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Household stock market participation in South Africa: the role of financial literacy and social interactions

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Abstract

Purpose – One of the most important phenomena that have been confronted in the field of household finance is the stock market participation puzzle. The puzzle describes the anomaly that the majority of households do not have ownership of stock market products, though empirically stocks give higher expected returns than risk-free assets. The stock market participation rate plays an important role as it has a direct bearing on the equity premium. In this study, the authors aim to investigate how financial literacy and various proxies of social interaction are associated with stock market participation in South Africa.

Design/methodology/approach – The study uses probit regression and ordinary least squares using the South African National Income Dynamics survey Wave 5 of 2017 to investigate whether financial literacy and social interaction are significantly associated with stock market participation. The financial literacy index is computed using factor analysis on the responses to the financial literacy questions used in the survey. The authors use three proxies for social interaction, namely membership in a Stokvel, membership in a men's association and membership in a women's association.

Findings – The results reveal that an increase in financial literacy increases the odds of respondents participating in the stock market. Among the control variables, age, race and level of education are significantly associated with stock market participation. When it comes to social interaction, it is belonging to a men's association that is significantly associated with stock market participation. The other proxies for social interaction are insignificantly associated with stock market participation.

Originality/value – The study contributes to the extant literature by using a set of proxies for social interaction that have the potential to influence stock market participation which have not been used in a South African context.

Keywords Behavioural finance, Household finance, NIDS, Stock market participation

Paper type Research paper

1. Introduction

According to Haliassos and Michaelides (2003), one of the most important phenomena that have been confronted in the field of household finance is the stock market participation puzzle. The puzzle describes the anomaly that the majority of households do not have ownership of stock market products, though empirically stocks give higher expected returns than risk-free assets. The stock market participation rate plays an important role as it has a direct bearing on the equity premium (Mankiw and Zeldes, 1991) and an understanding of the complexities of stock market participation and therefore helps in understanding the equity premium puzzle of Mehra and Prescott (1985). Also, an increased stock market participation

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rate, especially from the previously disadvantaged demographic groups, would go a long way in resolving some deeply embedded income inequality problems in South Africa.

Globally, retail investors are increasing in financial markets. The increased utilisation of online applications like the Robinhood [1] app in the USA and EasyEquities [2] in South Africa has provided retailers with seamless avenues through which they can participate in the financial markets at low costs. However, though it is now relatively easy for retail investors to participate in the stock market, the growing complexity of financial products available on the stock market has shifted financial risks to households, thereby forcing individuals to bear these risks and in the process amplifying the need for financial literacy.

Different stakeholders in South Africa have been using different avenues in attempts to increase the levels of financial literacy with the hope that this would translate into increased stock market participation. The Johannesburg Stock Exchange (JSE) has been running the JSE Investment Challenge [3] for almost half a century. The initiative gives an opportunity to secondary school learners as well as students at institutions of higher learning to know the basics of investing on the stock exchange by giving them a virtual sum of R1 million which they should invest over six months. The Chartered Financial Analysts (CFA) Society South Africa also provides an annual competition for university students to sharpen their financial literacy skills. In 2004, the government of South Africa adopted the Financial Sector Charter which obliged all financial services companies to set aside 0.2% of their annual profits for the financial education programs of their clients [4]. All these attempts are designed to increase stock market participation. The question is, can these financial literacy programmes translate into increased stock market participation?

Several studies have been done on the linkages between financial literacy and stock market participation in the developed world, thereby making the empirical and theoretical foundations of this important association rooted in the mature markets of the world (Jappelli and Padula, 2013; Lusardi and Mitchelli, 2007). However, individuals in emerging economies confront a different set of constraints than those in mature markets as far as participation in the stock market is concerned. It is therefore of paramount importance to examine the impact of financial literacy on an emerging market from the least developed continent, Africa. South Africa has been chosen because of its continental importance as it is considered the gateway into Africa and therefore the findings have important implications for other African countries. Though some studies were done in an African context (such as Epaphra and Kiwia, 2021; Kuffour and Adu, 2019), the samples used in these studies were not nationally representative as they were only concentrated in a single city, thereby making a generalisation of the findings difficult. In South Africa, Nanziri and Olckers (2019) use the same dataset as the one used in the present study to examine the association between financial literacy and stock market participation. However, in their study, financial literacy was measured by a crude measure where a respondent was adjudged to be financially literate if they correctly answered three out of the four questions on financial literacy they were asked. The present study uses a financial literacy measure obtained from a factor analysis of the responses given by the respondents, and this has been supported in the literature as being more comprehensive than crude measures of financial literacy.

We further expand on the determinants of stock market participation by examining whether social interaction is significantly associated with stock market participation. According to Hong *et al.* (2004), there are various ways through which social interaction might influence stock market participation. First, potential investors might get an opportunity to learn from their peers about the higher returns historically observed in the stock market (Ellison and Fudenberg, 1995). Also, potential investors might be excited to converse about the dynamics of the stock market with fellow participants or friends the same way they would enjoy discussing other topics like sports and books, especially where there are shared interests (Becker, 1991). We explore the potential of social interactions to influence

stock market participation in a South African context. Various proxies of social interaction have been used in existing literature including church attendance, knowledge of neighbours, visiting neighbours (Hong *et al.*, 2004), interaction with friends and membership in a community organisation (Liu *et al.*, 2014). In this study, we use three proxies for social interaction (membership of a Stokvel, membership of men's association and membership of women's association) that have not been used in literature to establish whether they are significantly associated with stock market participation. We hypothesise that the interaction that takes at the three levels identified above might have a significant association with stock market participation. We, therefore, expand the findings from Nanziri and Olckers's (2019) study by looking beyond the individual influences of stock market participation by exploring how the peer effects from social interactions are associated with stock market participation.

Probit regression is used to examine whether there is an association between financial literacy and stock market participation using data from the South African National Income Dynamics Study (SA-NIDS) fifth and most recent wave conducted in 2017. A host of control variables that have been empirically linked with stock market participation are also included in the probit model. The findings show that financial literacy has a positive association with stock market participation. An increase in financial literacy increases the odds of participating in the stock market. Education, race and age are also found to be significant predictors of stock market participation. For the potential association between social interaction and stock market participation, we utilise a traditional ordinary least squares model where our independent variable is stock market participation and our main independent variable is social interaction. Our results reveal that membership in a men's association is significantly associated with stock market participation while belonging to a Stokvel and women's association is not significantly associated with stock market participation.

The rest of the paper is organised as follows: Section 2 reviews the literature, Section 3 outlines the methodology used in the study, Section 4 presents the results as well as the discussion thereof and Section 5 concludes the study.

2. Literature review

2.1 Theoretical framework

According to Lusardi and Mitchell (2014), the conventional economic approach to investment and consumption decisions is premised on the belief that rational individuals tend to consume less than they earn in times of high earnings and will save to support consumption when income falls. Given that scenario, the consumer should therefore be positioned to arrange optimal saving and decumulation patterns in a manner that smoothes marginal utility over a lifetime. The process of optimising saving and decumulation patterns explained above needs consumers to have an understanding of the consumer preferences (e.g. risk aversion and discount rates) and the economic environment (e.g. risky returns on investments and liquidity constraints) (Lusardi and Mitchell, 2014). The problem with such an economic approach is that it implicitly assumes that individuals have the capacity and expertise to formulate and execute investment decisions as well as compute the oftentimes complex economic calculations. In the real world, few people possess the extensive financial knowledge often needed in implementing investment plans as the acquisition of such extensive knowledge comes at a cost.

A recent empirical body of literature has endeavoured to probe how individuals acquire and deploy financial literacy and its links to investment behaviour. Delavande *et al.* (2008) suggest a simple two-period model of consumer saving and portfolio allocation across bonds and risky stocks, allowing for the acquisition of human capital in the form of financial knowledge. The work by Delavande *et al.* (2008) posits that individuals will therefore choose

to optimally invest in the acquisition of financial knowledge to get access to assets that provide higher returns. This acquisition of financial knowledge will help individuals to identify better-performing assets and/or hire financial advisors who can reduce investment expenses.

Theoretically, Hong *et al.* (2004) use a model that compares two classes of investors; socials and non-socials who face fixed costs of participating in the market. For the non-social investor, the fixed cost of stock market participation is not related to the participation decisions of other investors. Conversely, for the social investor, the fixed cost of stock market participation is influenced by the choices of peers. In other words, a social investor is attracted to the stock market when there are peers who already participate.

2.2 Defining and measuring financial literacy

Though several studies have highlighted the importance of financial literacy in financial decision-making behaviour, a universal measurement of financial literacy remains elusive. Marcolin and Abraham (2006) suggest that researchers generally agree on the definition of financial literacy but with no agreed and standardised method of measuring this construct. One of the earliest definitions for the concept of financial literacy can be attributed to Noctor *et al.* (1992) who defined financial literacy as "the financial knowledge that leads to informed decision making". This definition is a two-dimensional definition that firstly comprises financial knowledge which is a consequence of educational programmes, and secondly the ability to utilise the knowledge acquired in making sound financial decisions. Other studies restrict the definition of financial literacy to financial knowledge accruing from educational programmes and dissociate it from the financial decision-making dimension (Hilgert *et al.*, 2003). Lusardi and Mitchell (2014) argue that if individuals possess financial knowledge that they cannot use appropriately, they should be adjudged to be financially illiterate. The OECD (2013) report provides an extensive definition of financial literacy which encompasses financial knowledge and comprehension of that knowledge, skills acquired and confidence to use the knowledge as well as effective decision making.

The wide scope of financial literacy as seen by the different definitions shown above, makes the measurement of the financial literacy construct an uphill task and has often led to different proxies being used in different studies. After coming up with a set of questions presumed to be determinants of the level of financial literacy, some studies (e.g. Bianchi, 2018; Rakow, 2019) use a score of correct answers as a proxy for financial literacy. This is a percentage of correct answers to the total questions asked and uses equal weighting for all contents. Other studies use financial literacy indices extracted from performing a factor analysis on the responses collected to measure the level of financial literacy. In attempts to ameliorate the weaknesses of using equal weights for contents, the OECD (2013) uses an alternative weighted score of correct answers where three levels of weights are used based on the content area, the cognitive process of learning and the context of the study. The present study measures financial literacy by performing factor analysis on responses from financial literacy questions asked in the NIDS survey, details which are included in Section 3.2.2.

2.3 Empirical studies on financial literacy and stock market participation

According to Lusardi and Mitchell (2014), the extent to which individuals participate in financial markets is a result of the awareness they have of the operations, risks and benefits of such markets. The majority of the studies done on the association between financial literacy and stock market participation have been done in developed countries. These studies done in the developed world have affirmed the low literacy levels of individuals, thereby dispelling the misconception that financial literacy depends on the state of economic development of a country (Lusardi and Mitchell, 2011). Low financial literacy levels have been reported even in

developed countries such as Germany, Netherlands and Sweden (Lusardi and Mitchell, 2011). In a study using a survey that included respondents drawn from the Netherlands, van Rooij *et al.* (2011) report that the more individuals are financially knowledgeable, the more they are likely to participate in the stock market. Alessie *et al.* (2021) examine the discrepancy between the financial literacy levels between males and females and conclude that the differences can be attributed to a lack of confidence in the females as a removal of the "do not know" options from the financial literacy questions often leads to the females picking the correct answer. Bianchi (2018) examines the association between financial literacy and stock market participation among French households and reports that financial literacy is highly and positively related to stock market participation.

In Africa, several studies have been done to examine the role of financial literacy on stock market participation in different countries. In Tanzania, Epaphra and Kiwia (2021) used a sample of 484 adult respondents from a population of 130,000 adults residing in Arusha City, Tanzania to examine if financial literacy is important in the decisions of individuals to participate in the stock market. As a measure of financial literacy, Epaphra and Kiwia (2021) use a self-assessment metric where respondents are asked to rate their level of financial knowledge on a scale of 1–10. The study reports that insufficient financial knowledge is responsible for the low levels of stock market participation even for respondents whose wealth and education are high compared to the general population. The study gives important results on the importance of financial literacy on the levels of stock market participation but had a weakness in that all the 484 respondents who took part in the study were drawn from one city, creating potential problems of inferring the results to the whole country. A study by Willows (2019) revealed a weak correlation between the self–assessed financial knowledge and measured financial knowledge, making the use of a self-assessment measure of financial literacy by Epaphra and Kiwia (2021) biased.

Rather than concentrating on the role of financial literacy on stock market participation, Kuffour and Adu (2019), investigate the combined effect of financial literacy and trust on the financial behaviour of 398 respondents drawn from the Kumasi Metropolis of Ghana. Two indices for financial literacy were created for the study. The first metric of financial literacy was attained by diving the number of correct answers by the total number of questions asked while the second index was attained through factor analysis. The results from the study revealed that financial literacy is more important in decisions to participate in the stock market compared to the levels of trust in the financial system. Trust in the study was measured as the perceived reliance on the financial system and included such factors as sound management, quality of investor protection and effective regulation and supervision.

While several studies have looked at the determinants of financial literacy from a South African point of view (e.g. Aboluwodi and Nomlala, 2020; Nanziri and Leibbrandt, 2018), few have explored the linkages between financial literacy and stock market participation. Our study is closer to Nanziri and Olckers (2019) who use wave 5 of the NIDS survey, which is the survey used in the present study, to explore the predictors of financial literacy in South Africa as well as the association between financial literacy and stock market participation. Though the study provided great insights into the role of financial literacy on stock market participation, it used a crude measure for financial literacy. In Nanziri and Olckers (2019), respondents were adjudged to have been financially literate if they correctly answered three out of four of the questions that were used to measure financial literacy in the NIDS survey. In this study, we seek to augment the findings of Nanziri and Olckers (2019) by using an alternative metric of financial literacy using the same questions and survey.

When it comes to the relationship between social interaction and stock market participation, several studies have been done using different proxies of social interactions. Hong *et al.* (2004) report that social households (represented by interaction with neighbours as well as church attendance) have increased odds of participating in the stock market than their

non-social counterparts. Liu *et al.* (2014) divide their proxies of social interaction into traditional ways of social interaction (e.g. interaction with friends) and modern ways of interaction (e.g. presence of broad-band Internet connection at households' residences). The study reported a significant association between both the traditional and modern ways of social interaction *vis-à-vis* stock market participation. Hermansson *et al.* (2022) investigate the effects of learning channels from private networks, financial advisors and the media on stock market participation. The authors report that learning from private networks and from financial advisors does not increase stock market participation. It is actually only learning emanating from media that was reported to be positively associated with stock market participation.

3. Methodology

3.1 Data

The data used in this study are sourced from the SA-NIDS [5] which was the first nationally representative panel data study to be conducted in South Africa. The NIDS is a brainchild of the Department of Planning, Monitoring and Evaluation (DPME) in South Africa and is implemented by the Southern Africa Labour and Development Research Unit (SALDRU) based at the University of Cape Town's School of Economics. The study has 5 completed waves running from 2008 to 2017 with a nationally representative sample of 28,000 individuals in 7,300 households across South Africa. The core survey was repeated with the same households every two to three years. The survey contains a broad array of questions including how households cope with positive and negative shocks, labour market participation, financial market participation etc.

NIDS currently has five waves, with the initial wave having been conducted in 2008 while the most recent wave was conducted in 2017. While the survey currently contains five completed waves, financial literacy questions were only introduced during the last wave of the survey. Thus, only the last wave of the survey is used for this study. According to Daniels *et al.* (2020), attrition of respondents across the NIDS surveys has been concentrated among high-income earners. At the same time, existing research shows a strong correlation between income and financial literacy. The most recent wave of NIDS (for the year 2017) coincided with a top-up sample that targeted high-income households, thereby further strengthening the rationale for using wave 5 only.

3.2 Variables

3.2.1 Dependent variable. NIDS does not provide a variable that directly measures stock market participation. A variable that asks whether respondents have ownership of either mutual funds, stocks or shares is therefore used as a proxy for stock market participation in this study. This approach has also been used to proxy for indirect and direct stock market participation (Hong *et al.*, 2004). A dummy variable is therefore created which is given a "1" if a respondent has ownership of mutual funds, stocks or shares, or "0" otherwise. 99.2% of the respondents reported that they do not own stocks, mutual funds or shares while 0.8% confirmed that they owned mutual funds, shares or stocks. The low stock market participation (0.8%) reflects the importance of the present study to increase participation by retail investors but also becomes a caveat in terms of analysis as the results could be biased from the very low level of participation. Nanziri and Olckers (2019) restrict their subpopulation to the working-age respondents between the ages of 25 and 60 who earn a minimum of 2000 South African Rands from their primary occupation and still end up with very low levels of stock market participation (1.53%). In further robustness checks,

we restrict our sample in line with the restrictions imposed by Nanziri and Olckers (2019) and our results remain qualitatively similar.

3.2.2 Financial literacy and stock market participation. Financial literacy was incorporated into the NIDS survey in 2017. Five questions are used to measure financial literacy and these five questions have also been used in the S & P Global FinLit Survey and the questions are drawn from the Financial Literacy Around the World (FLAT) studies. Four topics related to broad areas of basic finance are incorporated in the five financial literacy questions used in the NIDS survey. These four topics are; numeracy, inflation, compound interest and risk diversification. All four topics are allocated a question each except for the compound interest topic which is allocated two questions. The financial literacy questions included in the last wave of the NIDS survey are included in the Appendix.

The financial literacy index for this study is constructed following van Rooij *et al.* (2011). For each question, a dummy variable is created for respondents who correctly answer the question. Factor analysis is then performed on those binary variables using the iterated principal factor method. Those respondents who refused to answer and those that claimed they do not know are presumed to have answered incorrectly. Since the interest compounding topic has two questions, the study follows Nanziri and Olckers (2019) by considering a respondent to have correctly answered the compounding topic by answering correctly in at least one of the two questions. One factor is retained with the factor loadings shown in Table 1.

Given the factor loadings in Table 1, factor scores are then obtained using the Bartlett method (Bartlett, 1937). To confirm the validity of the financial literacy index computed through the principal component analysis above, the distribution of the financial literacy index is reported across demographic variables such as education, age and gender in Table 2:

As expected, Table 2 shows that basic financial literacy increases strongly with the level of education. The respondents who have the lowest levels of basic financial literacy are concentrated in the lowest educational categories; primary and secondary education. Conversely, the respondents with higher levels of education (from certificate level to postgraduate degree) are concentrated in the highest quartiles of the basic financial literacy index. Table 2 also shows gender differences in basic literacy as women display lower basic knowledge than men. These findings are consistent with Lusardi and Mitchell (2007) who report similar results. However, the difference between the basic knowledge of men and women is narrow and this supports the findings of Nanziri and Olckers (2019) who report similar findings in a South African context using a different methodology for measuring financial literacy. Table 2 also shows that the profile of basic literacy has a hump shape with regard to age. Basic financial literacy is concentrated at higher quartiles in the youngest age groups and this reaches a maximum and starts declining in older age groups. This is consistent with Lusardi and Mitchel (2007) who report a decline in financial literacy in older age groups. Lusardi and Mitchelli (2007) also reports an inverse U-shape in the mastery of financial concepts such as the competence to compute percentages and basic divisions. In Tanzania, Lotto (2020) reported that financial literacy is high for young adults and falls with old age. Laibson *et al.* (2009) argued that people become more financially literate through experience but begin to lose financial literacy in old age due to decreases in cognitive ability.

Table 1.
Factor loadings corresponding to the basic literacy questions

Basic literacy questions	Factor loadings
Numeracy	0.26
Interest compounding	0.27
Inflation	0.18
Risk	0.63

	Basic financial literacy quartiles					
	1 (low)	2	3	4 (high)	Mean	*N*
Education						
Primary	0.391	0.264	0.198	0.147	2.101	3,591
Secondary	0.209	0.264	0.268	0.260	2.571	13,298
Certificate/diploma	0.131	0.213	0.299	0.357	2.881	2,480
Undergrad	0.079	0.161	0.292	0.468	3.150	380
Postgrad	0.069	0.130	0.262	0.539	3.271	347
Others	0.314	0.190	0.124	0.371	2.552	105
			χ^2 (15) = 1198.2***			
Age						
Less than 20	0.217	0.248	0.276	0.259	2.576	2,151
21–30	0.192	0.251	0.283	0.274	2.639	6,244
31–40	0.211	0.255	0.265	0.269	2.591	4,374
41–50	0.234	0.258	0.250	0.258	2.531	3,200
51–60	0.302	0.254	0.222	0.222	2.363	2,808
61–70	0.364	0.249	0.179	0.208	2.231	1,978
70 and above	0.467	0.208	0.166	0.159	2.017	1,298
			χ^2 (18) = 721.28***			
Age						
Male	0.218	0.241	0.272	0.268	2.589	8,905
Female	0.271	0.256	0.235	0.238	2.439	13,148
			χ^2 (3) = 113.31***			

Note(s): The table shows the distribution of the basic literacy index across different levels of education, age groups and gender. The basic literacy index is categorised into four quartiles, and the proportion of individuals in each literacy quartile as well as the mean quartile number is reported for each subgroup of education, age and gender. The weighted percentages as well as Pearson chi-square statistic test the null hypothesis that the distribution of individuals across the 4 literacy quartiles is independent of education, age and gender. *** denotes the statistical significance of the chi-square statistic at $p < 0.001$

Table 2.
Basic and advanced financial literacy across demographics

The basic financial literacy index obtained from the principal component analysis used in this study is therefore consistent with the predictions of theory and empirical literature.

The study also uses a host of variables that have been empirically confirmed as predictors of stock market participation in literature. These variables include age, education, self-employment, gender, race education and income. A list of the control variables used in this study as well as their derivation is shown in Table 3:

The selected control variables are in line with existing literature on the predictors of stock market participation. For example, Guiso *et al.* (2008) report a positive association between age and stock market participation while investors with a college degree are found to have a higher proportion of their capital in risky assets van Rooij *et al.* (2011). When it comes to the role of gender in stock market participation, most studies have observed that stock market participation is lower among women than among men (van Rooij *et al.*, 2011; Nanziri and Olckers, 2019). Campbell (2006) and van Rooij *et al.* (2011) report that stock market participation is directly and significantly associated with income and wealth. Hong *et al.* (2004) report a pronounced link between race and stock market participation with whites, non-Hispanic households having higher participation rates compared to the other races controlling for wealth and education. Because of the historical disadvantage of the black community that arose from the apartheid era, it is therefore hypothesised that blacks are less likely to participate in the stock market than other races. Heaton and Lucas (2000) reported that the financial situation of those individuals who are self-employed is unique. Thus, a dummy variable is included to indicate whether the respondent is self-employed.

Variable	Description	Nature
Age	Number of years lived by each individual	Continuous variable
Gender	Sex of each respondent	Dummy variable: It takes a value of 1 if the respondent is male and "0" otherwise
Income	Represents the logarithm of the monthly income of the respondents	Continuous variable
Education	Represents the highest level of education attained by the respondents and categorised into Primary education, secondary education, certificate/diploma, undergraduate degree and postgraduate degree	Categorical variable: It takes a value "1" if primary education, "0" otherwise; "1" if secondary education, "0" otherwise; "1" if certificate/diploma, "0" otherwise; "1" if undergraduate degree, "0" otherwise; "1" if postgraduate degree, "0" otherwise Reference category: primary education
Self-employment	Whether the respondent is self-employed or not	Dummy variable: It takes a value of 1 if the respondent is self-employed and "0" if not self-employed
Race	The race of the respondents was categorised as black, Asian/Indian, white and other	Categorical variable: It takes a value of "1" if black, "0" otherwise; "1" if Asian/Indian, "0" otherwise; "1" if other, "0" otherwise Reference category: black

Table 3.
Control variables

The youngest respondents in the dataset included in this study are 18 years while the oldest are 110 years. Of the respondents, 40.4% were male while 59.6% were female. The distribution of the respondents by education shows that 17.8%, 65.8%, 1.9%, 1.7 and 0.5% reported their highest level of education attained in primary school, secondary school, certificate/diploma, undergraduate degree as well as postgraduate degree respectively. The majority of the respondents reported that they are not self-employed (94.6%) while only 5.2% professed that they are self-employed.

3.2.3 Stock market participation and social interaction. In examining the linkages between social interaction and stock market participation, our dependent variable (stock market participation) is as previously defined in Section 3.2.1. Our main independent variables (proxies for social interaction) take values of 1 if a respondent is a member of a Stokvel, member of a men's association, member of a women's association respectively or "0" otherwise. According to Hong *et al.* (2004), social interaction might also be related to optimism. To control for that, we use a *Depressed dummy* which takes a value of "1" if a respondent had felt depressed in at least one day in the past five days or "0" otherwise, in line with (Hong *et al.*, 2004). This is done on the premise of a possible relationship between depression and pessimism. Hong *et al.* (2004) reason that sociability might also be influenced by the extent to which individuals are more open-minded and willing to learn new things. Hong *et al.* (2004) control this using a proxy which they termed *Low Tech* dummy that takes a value of "1" if a respondent does not find it difficult to use a computer or word processor or "0" otherwise. In our survey, the question that comes close to this *Low tech* dummy asks respondents whether they are computer literate. Our *Low tech* dummy therefore takes a value of "1" if a respondent has at least some basic use of computers or "0" otherwise. We also control for the risk tolerant behaviour by using a dummy variable *Risk Tolerant* that we extract from the following question in the survey: Is it safer to put your money into one business or investment, or to put your money into multiple businesses or investments? We then assign a value "0" if the respondents answers: "Multiple businesses or investments", and "0" if they answer "One business or investment". We also control for other variables that have been linked with stock market participation namely age, race and education as previously defined in Section 3.2.1.

3.2.4 Econometric models. The study uses the probit regression model to test the association between basic financial literacy and stock market participation. The following specification was used to model the relationship between the dependent variable and the independent variables:

$$Stock\ \ SMP[1,0] = \alpha_1 + \beta_1 FL + \beta_2 Age + \beta_3 Education + \beta_4 Race + \beta_5 Net\ \ income + \beta_6 Self\ \ employed + \varepsilon \quad (1)$$

where the *Stock SMP* [1, 0] is the probability of participating in the stock market, FL is the basic financial literacy index and the rest of the independent variables are defined in Sections 3.2.1 and 3.2.2. To establish the association between stock market participation, we follow Hong *et al.* (2004) by using the following ordinary least squares model:

$$Stock = \alpha_1 + \beta_1 Social + \beta_2 Age + \beta_3 Education + \beta_4 Race + \beta_5 Net\ \ income + \beta_6 Depressed + \beta_6 Low\ \ Tech + Risk + \varepsilon \quad (2)$$

4. Results and discussion

The results of the empirical model to test the association between basic financial literacy and stock market participation using a probit regression model are displayed in Table 4.

The results in Table 4 show that the basic financial literacy variable is positive and significantly associated with stock participation at the highest confidence level ($p < 0.01$). The coefficients reported in the second column of Table 4 are based on log odds. Thus, the 0.2756 coefficient for the basic financial literacy variable implies that a one-unit change in financial literacy leads to a 0.2756 unit change in the log of the odds of stock market participation.

	Coefficients		Odds ratio	Marginal effects	
	Estimate	*z*-value	Odds	Marginal effect	*z*-value
Financial literacy	0.2756*** (0.3154)	−11.451	1.3173	0.0048** (0.001)	3.1200
Education: (primary)					
Secondary	0.2820 (0.2466)	1.144	1.3258	0.0046 (0.0039)	1.2005
Certificate/diploma	0.7221** (0.2489)	2.901	2.0589	0.0233* (0.0127)	1.834
Undergrad	1.0477** (0.2737)	3.828	2.8511	0.0624* (0.0334)	1.8640
Postgrad	1.4403*** (0.2635)	5.465	4.2223	0.1292* (0.0533)	2.424
Other	0.6671*** (0.4907)	1.359	1.9486	0.0269 (0.0357)	0.755
Race (Black)					
Coloured	−0.0023 (0.1448)	−0.016	0.9976	−0.0000 (0.0025)	−0.0161
Asian/Indian	0.6224** (0.2220)	2.803	1.8633	0.0235 (0.0147)	1.5942
White	0.4509*** (0.1244)	3.623	1.5697	0.0131* (0.0058)	2.2593
Other	−2.4324 (99.0751)	−0.025	0.0878	−0.0062*** (0.0011)	−5.3583
Self-employed (NO)					
YES	−0.1062 (0.3140)	−0.338	0.8992	−0.0016 (0.0042)	0.6989
Age	0.0171*** (0.0042)	4.037	1.0172	0.0003*** (0.000)	3.7185
Net income	0.0000 (0.000)	0.025	1.0000	0.0000 (0.000)	0.025
Constant	−3.6125*** (0.3154)	−11.451	0.0357		

Note(s): In the first column, the reference category of nominal variables is shown in brackets. In the second and fifth columns, standard errors are shown in parentheses. ***, ** and * denote statistical significance at the 0.1%, 1% and 5% levels, respectively

Table 4. Probit regression results

In terms of the odds ratios, the results in Table 4 show that for every one-unit increase in financial literacy, the odds of participating in the stock market increase by a factor of 1.317. The marginal effects of the independent variables are also included in columns 5 and 6 of Table 4 for improved intuition. The marginal effects of binary categorical variables measure the discrete change of how predicted probabilities change as the binary independent variable changes from 0 to 1. The findings on the positive association between financial literacy and stock market participation presented in Table 4 resonate well with findings from other studies done both in the developed world as well as emerging markets. In Africa, Lotto (2020), Nanziri and Olckers (2019) and Kuffour and Adu (2019) all document the importance of improved financial literacy in efforts to increase stock market participation.

On the control variables which were used in the model to test the association between financial literacy and stock market participation, education, race and age were found to be significant predictors of stock market participation. Regarding the respondents who only had primary level education as their highest level of education, the odds of participating in the stock market increase with the increase in education from secondary level education to postgraduate level. However, the odds of participating in the stock market for secondary education holders, with reference to the primary school education holders is not statistically significant. Interestingly, the odds ratio for the postgraduate education holders in this regard is the most statistically significant. This corroborates previous studies which have documented the importance of education in stock market participation (e.g. Nanziri and Olckers, 2019). Efforts being made by stakeholders like the Johannesburg Stock Exchange and CFA Society South Africa on investing in the financial literacy of university students will lead to the uptake of more stock market products based on the results of this study. Compared to the black South African respondents, Asian/Indian and white demographic groups had statistically significant increased odds of participating in the stock market. The odds of participating in the stock market of the coloureds compared to the blacks were not statistically different. More should be done in making sure that accelerated intervention programmes on financial literacy are targeted at the black and coloured community.

In the results displayed in Table 5, several points can be noted. First, the only sociability indicator that is significantly associated with stock market participation is belonging to a men's association. Men who belong to a men's association are 3.6% more likely to directly or indirectly own stock market products than their counterparts who do not belong to a men's association. On the other proxies for social interaction (belonging to a Stokvel and a women's association), there is no significant association with stock market participation. Interestingly, Model 1 and Model 2 (showing the statistically insignificant effect of social interaction) are based on a subsample consisting of women only since these two proxies of social interaction are mostly associated with women. This could be a reflection of income inequalities between men and women in South Africa (Hill and Köhler, 2021). Even if women have an opportunity to learn about stock market participation from their peers through social interaction, this might not translate into stock market participation because of the lack of financial resources to commit to investing in stock market products. On the other hand, because men are more financially stable than their female counterparts in a South African context, they are better placed to "action" what they learn from social interactions because of the availability of financial resources.

4.1 Robustness

According to Thomas and Spataro (2018), age captures the life-cycle effects that could influence the behaviour of an individual towards stock market participation. This means that the participation probability of individuals on the stock market increases with age as people become more experienced. However, at older ages, the probability of stock market participation begins to increase at a decreasing rate. In their study, Thomas and Spataro (2018) introduce the square of age into their model to check the quadratic relationship between age and stock market

	Stock market participation		
	1	2	3
Sociability	0.0051 (0.0064)	−0.01025 (0.0131)	0.0365** (0.0188)
Education (primary)			
Secondary	0.0026 (0.0090)	0.0066 (0.0086)	0.0241* (0.0113)
Certificate/diploma	−0.0091 (0.0115)	0.0085 (0.0118)	0.0145 (0.0145)
Undergraduate	0.0291** (0.0171)	0.0610*** (0.0209)	−0.0373 (0.0240)
Postgraduate	0.0468*** (0.0179)	0.02045 (0.0208)	0.0462 (0.0282)
Other	−0.0256 (0.0081)	0.0021 (0.0312)	−0.0201 (0.0365)
Race (Black Africans)			
Coloured	0.0093 (0.0081)	0.0122 (0.0081)	−0.0121 (0.0093)
Asian/Indians	0.0681*** (0.0024)	0.1013*** (0.0308)	0.0381 (0.0608)
Whites	0.0304*** (0.0132)	0.0197 (0.0251)	0.0039 (0.0252)
Net income	0.0000*** (0.0000)	0.0000 (0.0000)	0.0000*** (0.0000)
Age	0.0003 (0.0002)	0.0004 (0.0003)	−0.0003 (0.0003)
Risk tolerant indicator	0.0088 (0.0056)	0.0065 (0.0056)	0.0037 (0.0067)
Depressed indicator	0.00301 (0.0055)	0.0010 (0.0056)	0.0030 (0.0068)
Low tech indicator	−0.0016 (0.0071)	0.0038 (0.0074)	−0.0105 (0.0079)
Intercept	0.9675 (0.0163)	0.9708 (0.0171)	1.0197 (0.0000)
Multiple *R*-squared	0.1164	0.0420	0.0738
Adjusted *R*-squared	0.1088	0.0275	0.0610

Note(s): In models 1, 2 and 3, the sociability indicator is Stokvel, women's association and men's association, respectively. Models 1 and 2 are based on a subsample that consists of women only since these two proxies of social interaction are mostly associated with women. Model 3 is based on a subsample consisting of men only since they are most likely to be members of a men's association. Standard errors are shown in parentheses. *** and ** show statistical significance at the 1 and 5% levels of significance, respectively

Table 5. Social interaction and stock market participation

probability. The model in Equation (1) is re-estimated including the quadratic term of age in line with Thomas and Spataro (2018). The age-squared coefficient is positive and significant at the 1% level and the rest of the independent variables are qualitatively similar to the model without the quadratic term. The results confirm the role of financial literacy in stock market participation as well as the life cycle effects of age. Other studies have examined the determinants of stock market participation at the household level (e.g. Hong *et al.*, 2004). We restrict our sample to only include the household heads (they are more likely to make financial decisions in each household) and remained with 10, 004 respondents (of which 1.39% professed to owning stocks, pensions and mutual funds). The results remain qualitatively similar; financial literacy is positively associated with stock market participation and the control variables maintain the coefficient signs.

4.2 The endogenous problem

According to Thomas and Spataro (2018), the failure to control for endogeneity of financial literacy in a model to test the association between the stock market leads to negatively biased results. Liao *et al.* (2017) posit that experience in financial markets could enhance an individual's financial literacy and therefore used an instrument variable to remedy the potential endogeneity. Lusardi *et al.* (2017) argue that financial literacy can be endogenous and dependent on wealth and this includes stock market wealth. To ameliorate this problem, the authors re-estimated their models using a Generalised Methods of Moments approach utilising instrument variables. The results reported from the present study could therefore be biased by the potential existence of this endogeneity problem. The NIDS survey does not contain potential variables that could be used to avert the problem of endogeneity as used in existing literature to create instrument variables. This should therefore be taken into consideration when interpreting the results of this study.

5. Conclusion

The study sought to examine the role of financial literacy and social interactions in decisions to invest in the stock market in South Africa while controlling for demographic factors. The study used a sample of 22,052 respondents selected from wave 5 of the SA-NIDS survey conducted in 2017. First, financial literacy was found to significantly increase the odds of one participating in the stock market. Also, higher educational levels were associated with increased odds of participating in the stock market. Compared to blacks, coloureds, Asians/Indians, as well as whites, had increased odds of participating in the stock market. In terms of social interaction, it is only membership in a men's association that is positively and significantly associated with stock market participation. The other proxies for social interaction (membership of a Stokvel and membership of a women's association) are insignificantly associated with stock market participation. Though it has been documented that many economies have introduced national strategies for financial education (Liao *et al.*, 2017), it would be more efficient in a South African context to start with the most vulnerable groups which this study has identified as the less educated, females and blacks. The study also recommends that financial knowledge be enshrined into the national compulsory curriculum starting at advanced secondary school years so that the younger generation appreciates the dynamics of stock market investing. To the curators of the SA-NIDS survey, it is recommended that the survey includes some advanced financial literacy questions so that models that include both basic financial literacy as well as advanced financial literacy can be easily specified from the variables in the survey. Future studies could explore the association between financial literacy and other financial behaviours like retirement planning and risk-taking.

Notes

1. Robinhood is a free-trading app that lets investors trade stocks, options, exchange-traded funds and cryptocurrency without paying commissions or fees.
2. EasyEquities is a South African online platform which allows anyone to buy shares in the brands and companies they love for as little as R5 (local investments) and $10 (international investments)
3. https://university.jse.co.za/University/About
4. https://www.povertyactionlab.org/evaluation/evaluating-effectiveness-financial-literacy-program-south-africa
5. The adult questionnaire can be accessed at http://www.nids.uct.ac.za/nids-data/documentation/questionnaires/wave-5

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Appendix
Financial literacy questions

(1) Numeracy: Suppose you need to borrow R100. Which is the lower amount to pay back: R105 or R100 plus three percent?

- R105
- *R100 plus 3%*
- Don't know
- Refused

(2) Inflation: Suppose over the next 10 years the prices of the things you buy double. If your income also doubles, will you be able to buy less than you can buy today, the same as you can buy today, or more than you can buy today?

- Less
- The *same*
- More
- Don't know

(3) Compounding 1: Suppose you put money in the bank for two years and the bank agrees to add 15 percent per year to your account. Will the bank add more money to your account the second year than it did the first year, or will it add the same amount of money both years?

- *More*
- The same
- Don't know
- Refused

(4) Compounding 2: Suppose you had R100 in a savings account and the bank adds 10 percent per year to the account. After five years, if you did not remove any money from the account, would you have . . .

- *More than R150*
- Exactly R150
- Less than R150
- Don't know
- Refused

(5) Risk diversification: Suppose you have some money. Is it safer to put your money into one business or investment, or to put your money into multiple businesses or investments?

- One business or investment
- *Multiple businesses or investments*
- Don't know
- Refused

	Numeracy	Inflation	Compounding 1	Compounding 2	Diversification
Correct	0.4695	0.4255	0.5560	0.5754	0.5006
Incorrect	0.4344	0.4731	0.3372	0.3123	0.3790
Don't know	0.0876	0.0979	0.1016	0.1088	0.1139
Refused	0.0082	0.0034	0.0050	0.0033	0.0062

Table A1. Distribution of how respondents answered the financial literacy questions

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