madden et al., 2003; Johnson & Bickel, 2002) which find no systematic differences in SDRs between real and hypothetical questions, for adult participants. Future research might examine whether the effect found in this paper exists when using monetary incentives.

In order to reduce any social desirability effect, the participants in the "after" group answered the questionnaire at the beginning of the third lecture of the finance course, and one of the researchers who was previously unknown to the students gave the instructions, supervised and collected the questionnaires. We also emphasized the fact that the questionnaires are anonymous. However, despite these effort to reduce such effects, they still might have had some influence on the results.

Another limitation of the current work is that we cannot be sure that the effect we found is long lasting. Future research might examine this issue by examining students in their last semester, and even graduates with degrees in business.

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[2] The results reported in Tables I & II are not clustered by class as there was only one class in the before group and two classes in the after group. However, we compared the means of the results from the two classes in the "after" group, and found no significant differences between groups in any of the presented variables. In addition, we ran regressions similar to those presented in Table II, each time with only one of the classes in the "after" group, which yielded results similar to those presented in Table II.

As learning basic capitalization methods reduces present orientation, it might lead to increased savings and less consumption or credit use which, as Meier & Sprenger (2013) indicate, might lead to better financial outcomes. According to our findings, we suggest that a basic understanding of capitalization should be considered part of educational programs focusing on savings and financial understanding.

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