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FINANCIAL KNOWLEDGE AND RETIREMENT PLANNING IN BARBADOS

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Lisa Brathwaite Phillips¹

Abstract

Since the 2008 global financial crisis, an increasing number of studies have sought to underscore the importance of financial knowledge in prudent and sound financial decision making and outcomes. Given the world's aging population and concerns about the well-being of the elderly, this notion has also been extended to capture its impact on retirement planning practices. Similarly, this paper seeks to examine the link between financial knowledge and retirement preparedness in Barbados. Firstly, the study establishes the role savings play in retirement well-being through consumption theory. A regression analysis is then used on data from an online survey of 170 Barbadian respondents to test the link between financial knowledge and retirement planning. The results suggest that financial knowledge does have a positive impact on the level of retirement planning in Barbados.

JEL Classification: D91, J26

Keywords: Barbados, Financial Knowledge, Retirement Planning

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1. Introduction

As the global average life expectancy continues to rise, retirement planning has become a key tool for an individual to ensure his or her social well-being in this extended post-employment period. Retirement planning can be defined as the preparation for life after permanently leaving the workforce, by building up financial assets in the early- to mid-stages of the employment period to meet retirement goals (Achari, et al., 2020). The ability to accomplish these retirement goals is then seen as being tied to the happiness and overall social well-being of the retiree (Taylor & Doverspike, 2003). Moreover, empirical studies have shown that financial stability in retirement has a positive impact on a retiree's quality of life (Pinquart and Schindler 2007; Quick and Moen 1998; Yeung and Zhou 2017).

Nevertheless, many individuals lack the necessary financial knowledge to effectively plan for their retirement, and hence ensure social well-being in their golden years (Lusardi and Mitchell 2007, 2011a, 2017). Financial knowledge refers to the understanding of essential financial concepts and products (Huston, 2010). Without a sufficient understanding of simple financial matters, an individual is usually unable to determine how much funds they need to retire, and hence, is less likely to employ savings mechanisms and accumulate assets to financially plan for retirement (Behrman, et al. 2012, Lusardi and Mitchell 2011a, 2011b). Moreover, using data from the US FINRA Foundation NFCS (2009), Lusardi and Mitchell (2017) showed that more sophisticated concepts, such as those related to the stock market, were not widely understood. Consequently, such markets are less likely to be used for retirement investment (Van Rooij, et al., 2011).

In Barbados, there is a social security system in place, which was established under the National Insurance and Social Security (Benefit) Regulations, 1967. This system is administered by the country's National Insurance Scheme and guarantees a pension up to 60 percent of average insurable earnings for contributors, and a stipend of BDS\$230 per week for non-contributory pensioners. However, with an aging population² and an increasing life expectancy³, the long-term viability of this fund may not be sustainable without significant government intervention.

Millar and Devonish (2009) found survey evidence that a number of Barbadians switched from defined benefits plans to defined contribution plans⁴. However, it was not commensurate with increased activity on these plans. Defined contribution plans place more responsibility on the holder of the plan as their contribution and management of the plan affects their level of return and subsequent pension income in retirement. Therefore, participation and rebalancing of these plans, as well as other forms of retirement planning, is usually determined by the individual's financial knowledge. In the same study, the authors found that less than half of the 134 participants were able to correctly answer a simple time value of money question using compound interest.

In this vein, this study seeks to test the hypothesis that greater financial knowledge leads to a higher level of active retirement planning in Barbados. It considers an individual's knowledge of financial

² Barbados birth rate continues to trend downwards with a reported 1.62 births per woman in 2019, compared to 1.71 births per woman ten years earlier (<https://data.worldbank.org/indicator/SP.DYN.TFRT.IN?locations=BB> accessed September 29, 2021).

³ United Nations reported Barbados' average years of life expectancy at 79.02 for the period 2015-2020, which was above the world average of 72.28 for the same period. (<https://population.un.org/wpp/Download/Standard/Mortality/> accessed September 29, 2021).

⁴ This switching was likely driven by fewer employers offering defined benefit plans due to the higher cost of such plans to the employer.

products and basic concepts, such as compounded interest rates, risk diversification and inflation. It also looks to determine their level of retirement planning. To conduct the analysis, a standardised online survey of 170 respondents was utilised and a multiple regression model was employed.

This study is important for a couple of reasons. Firstly, given the pressures on social security systems worldwide, understanding the link between financial knowledge and retirement preparedness can help to inform public policy. Governments can use this literature to design appropriate policy measures to boost active citizen participation in planning for their post-employment phase, which should translate to greater social well-being among the elderly. Additionally, this study seeks to build on the work of Millar and Devonish (2009), which examined how persons' perception of their knowledge about financial matters, and their ability to answer a simple compound interest question affected pension planning in Barbados. This study seeks to add to the retirement literature by measuring financial knowledge in Barbados and assessing its relationship with general retirement planning.

The remainder of the paper is structured in the following way. Section 2 outlines the main mathematical theory underpinning the study. Section 3 describes the data and methodology used, while section 4 presents the results. The discussion is contained in section 5, and finally, section 6 concludes.

2. Theory

This study is founded on the Modigliani and Brumberg (1954) life-cycle model of consumption/savings and Friedman's (1957) permanent income hypothesis. These theories postulate that a consumer's total utility is derived from consumption over their lifetime, which accounts for wealth, current and future incomes. That is, consumers will smooth their consumption by building up assets during the working period, which they will dissave during retirement to obtain the desired consumption.

Specifically, a simple intertemporal optimisation model with two periods is considered, in which period 1 represents the individual's working life and period 2 is the retirement phase. In this model the consumer receives utility from both consumption in the working period as well as prospective consumption in retirement. Mathematically, the consumer's utility function can be stated as:

$$U(c_1, c_2) = u(c_1) + \alpha E u(c_2) \quad (1)$$

Where c_1 represents consumption in period 1, c_2 is consumption in period 2, and α is the discount factor. The discount factor measures how much consumption an individual is willing to give up in the working period in order to have an extra dollar of consumption in retirement, such that $\alpha < 1$ indicates that a consumer values consumption today more than consumption in the future.

To account for the fact that a person's actual life span is uncertain, expected utility theory was applied in period 2 (denoted by E in equation 1). Here, the expected utility sums the probability of survival (p_i), from retirement age (i) up to a maximum life span (s), times period 2 consumption in the respective states. Formally, this probability weighted-average consumption utility is represented by the following formula:

$$\sum_i^s p_i u(c_{2,i}) \quad (2)$$

Further, applying behaviour theory under uncertainty, it is assumed that in each period the consumer has constant relative risk aversion (CRRA) utility preferences (Campbell & Mankiw, 1991). Hence, the consumer's utility maximisation problem takes the following form:

$$\underset{c_1, c_2}{Max} \quad U(c_1, c_2) = \frac{c_1^{(1-\theta)} + 1}{(1-\theta)} + \alpha E \frac{c_2^{(1-\theta)} + 1}{(1-\theta)} \quad (3)$$

Subject to the following intertemporal budget constraint:

$$Ec_2 = (m_1 - c_1)(1 + r) + m_2 \quad (4)$$

Where, θ is the degree of relative risk aversion, such that $\sigma = \frac{1}{\theta}$ represents the intertemporal elasticity of substitution, m_1 is the income received after taxes and other statutory payments in the working period (period 1), m_2 is the income in the retirement period (such as social security benefits) and r is the interest rate return on retirement savings. Retirement savings (s_1), is represented by the expression $(m_1 - c_1)$, such that if m_1 is greater than c_1 the individual is saving, while oppositely, if m_1 is less than c_1 the consumer is borrowing.

Solving the maximisation problem for consumption in period one we get the following consumption Euler equation (see Appendix 1 for calculations):

$$c_1 = \frac{Ec_2}{[\alpha(1+r)]^\sigma} \quad (5)$$

Equation 5 shows that the optimal consumption choice is achieved when consumption in the working period is equal to the present value of the consumer's expected consumption in retirement.

Rearranging equation 5 to get a value for Ec_2 and substituting into the budget constraint, the value the following value for c_1

$$c_1 = \frac{m_1(1+r) + m_2}{[\alpha(1+r)]^\sigma + (1+r)} \quad (6)$$

The value for c_1 is substituted into the equation for retirement savings to determine the optimal savings as a function of income, the interest rate and the discount rate:

$$s_1 = m_1 - \frac{m_1(1+r) + m_2}{[\alpha(1+r)]^\sigma + (1+r)} \quad (7)$$

The optimal utility solutions highlight the importance of financial knowledge in retirement planning. Departure from the optimal savings solution leads to deviation from the optimal consumption in each period, and hence, a lowering of overall consumer satisfaction. To illustrate, an example is provided in Table 1 of a consumer who has first period income of \$500,000, second period income of \$75,000 and a discount factor of 0.6. For simplicity, the intertemporal elasticity of substitution is assumed to be 1, and the interest rate is fixed at 5 percent. To show the results of a deviation from the optimal savings using the same parameters, the calculated optimal retirement savings is adjusted by intervals of \$50,000 in both directions to show the fluctuations in consumption in both periods. The expected utility is then calculated using the correct form of the consumer maximisation problem when the intertemporal elasticity of substitution is 1 (*see equation Equation A6 in Appendix 2*).

Table 1: Impact of Changes in Savings on Expected Utility

Retirement Savings	Consumption Working Period	in	Expected Consumption Retirement	in	Expected Utility
42,857	457,143		120,000		20.050
92,857	407,143		172,500		20.152
142,857*	357,143*		225,000*		20.180*
192,857	307,143		277,500		20.155
242,857	257,143		330,000		20.081

*Optimal level

Source: Author's Calculations

Table 1 shows that the higher the consumer's retirement savings accumulated in period 1, the greater the value of expected consumption in retirement. However, above or below the optimal solution obtained in this case, we see that it leads to reduced lifetime expected utility or well-being of the consumer. Therefore, to maximise their overall well-being, the consumer must be able to determine his/her expected consumption goals in retirement (Venti 2006, Lusardi and Mitchell 2014). Once this is done, knowledge of financial products, the associated risk and interest rates, as well as how to calculate compounded interest, allows individuals to make the appropriate financial decisions to achieve their optimal retirement savings. Additionally, a basic understanding of how inflation and interest rates interact is key to ensuring that the consumer's expected purchasing power at retirement is maintained.

3. Data & Methodology

This study uses primary data collected through a structured electronic questionnaire. The survey process was conducted in accordance with the American Psychological Association's Ethics Code (American Psychological Association, 2017), and anonymity for all participants was maintained. The survey comprised of three sections. Section 1 assessed the participants' financial knowledge using a combination of questions, including a modified 13-item survey from the Organisation for Economic Cooperation and Development's International Network on Financial Education (OECD INFE) (2011) financial literacy questionnaire on simple knowledge of financial products and five financial concept questions from the FINRA Foundation NFCS (2009) survey. The financial concepts tested were on the time value of money, interest rates, compound interest, risk diversification and inflation. Section 2 looked at types of retirement preparedness and the final section gathered demographic information about the participant.

The snowball sampling procedure was employed, where the survey was shared through social media, given the COVID-19 protocols in place in Barbados at the time of the exercise. On completion of the questionnaire process, 170 useable survey responses were obtained, with 76 percent of the respondents being female and 24 percent being males (*See Appendix 3 for the descriptive statistics of the demographic characteristics*). Given the sampling and questionnaire dispersion methods employed, a runs test for randomness was performed on both the gender and age variables, and the following test statistic was calculated:

$$z = \frac{r - \mu_r}{\sigma_r} \quad (8)$$

Where r represents the number of runs in the data, μ_r is the mean number of runs and σ_r is the standard deviation of the number of runs.

The results of the runs tests are presented in Table 2. The results indicate that at the 5 percent significance level, the null hypothesis is accepted. Hence, it was concluded that the sequence of data was random for both variables.

Table 2: Results of the Runs Tests

Variable	Z - statistic	Critical Value
Gender	1.43	1.96
Age	0.48	1.96

Source: Author's Calculations

After analysing the data, the following regression equation was performed to test the main hypothesis, that higher financial knowledge leads to greater retirement planning:

$$RP_i = \beta + \gamma FK_i + \delta C_i + \varepsilon \quad (9)$$

Where i represents the individual, RP is the calculated retirement planning index, FK is the estimated financial knowledge index, and C represents the control variables which consists of consumer specific characteristics, namely age, age squared, gender, income and education.

To obtain a value for the retirement planning variable, responses to the questions related to knowing how much you need to retire and financial steps taken to plan for retirement were scored and tallied to give a continuous value between 0 and 2 for each participant. Similarly, the responses for the financial knowledge subsections were scored and summed to give the result per respondent out of a maximum 4-point score. Table 3 presents the summary statistics of the regression's dependent variable, and main explanatory variable under examination.

Table 3: Summary Statistics of the Key Variables

Variable	Minimum Value	Maximum Value	Mean Value	Standard Deviation
Retirement Planning (RP)	0.00	1.60	0.54	0.54
Financial Knowledge (FK)	1.08	3.77	2.45	0.71

Source: Author's Calculations

4. Results

4.1 Retirement Planning

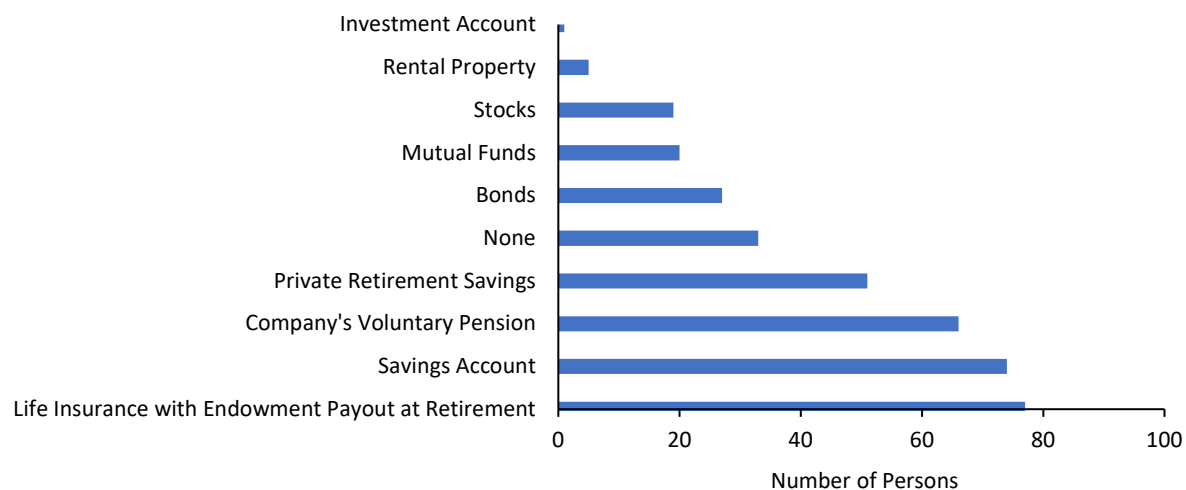
A majority of the respondents (66 percent) indicated they did not know how much they needed to save towards their retirement. As shown in Table 4, this disproportion was observed across all age groups, where less than 50 percent of respondents in each category knew how much funds they needed for retirement. The youngest age group (ages 18 to 25) was the least aware (20 percent) of how much they needed to save for retirement, followed by the 46 to 55 age group (27 percent). The 36 to 45 age group was the most prepared, with 40 percent of respondents knowing how much they needed to retire. This age group was trailed by those closest to retirement (persons ages 56 to 65), where 38 percent of respondents in this age group knew how much they needed to retire.

Table 4: Crosstabulations of Age Group and Knowing Amount Required for Retirement

Age Group	Do you know how much you need save for retirement?	
	Yes	No
18 to 25	20%	80%
26 to 35	31%	69%
36 to 45	40%	60%
46 to 55	27%	73%
56 to 65	38%	62%

Source: Author's Calculations

When actually considering retirement investments, 82 percent of the participants had invested in some type of asset, with more than half of those participants holding multiple investments. The number of retirement planning instruments held was positively correlated with the participant's income. Figure 1 gives the list of retirement savings instruments identified. Figure 1 shows that safer instruments such as dual savings-life insurance policies (45 percent of respondents) and savings accounts (44 percent of respondents) were staples in many portfolios, followed by voluntary company pension schemes and private retirement plans. To a lesser extent, there was also investment in riskier instruments such as mutual funds (12 percent of respondents), stocks (11 percent of respondents) and investment accounts (0.6 percent of respondents).

Figure 1: Responses to "What financial steps have you taken to plan for retirement?"

Source: Survey Tabulations

In line with the findings on the main instruments used to invest for retirement, most of the participants (40 percent) who took steps towards planning indicated that they received financial retirement planning advice from their insurance agent. Approximately 25 percent also consulted family and friends with financial experience before investing/saving, while a similar amount indicated they did not consult anyone at all before making their investment.

4.2 Financial Knowledge

Of the 170 respondents, 89 percent indicated that they were responsible, either solely or together with someone else, for managing the money decisions of their household. Additionally, 55 percent of all households represented in the survey had budgets.

Respondents were familiar with most of the financial products being surveyed. All survey participants knew about insurance policies, credit cards, mortgages and chequing and savings accounts, with the percentage of respondents who actually held these instruments being 63 percent, 74 percent, 35 percent, 46 percent and 95 percent, respectively. Pension funds were also held by 46 percent of the participants. The most unfamiliar products were microfinance loans and investment accounts, where 46 percent and 16 percent of participants, respectively, have never heard of these products. Mutual funds and line of credits were also not widely known, and only 17 percent of individuals held mutual funds, while 25 percent had a line of credit.

Table 5 shows the responses to the financial concept questions. The majority of participants responded accurately to these questions with the exception of the two stock market questions. Forty percent of respondents answered question 4 on risk diversification in the stock market accurately, while only 16 percent of respondents answered question 5 on the relationship between interest rates and stock prices correctly. In the cross-tabulation analysis, the ratios of correct answers across age groups and educational levels were relatively comparable in the first three questions, while persons who attained higher levels of education scored better in the stock market questions.

Table 5: Responses to the Included FINRA Foundation NFCS (2009) Questions

Questions		Correct	Incorrect	Do know	not Refusal
1.	Suppose you had \$100 in a savings account and the interest rate was 2% per year. After 5 years, how much do you think you would have in the account if you left the money to grow?	81%	11%	6%	2%
2.	Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, how much would you be able to buy with the money in this account?	66%	10%	22%	2%
3.	Please tell me whether this statement is true or false. "A 15-year mortgage typically requires higher monthly payments than a 30-year mortgage, but the total interest over the life of the loan will be less".	72%	12%	14%	2%
4.	Please tell me whether this statement is true or false. "Buying a single company's stock usually provides a safer return than a stock mutual fund".	40%	4%	54%	2%
5.	If interest rates rise, what typically happens to stock prices?	16%	35%	45%	3%

Source: Survey Tabulations

4.3 Testing the Main Hypothesis

The results of the regression analysis are presented in Table 6. These results suggest that financial knowledge is statistically significant and has a positive impact on retirement planning. That is, an increase in a person's financial knowledge leads to an increase in his/her retirement planning. One's income was also found to be statistically significant and positively related to retirement planning.

Table 6: Results of the Multiple Regression Analysis

Model	Coefficient	Standard Error
(Constant)	0.007	0.360
Financial Knowledge	0.245***	0.058
Age	-0.239	0.196
Age2	0.040	0.030
Gender (female)	-0.074	0.088
Income	0.087***	0.025
Education	0.032	0.042

Notes: ***, ** and * indicate statistical significance at the 1, 5 and 10 percent levels of testing.

Source: Author's Calculations

5. Discussion

A cornerstone of achieving optimal well-being in retirement is knowing how much savings you need to meet your optimal consumption. Yet, consistent with the literature (see Lusardi, 1999; Lusardi and Beeler, 2007; Lusardi and Mitchell, 2011b) a majority of respondents in the study indicated they were unaware of how much they will need for retirement. For the younger age groups, it can be assumed that due to their longer horizon to plan for retirement, they may exhibit inertia as predicting optimal savings requires stocktaking of one's finances and financial calculations. However, even in the older age groups, the majority still did not know what could be their possible optimal retirement savings. This latter result may suggest that persons in this age group may be incapable of determining how much they need for retirement due to their limited knowledge of financial concepts.

The results on financial and retirement savings instruments suggest that many Barbadians are familiar with, and invest in the basic savings product. Additionally, the existence of household budgets in most cases implied that Barbadians have a basic understanding of money management. However, similar to the findings of Millar and Devonish (2009), more active planning may be necessary. Given the low interest rate environment in Barbados, a better understanding of more sophisticated products, which tend to offer higher returns, as well as being able to rebalance your portfolio to adjust to market conditions, may aid Barbadians in better achieving their retirement goals.

Response to the FINRA Foundation NFCS (2009) Questions were similar to the findings of Lusardi and Mitchell (2017). Particularly for Barbados, financial knowledge may be lacking as it relates to stock market questions because the domestic stock market is underdeveloped and not commonly used directly by the average Barbadian for investment purposes.

The main finding of the regression analysis was in line with much of the literature (Lusardi and Mitchell 2011b; Achari, Oduro and Nyarko 2020; Stella, Filotto and Cervellati 2020). This result confirmed the study's hypothesis that more financial knowledge results in greater retirement planning. This is not

surprising as theory suggests that rational consumers would seek to maximise their utility through an optimal consumption-savings mix in each period over the life span. Therefore, where the consumer satisfaction is not pursued, it may be the case that the consumer lacks the financial knowledge to achieve it.

6. Conclusion

The study used survey data on 170 participants to look at the level of financial knowledge and retirement planning in Barbados, to examine the relationship between them. The findings revealed that Barbadians are underprepared for retirement, and while knowledge of basic financial products and concepts is reasonably observed, many individuals lack an understanding of more sophisticated concepts and products. Overall, financial knowledge was found to have a positive impact on the level of retirement planning in Barbados.

These results are tentative as the sampling technique employed may not capture all segments of the Barbadian population. However, the study still provides some useful implications for national policy. These results can be used to fashion government policy in order to improve social well-being in the retired community and reduce government outlay on retirement assistance and elderly care. An introductory course on financial concepts and products can be added to the secondary school curriculum to equip the youth with techniques and tools they can employ to save for retirement when they enter the working force. Moreover, Barbados' Financial Literacy Bureau can seek to place more emphasis on training for financial retirement planning to ensure that persons are able to determine their optimal retirement savings and make appropriate financial decisions to meet these goals and obtain optimum social well-being.

Given the findings of the study, future research can be conducted to test the relationship between financial knowledge and the value of accumulated retirement savings, which were not considered here. The use of the dollar amount of savings may provide a better indication of participant preparedness, when augmented with income, age and consumption levels.

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Appendix

Appendix 1: Solving the Consumer's Utility Maximisation Problem

$$\begin{aligned} \underset{c_1, c_2}{Max} \quad U(c_1, c_2) &= \frac{c_1^{(1-\theta)} + 1}{(1-\theta)} + \alpha E \frac{c_2^{(1-\theta)} + 1}{(1-\theta)} \\ \text{s.t} \quad Ec_2 &= (m_1 - c_1)(1+r) + m_2 \end{aligned}$$

Applying the Lagrangian method:

$$\mathcal{L} = \frac{c_1^{(1-\theta)} + 1}{(1-\theta)} + \alpha E \frac{c_2^{(1-\theta)} + 1}{(1-\theta)} + \lambda [(m_1 - c_1)(1+r) + m_2 - Ec_2] \quad (A1)$$

Solving for the first order conditions:

$$\begin{aligned} \frac{\partial \mathcal{L}}{\partial c_1} &= c_1^{-\theta} - \lambda(1+r) = 0 \\ \lambda &= \frac{c_1^{-\theta}}{(1+r)} \end{aligned} \quad (A2)$$

$$\begin{aligned} \frac{\partial \mathcal{L}}{\partial Ec_2} &= \alpha Ec_2^{-\theta} - \lambda = 0 \\ \lambda &= \alpha Ec_2^{-\theta} \end{aligned} \quad (A3)$$

$$\begin{aligned} \frac{c_1^{-\theta}}{(1+r)} &= \alpha Ec_2^{-\theta} \\ \frac{c_1^{-\theta}}{Ec_2^{-\theta}} &= \alpha(1+r) \\ \left(\frac{Ec_2}{c_1} \right)^{\theta} &= \alpha(1+r) \end{aligned}$$

$$\frac{Ec_2}{c_1} = [\alpha(1+r)]^{\frac{1}{\theta}}$$

$$c_1 = \frac{Ec_2}{[\alpha(1+r)]^{\sigma}} \quad (A4)$$

Appendix 2: The Consumer's Utility Maximisation Problem When the Intertemporal Elasticity of Substitution is 1

The CRRA utility preferences takes the form: $u(c_t) = \frac{c_t^{(1-\theta)} + 1}{(1-\theta)}$

As the focus of the paper is not the income/substitution effect of the rate of returns on savings, I assume that $\theta = 1$. Using the L'Hospital rule to solve this limit, the function form is now:

$$\lim_{\theta \rightarrow 1} \frac{c_t^{(1-\theta)} + 1}{(1-\theta)} = \lim_{\theta \rightarrow 1} \frac{-\ln c_t}{-1} = \ln c_t \quad (A5)$$

Hence, the consumer's maximisation problem takes the following form:

$$\max_{c_1, c_2} U(c_1, c_2) = \ln(c_1) + \alpha \ln(Ec_2) \quad (A6)$$

Appendix 3: Frequency Table of Demographic Characteristics

Variable		Number of Participants	Percentage of Total (%)
Age	18 to 25	5	3
	26 to 35	61	36
	36 to 45	50	29
	46 to 55	33	19
	56 to 65	21	12
Gender	Male	41	24
	Female	129	76
Marital Status	Married	49	29
	Single	92	54
	Divorce	9	5
	Living with partner	17	11
	Widowed	2	1
Highest Level of Education	Secondary School	24	14
	Associate Degree	11	7
	Bachelor's Degree	73	43
	Master's Degree	39	23
	Technical Certificates	15	9
	Professional Designation	5	3
	Post Graduate Diploma	1	1
Employment Status	Full-time work	144	85
	Part-time work	4	2
	Student	4	2
	Unemployed	11	7
	Contract	1	1

	Self-employed	5	3
Annual Income	Prefer not to say	24	14
	\$20,000 or less	13	8
	\$20,001 to \$40,000	38	22
	\$40,001 to \$60,000	40	24
	\$60,001 to \$80,000	31	18
	\$80,001 to \$100,000	7	4
	Above \$100,000	17	10
Dependents	Yes	111	65
	No	59	35

Source: Survey Tabulations