

GENERAL & APPLIED ECONOMICS | RESEARCH ARTICLE

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Financial behavior, confidence, risk preferences and financial literacy of university students

Calvin Mudzingiri^{1*}, John W. Muteba Mwamba² and Jacobus Nicolaas Keyser³

Abstract: This study investigates determinants of financial behavior (FB) of university students at a university in South Africa. It examines whether financial behavior, confidence, time preferences, risk preferences and financial literacy perceptions of university students differ by financial literacy level. Data were gathered via a questionnaire that included personal information, FB, financial perceptions and financial knowledge responses as well as a multiple price list (MPL) risk preferences and time preferences experiment tasks. A convenient total sample of 191 students (females = 53%) participated in the study. A *t*-test analysis showed that FB, risk preferences, confidence levels, time preferences and financial literacy perceptions of university students significantly differed by financial literacy level. Our results show that university students with low financial literacy levels are more overconfident, risk loving and impatient; such FB is synonymous with major causes of financial crises across the world. An OLS regression model analysis showed that the risk preferences index, financial literacy perception index and confidence significantly influenced the FB of categorized university students. The risk preference index significantly influenced debt FB of categorized university students. In order to



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PUBLIC INTEREST STATEMENT

This study investigates whether there are significant differences in financial behavior, confidence, risk preferences, time preference and financial literacy perceptions of university students with different levels of financial literacy. It examines whether confidence, financial literacy perceptions, risk preferences, time preferences, financial literacy an individual characteristics influence financial behavior of university students. The results show that there is significant difference in confidence, financial behavior, risk preference, financial literacy perception, financial decision status and time preferences of university students by their level of financial literacy. University students with low levels of financial literacy are more overconfident, more risk loving and more impatient. Our findings also show that financial behavior of categorised university students is significantly influenced by confidence, risk preferences, financial literacy perceptions and financial decision status. Providing factual financial literacy to university students can provide the correct dose of confidence, patience, perceptions and risk aversion attitude.

understand the FB of university students, one should take cognizance of their preferences, financial knowledge, confidence and personal characteristics.

Subjects: Social Sciences; Behavioral Sciences; Economics, Finance, Business & Industry; Education

Keywords: financial behavior; confidence; risk preferences; financial literacy; university students

JEL classification: C91; G4; G41; I22

1. Introduction

Financial behavior (FB) can play a pivotal role in influencing the welfare of individuals in a household, society, nation and the world at large. A set of observable financial activities by economic agents best describes FB. Such evident behavior is mainly influenced by one's identity, wants, knowledge, performance, achievement, personal characteristics, significance and psychological factors (Bergner, 2011; García, 2013). Individuals who exhibit financial knowledge and can execute financial activity to improve their welfare are known to be financially literate. The quest to understand what drives FB is invaluablely critical—especially considering the advent of financial crises, which generally negatively affect the welfare of individuals across the social divide (Bernanke, 2006).

Economics literature suggests that when agents make decisions, they tap into all available information to make choices that maximize their utility, profit and wellbeing. Further, the rational expectation theory of Robert Lucas holds that economic agents have an unlimited ability to process information—which enables them to make well-informed choices (Sargent, 1986). Behavioral finance literature have since refuted this assertion (García, 2013; Thaler & Sunstein, 2008). Behavioral economists believe that market systems are riddled with imperfections, risk, uncertainty and rigidities that prevent information from being readily available. Behavioral economics contends that making decisions in such an environment is susceptible to “cognitive biases” and “bounded rationality” (García, 2013).

Internal factors that affect FB are cognitive ability and psychological factors, while external factors include social and economic conditions (Capuano & Ramsay, 2011). The theory of planned behavior contends that financial knowledge interacts with financial attitudes, subjective norms and perceptions to stimulate FB (Koropp, Kellermanns, Grichnik, & Stanley, 2014). Financial literacy is exhibited through financial knowledge and the capability to make use of acquired financial knowledge to improve one's welfare (Atkinson, McKay, Collard, & Kempson, 2007; De Meza, Irlenbusch, & Reyniers, 2008). Financial literacy traits are highly associated with cognitive abilities (Delavande, Rohwedder, & Willis, 2008; Lusardi & Mitchell, 2008). This makes it plausible to represent financial knowledge as cognitive abilities exhibited by university students. Our study is framed around the theory of planned behavior by Ajzen (2011) where we explore interactions between financial knowledge, perceptions, individual characteristic, attitudes and financial behavior.

This study seeks to explore factors that influence the FB of university students. The research examines factors that impact FB across the financial literacy level and gender of university students. We explore whether confidence and psychological aspects such as risk preferences and time preferences significantly influence students' FB. Our study seeks to answer the following questions; i) Are there variations in financial behavior, confidence levels, risk preferences, time preferences, financial literacy perception and decision making status of university students with different levels of financial literacy? ii) Does confidence, risk preferences, time preferences, financial literacy perceptions and decision-making status influence financial behavior of university students?

A total of 191 students at the University of the Free State in South Africa participated in a MPL risk preferences and time preferences eliciting experiment on 27 August 2016 (Andersen, Harrison, Lau, & Rutström, 2008; Holt & Laury, 2002). The students also completed a questionnaire that documented personal information, FB, financial perceptions and financial knowledge. Financial knowledge was measured using a 30-question financial literacy test which was included in the questionnaire. We constructed variables confidence, a risk preference index (RPI), time preferences index (TPI) and financial literacy perception index (FLPI) from the data collected. Our study is confined to three FB outcomes of university students; namely, personal finance behavior, saving and investment behavior, and debt behavior. The choice of the FB outcomes is informed by their relevance to university students.

There is evidence that South African citizens are faced by high levels of consumer debt, low saving rates, proliferation of fraudulent financial schemes, high product service and penalty fees, lack of available and comparable pricing information as well as limited information on recourse mechanisms (Struwig, Roberts, & Gordon, 2013). About 40% of respondents of the Gauteng City-Region Observatory Quality of Life Survey 2015 indicated that they had some form of debt in their name (Joseph & Culwick, 2015). It is therefore important to understand the determinants of FB of South African citizens and university students are not exceptions. There is a need to understand what drives personal finance and debt behavior of university students in light of their financial literacy.

The gap between one's level of financial literacy and perceptions of one's financial literacy generate the level of confidence one holds. Higher perception levels coupled with very low levels of financial literacy make one overconfident, while the reverse leaves one to be less confident (Allgood & Walstad, 2016). Being overconfident or less confident may result in an individual ignoring crucial market signals that may be pivotal in making financially beneficial decisions. Skewed confidence levels may result in an individual having "cognitive biases" and may take short cuts in decision making.

Evidence on financial literacy confidence levels of economic agents are mixed. Barber and Odean (2001) conclude that overconfidence leads to investing in riskier stock positions. In an experimental study, entrepreneurs who were overconfident invested in business with low probability of success (Camerer & Lovallo, 1999). Financial confidence is important in making investment and savings decisions. Hung, Parker, and Yoong (2009) contend that confidence in financial knowledge helps individuals make better financial decisions. In addition, there are mixed findings on financial perceptions, knowledge and FB available. Parker and Stone (2014) found that perceived and actual knowledge positively influence retirement planning. Lusardi and Mitchell (2011) established a positive correlation between actual knowledge and perceived knowledge among US citizens. Conversely, Agnew and Szykman (2005) concluded that actual and perceived knowledge of investment varied greatly based on individual characteristics.

FB has been linked to individual risk preferences, time preferences, knowledge, perceptions, personal characteristics and other psychological factors (Lusardi & Mitchell, 2011; Meier & Sprenger, 2013). Forms of cognitive bias that create bounded rationality (better known as heuristics or shortcuts in financial decision making) are essentially driven by individual preferences and financial literacy (García, 2013). Furthermore, there is evidence in neuro-economics research that brain areas generating emotional states process information about risk, suggesting that emotions impact financial decisions (Kuhnen & Knutson, 2011).

A number of studies have concluded variation in risk preferences and time preferences across individuals, gender and groups. Women were found to be risk averse in a laboratory experiment (Fehr-Duda, De Gennaro, & Schubert, 2006). Baker and Nofsinger (2002) found that higher cognitive ability is associated with investing in higher risk stocks. Individuals unwilling to receive financial education were found to be impatient (Meier & Sprenger, 2013). Van Rooij, Lusardi, and Alessie (2011), in turn, found that subjects who invested on the stock market were more financially literate than others,

showing that participation in financial decisions increase financial knowledge. What has not been determined so far, though, is whether there is variation on FB, risk preferences, confidence, decision-making status and time preferences for university students with different levels of financial literacy. In addition, there is need to examine factors that influence financial behavior of university students.

Our study can be compared with the following studies: Allgood and Walstad (2016), LaBorde and Mottner (2013) and Németh (2014). In a national survey among United States adults, Allgood and Walstad concluded that FB is influenced by actual and perceived financial literacy. On the other hand, in a survey conducted in Hungary, Nemeth found that higher education students are generally overconfident and risk averse. In a study focusing on undergraduate students, LaBorde, Mottner and Whalley found that financial perceptions are generally higher than actual financial literacy. People with low IQs were found to be impatient and risk averse (Dohmen, Falk, Huffman, & Sunde, 2010). Our study is unique in that it collects data on FB, actual and perceived financial literacy knowledge and then intertwines the evidence with MPL experimentally elicited risk preferences and time preferences attitudes. The study adds a psychological dimension to factors that influence FB of university students (Koch & Nafziger, 2015).

Our study concluded that confidence, risk preferences and financial literacy perceptions significantly influence the FB of categorised subjects. Low financial literacy university students are more overconfident, more risk loving and more impatient. Risk preferences significantly impact debt behavior in university students. Other variables that significantly influence FB are income, decision-maker status, age, degree enrolled for and geographical location. Providing financial literacy education to students with low financial literacy improves their confidence, risk preferences and time preference choices.

The study is organized as follows. The next section focuses on methodology and the definition of variables. This is followed by results and findings, leading to discussion and conclusion in the final section.

2. Materials and methods

The study uses financial literacy questions adapted from the National Financial Capability Study (NFCS) and Jump Start and Knowledge Assessment Survey Questions (LaBorde & Mottner, 2013; Lusardi & Mitchell, 2011; Mandell, 2008). The questionnaire included questions on personal information, financial literacy perceptions, FB and financial knowledge responses. To elicit risk preferences and time preferences, the respondents participated in eight MPL tasks (Andersen et al., 2008). The subjects played a total of four risk preferences and four time preferences tasks, which were standardized and modified by the Research Unit in Behavioral Economics and Neuro-economics (RUBEN) at the University of Cape Town in South Africa to suit the South African context.

The set of financial literacy responses focused on personal finance (money management), debt, savings and investment, retirement and insurance. After carefully analyzing responses that reflect actual FB of university students, we decided to base our study on personal finance, saving and investment, and debt responses only. Our FB and financial literacy perception variables were predicted using factor analysis. All the variables have a Cronbach Alpha above (0.7) (the results can be provided on request). We also constructed three indices; namely, a RPI, time preference index (TPI) and financial perception index. We then constructed a confidence variable that shows whether a respondent is overconfident, neutral or less confident. Our analysis also includes personal characteristics of the university students. All subjects that scored a mark above average were categorized as belonging to the high-financial-literacy group, while those that scored a mark below average were classified as belonging to the low-financial-literacy group.

The study uses a model specification by Bergner (2011), which specifies FB as a function specified as follows:

$$FB = f(\text{knowledge}; \text{psychological factors}; \text{perceptions}; \text{personal characteristics})$$

The study uses a *t*-test analysis and Ordinary Least Squares analysis to explore variables that significantly influence FB of university students. Knowledge is represented by the financial literacy test score, while confidence, risk preferences and time preferences stand for psychological factors. We also included a set of personal characteristics in our regression models.

2.1. Sample

We collected data from a total convenient sample of 191 University students (females = 53%) at the University of the Free State in South Africa at the beginning of the second semester on 27 July 2016. All students who participated in the study were enrolled in the Faculty of Economic and Management Sciences pursuing some Bachelor of Commerce degree. The students were also enrolled for a financial literacy module known as “Personal Finance”. The students majored in economics, investment, law, administration, accounting, entrepreneurship, marketing, business management or human resources. Program majors that had a few respondents were grouped together and represented as “Other degree” in our analysis. University students were invited by way of email via a university internet platform known as Blackboard to participate in the study that included completing a questionnaire, a financial literacy test and MPL time preference and risk preferences experiments. Email was sent to over 400 students; 221 turned up and 191 students’ responses were used in the study. Participation in the study was voluntary; students completed the consent form and received R50 for participating in the MPL risk preference and time preference experiments. A total of 10% of students were randomly selected and paid prizes in line with their choices in the experiments.

The high cost of running an experiment and the easy accessibility of university students were the major reasons we settled for a convenient sample. Convenience sampling is a non-probability sampling method suitable for a target population meeting certain criteria, easily accessible, geographical proximity, available at a given time and willing to participate in the study (Etikan, 2016). For a population of 100, assuming a margin of error of 3%, alpha of 1% and $t = 2.58$ a sample of 68 observations can be used for continuous data regression while for a margin of error of 5% and a $t = 2.58$, a sample 87 observation can be used for categorical data (Kotrlík & Higgins, 2001). Our sample falls within the required threshold.

3. Defining variables

3.1. Financial behavior

We asked a set of financial literacy behavior questions with a seven-point Likert Scale response, where ‘1’ represents “never” and ‘7’ “always” on the following FB outcomes: debt, saving and investment, and personal finance. Saving and investment questions were as follows:

- (i) How often have you considered saving and investing your money?
- (ii) To what extent are your current savings and investments satisfying your personal needs?
- (iii) How often are you frustrated when you fail to have the opportunity to save and invest?
- (iv) How often do you dream about investing and saving money one day?
- (v) How likely are you prepared to start saving and investing if the opportunity arises?
- (vi) How often have you looked for information on savings and investment?

The set of FB questions were asked on all FB themes under study. The variable FB is split into three; namely, financial behavior, personal finance and debt behavior. In order to construct the variable FB, we predicted a variable using factor analysis from FB responses, saving and investment, personal finance and debt FB. In a similar way, we constructed the variable personal finance from saving and investment and personal finance responses using factor analysis. The variable debt behavior was predicted using factor analysis from debt FB responses.

3.2. Financial literacy perceptions

Students responded to a set of financial literacy perception statements with a seven-point Likert Scale, where '1' represents "strongly disagree" and '7' "strongly agree" on the following themes: debt, saving and investment, and personal finance:

- (i) I know what makes me a good or bad credit risk.
- (ii) I understand what affects the credit terms I am offered by different lending institutions.
- (iii) I am comfortable with my ability to make decisions about savings instruments based on their fixed and compounded interest rates.
- (iv) I understand the general relationship between risk and reward in investing.
- (v) I feel confident in my understanding of the differences between bonds, stocks, U.S. Treasury bills and mutual funds.
- (vi) I feel comfortable with my understanding of the various financial terms that go along with buying a home someday.
- (vii) I understand what personal net worth means.
- (viii) I am confident in my ability to write a monthly budget.

3.3. Risk preference index

The RPI is constructed from risk preference parameter choices elicited from four risk preference tasks over the university students' financial knowledge. We recorded the risk preference parameter on the initial switching point for an individual in the MPL experimental tasks. We calculated the average individual risk parameter for the four tasks and then divided it by the test score in the 30-question financial literacy test:

$$RPI = \frac{\text{average risk preference parameter}}{\text{financial literacy test score}}$$

The cumulative density graphical representations of the risk preferences index values show that subjects with low financial literacy are more risk loving when compared to subjects with high financial literacy (Figure 1). There is a wider variation on RPI values calculated for low financial literacy subjects when compared to subjects with high financial literacy. The RPI values for low financial literacy university students are cumulatively bounded between $-8 < RPI < 1$ whereas the RPI values for high financial literacy subject are between $-1 < RPI < 1$. Negative values of RPI reveal a risk-loving attitude; figures around 0 reveal a risk-neutral attitude; and positive RPI values reveal a risk-aversion attitude. The kernel density representation shows that RPI values for those with

Figure 1. RPI cumulative.

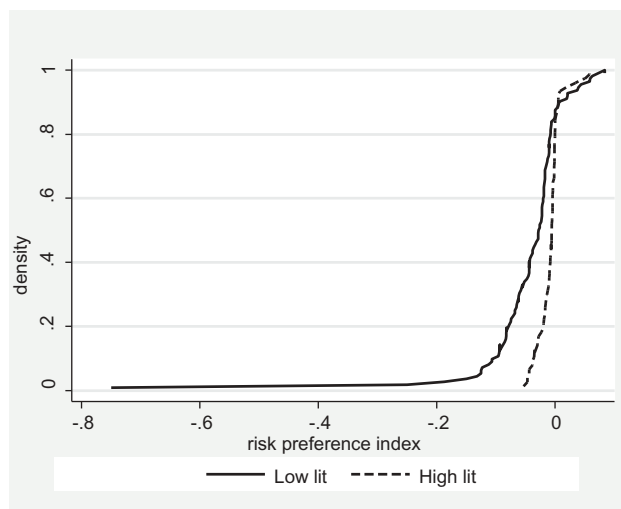
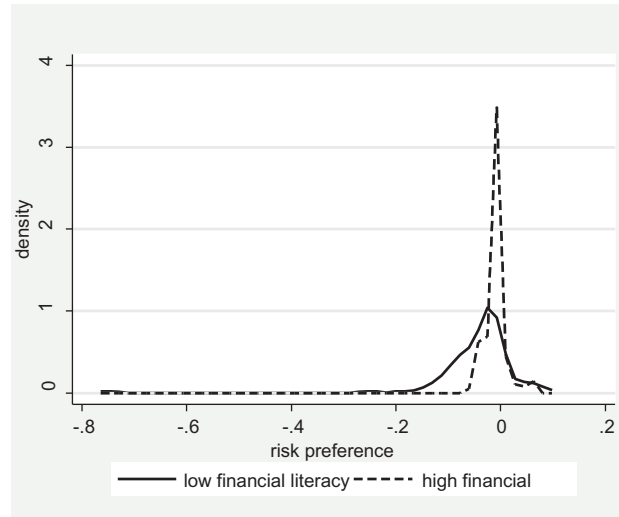


Figure 2. RPI kernel.



high financial literacy are concentrated around 0, reflecting that the subjects are generally risk neutral (Figure 2).

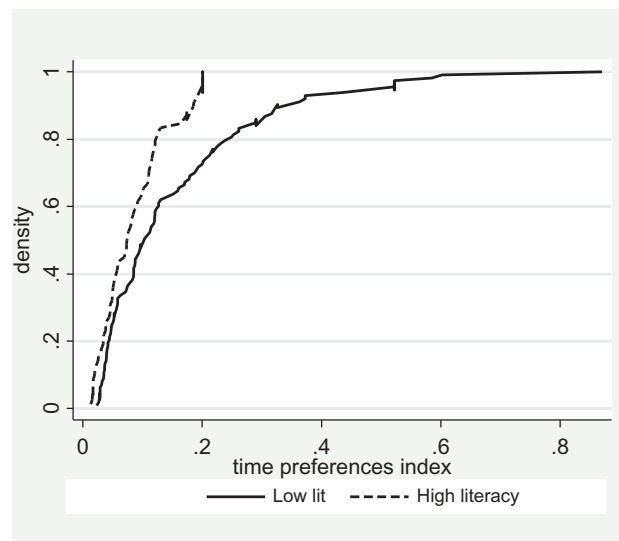
3.4. Time preference index

The TPI is constructed from time preference discount rates choices elicited from (four) time preference tasks, given individual financial literacy knowledge measured by financial literacy test score. We recorded the discount rate on the initial switching point for an individual on lottery options in the MPL time preference tasks. We calculated the average individual time discount rate for the four tasks and then divided it by the test score in the 30-question financial literacy test:

$$TPI = \frac{\text{average time preference discount rate}}{\text{financial literacy test score}}$$

The cumulative density graphical representation for TPI values show that high- financial-literacy subjects exhibited low calculated indices when compared with respondents with low financial literacy (Figure 3). The TPI values for high-financial-literacy university students' cumulative range are $0 < TPI < 0.2$ while those for the low-financial-literacy university students' range are $0 < TPI < 0.9$.

Figure 3. TPI cumulative density.



Low calculated TPI values show that high- financial-literacy subjects were more patient when compared to low-financial-literacy subjects. Higher financial literacy has been found to be associated with a higher level of patience (Van der Pol, 2011). Put differently, the graphical representation shows that low-financial-literacy subjects' TPI values are high—revealing that they were more impatient when compared to subjects with high financial literacy. People with low IQ were found to be impatient (Dohmen et al., 2010).

The TPI values for high-financial-literacy university students are clustered around $0 < TPI < 0.3$ on the kernel density distribution, while those for low-financial-literacy subjects are widely spread in respect of $0 < TPI < 0.7$ (Figure 4).

3.5. Financial literacy perception index

We constructed FLPI values by predicting a perception variable using factor analysis, then divided the value by the financial literacy test score:

$$FLPI = \frac{\text{financial literacy perception}}{\text{financial literacy test score}}$$

Figures 5 and 6 show a clear distinction in the FLPI between high- financial-literacy and low-financial-literacy university students.

The FLPI values for high financial literacy subjects are cumulatively clustered on a short range $-5 < FLPI < 2$ while values for low financial literacy are spread over a wide range $-14 < FLPI < 6$.

3.6. Confidence (C)

To measure confidence (C), we considered university students' financial literacy perceptions and actual financial knowledge, that is, test score in the financial literacy test:

$$C = \text{financial perceptions} - \text{financial literacy test score}$$

To measure financial literacy perceptions, we used Lusardi and Mitchell's (2011) statement with a seven-point Likert scale response, where '1' represents "strongly disagree" and '7', "strongly agree". The subjects had to respond to the statement, *I am good at dealing with day-to-day financial matters, such as checking accounts, credit and debit cards, and tracking expenses*. Financial literacy perceptions were divided by 7 and financial literacy test scores by 30 to scale the variables to the same level. The two variables were scaled to 1.

Figure 4. TPI kernel density.

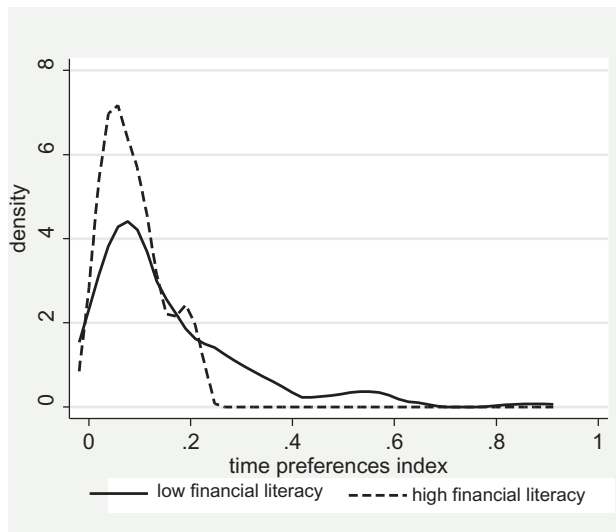
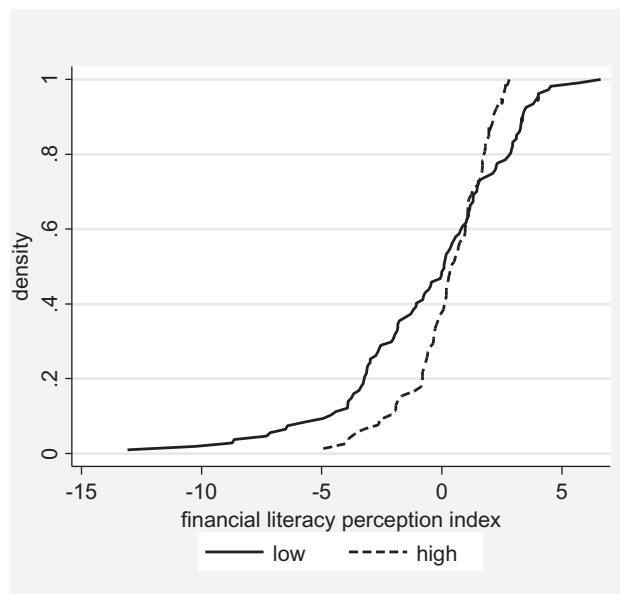


Figure 5. FLPI cumulative density.



The cumulative density representation of the variable confidence shows that subjects with low financial literacy were more overconfident than subjects with higher financial literacy (Figure 7). The range of confidence cumulative density values for low-financial-literacy students was $(-0.3 < C < 0.8)$, while the range of confidence values for high-financial-literacy students was $(-0.6 < C < 0.5)$. The kernel density graph for low financial literacy university students is more skewed to the right, showing overconfidence among the subjects (Figure 8). Although the graphical representations show that all subjects were generally overconfident, low-financial-literacy subjects exhibited higher levels of overconfidence, suggesting that the source of sub-optimal FB in lower-financial-literacy subjects is driven by the confidence gap. The findings that low financial literacy university students are risk loving, overconfident and impatient are confirmed in the *t*-test analysis below. A research by Barber and Odean (2001) concluded that overconfidence leads to investing in riskier stock positions.

Figure 6. FLPI kernel density.

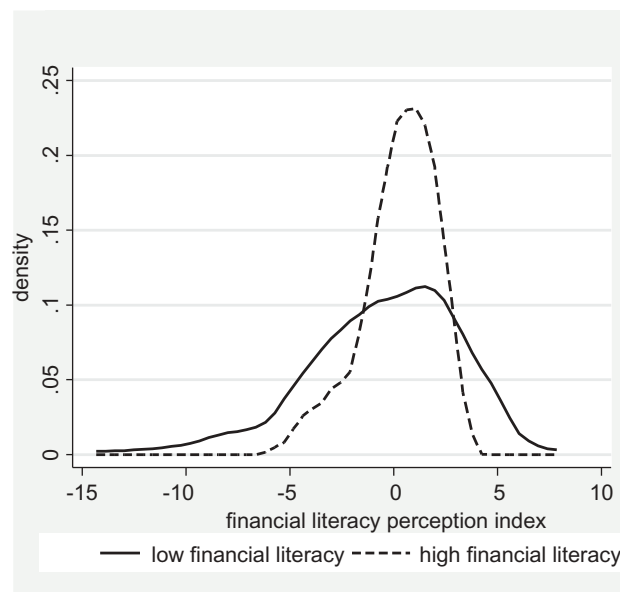
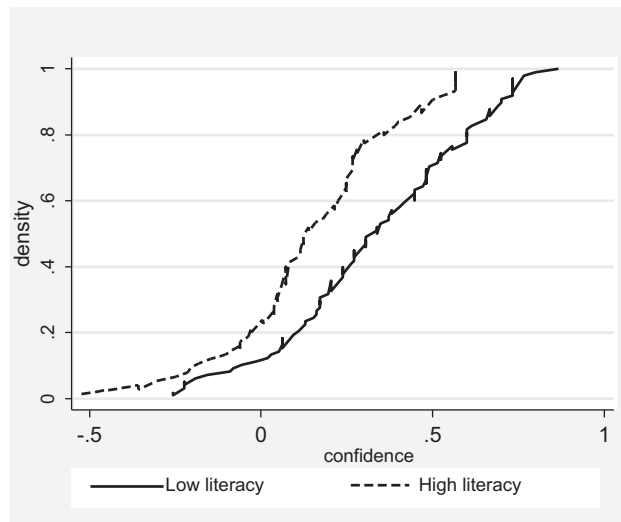


Figure 7. Confidence cumulative density.



4. Results and findings

4.1. Analysis using t-test by financial literacy level

We investigated whether there is significant difference in FB across financial literacy level using responses from savings and investment, personal finance (money management) and debt behavior responses (Table 1). Our results show a significant difference at 5% level in personal finance behavior by the level of financial literacy of the subjects. Our results furthermore show a weak significant difference in financial and debt behavior of university students by their financial literacy level at 10%. These results confirm that FB differ if individuals have different levels of financial literacy, which strengthens the argument that high-financial-literacy individuals achieve better life outcomes (Lusardi & Mitchell, 2005). The variation in financial behavior by financial literacy might explain why low financial literacy individuals achieve poor financial life outcomes. It also confirms what the theory of planned behavior contends, that is, financial knowledge influences financial behavior (Ajzen, 2011). The variation in FB can be improved by availing financial literacy on those with low financial literacy. Turning to the variable confidence, our results show a significant difference at 1% level in confidence levels of subjects by their level of financial literacy. Being over- or under-confident can increase challenges in making financial decisions either by increasing cognitive biases and making short cuts

Figure 8. Confidence kernel density.

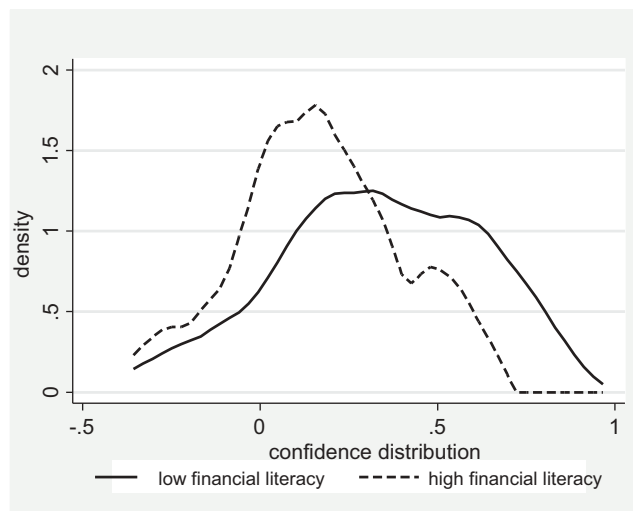


Table 1. t-test analysis by financial literacy level

Variable	Low financial literacy	High financial literacy	t-statistics
Financial behavior	-0.072593 (0.0897019)	0.1299613 (0.0986747)	$t = -1.5189^*$
Personal finance	-0.107605 (0.0864954)	0.1728434 (0.0961405)	$t = -2.1686^{**}$
Debt behavior	0.1133886 (0.0877871)	-0.1338221 (0.0889675)	$t = 1.9779^*$
RPI	-0.0440142 (0.0079607)	-0.0083771 (0.0022964)	$t = -4.3012^{***}$
Confidence	0.3338678 (0.0278756)	0.1530794 (0.0280137)	$t = 4.5746^{***}$
FLPI	-0.4917 (0.2686843)	0.3400647 (0.1949713)	$t = -1.9398^*$
TPI	0.1575176 (0.0141091)	0.0861551 (0.0064175)	$t = 4.6040^{***}$
Decision making status	2.135135 (0.076241)	1.884615 (0.0947872)	$t = 2.0594^{**}$

Mean and standard errors in brackets represented in the table.
 Standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

(García, 2013). Confidence levels among university students help them make decisions. Our results show that confidence levels in financial decision making of university students play an important role.

Being overconfident results in an individual failing to take note of market signals that may assist in making an optimal decision. Over confident individuals are more likely to invest in riskier financial stocks (Barber & Odean, 2001). Variation in confidence by financial literacy might help us to explain why more people with low financial literacy are more likely to participate in money pyramids and “ponzi” schemes which are a common feature in South Africa. On the other hand, being less confident may result in someone making sub-optimal financial decisions. Our findings also confirm significant differences of subjects’ RPI, TPI, FLPI and decision-making status by their level of financial literacy. This also shows that risk preferences, financial literacy perceptions and time preferences differ across levels of financial literacy. If this is true in the real world, then people with different levels of financial literacy would achieve different financial life out comes. Financial literacy influences perceptions and preferences for university students.

4.2. Analysis using t-test by gender

We investigated whether there is significant difference in FB across gender. Our results found no significant difference in FB, personal finance behavior and debt behavior by gender for university students (Table 2).

There is also no significant difference in confidence levels, decision status, RPI and FLPI—implying that for university students, gender is not a barrier to FB and decision making. We found a weak significant difference at 10% on TPI by gender. These results are similar to that of Wagland and Taylor (2009), who found that gender is not significant for University of Western Sydney students’ decision-making ability. Our t-test findings confirm that financial literacy plays a vital role in modeling FB of university students. Financial literacy also influences confidence levels, preferences, decision-making status and financial literacy perceptions—which, in turn, impact students’ FB.

Table 2. t-test analysis by gender

Variable	Male	female	t-statistics
Financial behavior	-0.0020563 (0.0942001)	0.0333982 (0.0943252)	$t = -0.2660$
Personal finance	-0.0091703 (0.0926042)	0.0347411 (0.0913592)	$t = -0.3376$
Debt behavior	0.0131522 (0.0858334)	0.0039518 (0.092808)	$t = 0.0728$
RPI	-0.03385 (0.009095)	-0.0257013 (0.0048771)	$t = -0.7896$
Confidence	0.2789632 (0.0306598)	0.235765 (0.0288143)	$t = 1.0267$
FLPI	0.1026325 (0.2967438)	-0.4037829 (0.3057562)	$t = 1.1885$
TPI	0.142711 (0.0149919)	0.1158657 (0.010825)	$t = 1.4518^*$
Decision making	1.988764 (0.0882447)	2.07 (0.0819645)	$t = -0.6745$

Mean and standard errors in brackets represented in the table
 Standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

4.3. Determinants of financial behavior of university students

In a bid to understand how financial literacy interact with psychological factors—such as risk preferences, time preference and confidence in influencing FB—we carried out a set of regression analyses split by gender and financial literacy. Only the financial literacy perceptions index (FLPI) significantly influenced the FB of all subjects (Table 3). For male university students, the RPI, confidence and FLPI significantly influenced FB. Confidence and risk preferences were found to interact in accepting bets with average that steadily decline with increasing confidence (Goodie, 2005). It follows then that risk preferences, confidence levels and financial literacy perceptions significantly influence FB in male students. Turning to female subjects, our results show that FB is significantly influenced by confidence only.

Revealing that confidence levels in female university students play a significant role in their financial behavior. Overconfidence or less confidence may lead to suboptimal choices hence, financial literacy initiative should focus more on factual knowledge and skills to assist university students to have an appropriate dose of confidence (Asaad, 2015). Our regression model for subjects with low financial literacy show that RPI and confidence significantly influence FB.

RPI and FLPI significantly impact FB for subjects with high financial literacy. The regression analyses in Table 3 could not confirm a significant impact of TPI on FB. Stated differently, time preferences do not significantly influence FB of university students. We investigated factors that influence personal finance behavior (Table 4). According to the results, FLPI is the only variable that significantly influences personal FB in all subjects. Confidence and FLPI significantly influence personal finance behavior in male subjects. Female subjects' confidence levels significantly influence their personal finance behavior. These results show that for subjects split across gender, the gap between their perceptions and financial knowledge better known as confidence plays a critical role in molding personal finance behavior. Low-financial-literacy subjects' personal FB is weakly and significantly influenced by the respondents' confidence levels. On the other hand, FLPI weakly significantly influences personal finance behavior in subjects with high financial literacy. In our regression analyses in Table 4, RPI and TPI do not influence personal finance behavior in any classification of the subjects.

Table 3. OLS Regression: Determinants of financial behavior

	All	Male	Female	Low literacy	High literacy
RPI	-1.09 (1.258)	-1.55* (0.924)	2.18 (2.514)	-2.19** (1.074)	12.2** (6.028)
TPI	-0.060 (0.455)	-0.21 (0.491)	0.35 (0.987)	-0.046 (0.500)	-2.94 (1.885)
Confidence	0.079 (0.278)	-0.77** (0.320)	1.00** (0.385)	0.75* (0.402)	-0.16 (0.420)
FLPI	0.055** (0.027)	0.066** (0.033)	0.037 (0.041)	0.011 (0.030)	0.10* (0.058)
_cons	-0.036 (0.117)	0.13 (0.158)	-0.15 (0.145)	-0.40** (0.197)	0.44** (0.215)
N	153	70	83	81	72
R ²	0.049	0.141	0.126	0.116	0.108

Standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

In Table 5, all subjects, male respondents and low-financial-literacy subjects' debt FB are significantly influenced by RPI. No other variable is confirmed to be influencing debt FB of the subjects. These results show that debt FB is generally influenced by risk preferences, given the university student's level of financial literacy. It shows that borrowing behavior in the subjects under consideration is influenced by risk preferences. Attitudes towards risk were found to significantly influence debt held by households in the US (Brown, Garino, & Taylor, 2013). Our findings show that debt FB of university students is mostly driven by their risk preferences.

Results from the OLS regression analysis show that FB of university students is mainly influenced by risk preferences, confidence and financial literacy perceptions. To understand FB of university students, we need to take note of their financial literacy perceptions, financial knowledge, confidence levels and risk preferences. Our results confirm assertions by the theory of planned behavior by Ajzen (2011) which posits that financial literacy and financial behavior may interact through unobserved feedback mechanisms.

We further controlled for personal characteristics in a quest to investigate factors that influence the FB of university students (Table 6). Income, RPI, living in an urban area, and being a joint

Table 4. OLS Regression: Determinants of personal finance behavior

	All	Male	Female	Low literacy	High literacy
RPI	-0.57 (1.175)	-0.86 (0.930)	1.78 (2.383)	-1.68 (1.031)	9.19 (6.149)
TPI	-0.14 (0.445)	-0.26 (0.433)	0.18 (0.959)	-0.099 (0.492)	-2.07 (1.860)
Confidence	-0.014 (0.281)	-0.83*** (0.307)	0.82** (0.406)	0.69* (0.408)	-0.28 (0.442)
FLPI	0.060** (0.027)	0.076** (0.031)	0.039 (0.042)	0.013 (0.030)	0.12* (0.061)
_cons	0.011 (0.116)	0.17 (0.154)	-0.099 (0.147)	-0.38* (0.193)	0.40* (0.203)
N	157	72	85	84	73
R ²	0.046	0.135	0.101	0.093	0.103

Standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5. OLS Regression: Determinants of debt financial behavior

	All	Male	Female	Low literacy	High literacy
RPI	-2.51*** (0.613)	-3.04*** (0.585)	-0.46 (2.780)	-2.41*** (0.546)	10.1 (6.784)
TPI	0.18 (0.549)	-0.0026 (0.679)	0.60 (1.211)	0.027 (0.628)	-2.80 (2.032)
Confidence	0.33 (0.282)	0.22 (0.360)	0.48 (0.448)	0.32 (0.419)	0.26 (0.448)
FLPI	-0.0020 (0.023)	-0.011 (0.032)	0.00063 (0.035)	0.0071 (0.028)	-0.036 (0.052)
_cons	-0.17 (0.112)	-0.15 (0.147)	-0.18 (0.175)	-0.056 (0.201)	0.13 (0.238)
N	159	72	87	86	73
R ²	0.054	0.125	0.028	0.070	0.043

Standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

decision maker significantly influenced FB in all respondents. Being a joint decision maker is the only variable that significantly influences FB of subjects with high financial literacy. For subjects with low financial literacy variables, RPI, confidence, income, being enrolled in investment degree and residing in an urban center significantly influenced FB. FB for male subjects with low financial literacy is significantly impacted by the variables RPI, confidence and income. Age and being enrolled for a Bachelor of Commerce Management Degree weakly and significantly influence FB in female university students with high financial literacy. In respect of female university students with low financial literacy, our results show that confidence and age significantly impact subjects' FB.

Switching to factors that determine personal finance behavior after controlling for personal characteristics of university students, our findings show that income, residing in an urban center and being a joint financial decision maker significantly influence personal finance behavior of all university students (Table 7). The FLPI weakly significantly influences personal finance behavior of students with higher financial literacy. On the other hand, RPI, income, being enrolled in a Bachelor of Commerce Investment Degree and residing in an urban center significantly influenced personal finance behavior of university students with low financial literacy. Confidence, income and RPI significantly impact personal finance behavior of male university students with low financial literacy. Age is the only variable that significantly influences personal finance behavior of female subjects with high financial literacy at 10% level. Personal finance behavior in female university students with low financial literacy is significantly determined by the variables, confidence and age.

Table 8 explores determinants of debt FB of university students after controlling for personal characteristics. RPI, being enrolled in a Bachelor of Commerce Administration Degree, and being a non-financial decision maker significantly influence debt FB of all university students. High-financial-literacy university students' debt FB are significantly determined by being a non-financial decision maker and being a joint financial decision maker—showing that decision-making status is important in molding FB. Individuals who participated in stock market investments were found to be financially literate, showing that involvement in financial decision making increases financial knowledge (Van Rooij et al., 2011). RPI and being enrolled in other degrees are the only variables that significantly influence debt FB in university students with low financial literacy. Only the variable RPI significantly influences debt FB of male university students with low financial literacy. For female university students with high financial literacy, being a non-financial decision maker,

Table 6. OLS Regression: Determinants of financial behavior

	All	High_lit	Low_lit	Male_high_lit	Male_low_lit	Female_high_lit	Female_low_lit
RPI	-1.91* (1.132)	9.95 (6.808)	-2.22** (1.021)	16.1 (12.926)	-2.95** (1.050)	1.30 (16.095)	-0.057 (2.659)
TPI	-0.089 (0.582)	-4.10 (2.464)	-0.13 (0.703)	-8.59 (6.479)	1.84 (1.147)	-1.09 (5.267)	-0.90 (1.192)
Confidence	0.12 (0.283)	-0.33 (0.446)	0.77* (0.453)	-0.63 (1.158)	-0.87* (0.445)	0.75 (0.770)	2.25*** (0.620)
FLPI	0.026 (0.029)	0.087 (0.052)	-0.0095 (0.034)	0.16 (0.111)	0.050 (0.041)	0.083 (0.090)	-0.074 (0.055)
Age	-0.0075 (0.022)	0.013 (0.035)	-0.025 (0.033)	-0.066 (0.102)	-0.040 (0.060)	0.20* (0.097)	-0.12** (0.052)
Income	0.23** (0.092)	0.14 (0.160)	0.24** (0.120)	-0.057 (0.238)	0.45*** (0.143)	0.36 (0.277)	0.17 (0.208)
African	0.17 (0.366)	0.27 (0.427)	0.44 (0.653)	1.02 (0.927)	0.34 (0.395)	-0.46 (0.566)	0.87 (0.650)
Investment degree	0.34 (0.222)	0.0070 (0.383)	0.74** (0.299)	-0.28 (0.524)	0.0078 (0.386)	-0.099 (0.710)	1.17* (0.594)
Other degree	0.29 (0.448)	0.20 (0.467)	-0.26 (0.931)	0.48 (0.699)	-0.42 (1.148)	-0.52 (0.822)	0 (.)
Admin degree	0.010 (0.220)	-0.22 (0.317)	0.29 (0.304)	-0.033 (0.742)	0.74 (0.462)	0.13 (0.449)	0.016 (0.631)
Management degree	-0.095 (0.275)	-0.68 (0.448)	0.52 (0.321)	-0.090 (0.638)	0.14 (0.472)	-0.85* (0.492)	0.89* (0.521)
Family size	-0.0040 (0.021)	-0.034 (0.024)	0.037 (0.040)	-0.071 (0.048)	-0.042 (0.070)	-0.0045 (0.038)	-0.025 (0.066)
Single	-0.28 (0.406)	-0.32 (0.593)	-0.15 (0.506)	-1.93 (2.627)	0.52 (1.059)	0.83 (1.135)	-0.36 (0.474)

(Continued)

Table 6. (Continued)

	All	High_lit	Low_lit	Male_high_lit	Male_low_lit	Female_high_lit	Female_low_lit
Urban	0.32* (0.165)	0.046 (0.275)	0.36* (0.202)	0.38 (0.564)	0.15 (0.275)	0.17 (0.457)	0.47 (0.297)
Non decision maker	-0.27 (0.178)	-0.19 (0.216)	-0.31 (0.285)	-0.63 (0.394)	-0.57 (0.333)	-0.37 (0.266)	-0.23 (0.533)
Join decision maker	-0.41** (0.166)	-0.51* (0.264)	-0.23 (0.241)	-0.56 (0.589)	-0.14 (0.294)	-0.69 (0.427)	0.030 (0.376)
_cons	-1.47 (1.151)	-0.21 (1.708)	-2.44 (1.650)	4.45 (5.625)	-3.12 (2.507)	-6.62* (3.426)	-0.42 (2.006)
N	151	72	79	30	39	42	40
R ²	0.180	0.321	0.307	0.588	0.514	0.477	0.645

Standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 7. OLS Regression: Determinants of personal finance behavior

	All	High_lit	Low_lit	Male_high_lit	Male_low_lit	Female_high_lit	Female_low_lit
RPI	-1.35 (1.045)	7.71 (6.734)	-1.82* (0.962)	15.2 (13.682)	-1.94* (0.957)	2.12 (15.730)	-1.09 (2.457)
TPI	-0.14 (0.528)	-3.33 (2.576)	-0.100 (0.649)	-7.83 (6.906)	1.62 (0.990)	-0.28 (5.231)	-0.96 (1.146)
Confidence	0.042 (0.275)	-0.35 (0.476)	0.69 (0.421)	-0.61 (1.262)	-1.00** (0.403)	0.81 (0.768)	2.14*** (0.607)
FLPI	0.032 (0.029)	0.096* (0.057)	-0.0077 (0.035)	0.15 (0.110)	0.064 (0.038)	0.089 (0.093)	-0.089 (0.054)
Age	-0.0079 (0.025)	0.0074 (0.036)	-0.025 (0.034)	-0.079 (0.107)	-0.021 (0.046)	0.18* (0.096)	-0.10** (0.050)
Income	0.23*** (0.086)	0.12 (0.146)	0.25** (0.114)	-0.050 (0.230)	0.40*** (0.127)	0.35 (0.266)	0.18 (0.212)
African	0.29 (0.360)	0.26 (0.425)	0.73 (0.586)	1.05 (0.928)	0.30 (0.350)	-0.47 (0.556)	1.16 (0.722)
Investment degree	0.31 (0.215)	0.055 (0.371)	0.63** (0.283)	-0.26 (0.531)	-0.033 (0.392)	-0.010 (0.677)	0.96 (0.573)
Other degree	0.32 (0.449)	0.21 (0.446)	-0.38 (0.986)	0.60 (0.690)	-0.52 (1.202)	-0.67 (0.749)	0 (.)
Admin degree	-0.066 (0.214)	-0.32 (0.325)	0.20 (0.285)	-0.055 (0.779)	0.70 (0.427)	-0.017 (0.469)	-0.058 (0.610)
Management degree	-0.12 (0.273)	-0.66 (0.445)	0.43 (0.326)	-0.22 (0.670)	0.11 (0.411)	-0.71 (0.464)	0.66 (0.474)
Family size	-0.0076 (0.021)	-0.040 (0.025)	0.033 (0.041)	-0.087 (0.052)	-0.036 (0.064)	0.00068 (0.035)	-0.031 (0.071)
Single	-0.060 (0.454)	-0.21 (0.581)	-0.014 (0.537)	-2.08 (2.734)	0.88 (0.675)	1.40 (1.080)	-0.30 (0.607)

(Continued)

Table 7. (Continued)

	All	High_lit	Low_lit	Male_high_lit	Male_low_lit	Female_high_lit	Female_low_lit
Urban	0.36** (0.165)	0.025 (0.282)	0.38* (0.200)	0.35 (0.590)	0.19 (0.227)	0.41 (0.432)	0.51 (0.300)
Non decision maker	-0.21 (0.176)	0.0080 (0.224)	-0.31 (0.266)	-0.55 (0.359)	-0.36 (0.345)	-0.15 (0.274)	-0.42 (0.534)
Joint decision maker	-0.35** (0.168)	-0.33 (0.275)	-0.29 (0.240)	-0.46 (0.602)	0.025 (0.281)	-0.51 (0.455)	-0.23 (0.354)
_cons	-1.77 (1.214)	-0.12 (1.769)	-2.81* (1.630)	4.86 (5.973)	-3.51** (1.591)	-7.21** (3.335)	-0.93 (2.207)
N	155	73	82	30	41	43	41
R ²	0.177	0.287	0.300	0.623	0.499	0.425	0.633

Standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 8. OLS Regression: Determinants of debt financial behavior

	All	High_lit	Low_lit	Male_high_lit	Male_low_lit	Female_high_lit	Female_low_lit
RPI	-2.54*** (0.721)	6.98 (6.664)	-1.79* (0.900)	2.00 (12.613)	-3.89*** (1.260)	1.75 (15.780)	0.96 (3.668)
TPI	0.024 (0.708)	-3.00 (2.570)	-0.19 (0.903)	-4.05 (5.636)	1.22 (1.444)	-2.99 (3.382)	-0.13 (1.781)
Confidence	0.29 (0.302)	-0.12 (0.470)	0.38 (0.483)	-0.016 (1.002)	0.46 (0.662)	-0.38 (0.702)	0.52 (0.868)
FLPI	-0.018 (0.026)	-0.022 (0.061)	-0.0029 (0.036)	0.070 (0.113)	-0.036 (0.045)	-0.044 (0.093)	0.015 (0.063)
Age	0.0057 (0.023)	0.020 (0.032)	0.0055 (0.034)	0.024 (0.083)	-0.038 (0.053)	0.064 (0.058)	-0.052 (0.087)
Income	-0.020 (0.120)	0.040 (0.187)	-0.021 (0.166)	-0.087 (0.287)	0.33 (0.205)	0.017 (0.248)	-0.18 (0.296)
African	-0.27 (0.301)	0.012 (0.259)	-0.75 (0.609)	-0.072 (0.498)	-0.016 (0.498)	-0.19 (0.237)	-1.12 (0.910)
Investment degree	0.27 (0.204)	-0.11 (0.270)	0.54 (0.345)	0.065 (0.604)	0.16 (0.549)	-0.45 (0.365)	0.76 (0.628)
Other degree	0.14 (0.306)	-0.099 (0.335)	0.83* (0.468)	-0.22 (0.523)	0.68 (0.682)	0.023 (0.508)	0 (.)
Admin degree	0.37* (0.211)	0.29 (0.239)	0.49 (0.367)	0.17 (0.382)	0.19 (0.518)	0.25 (0.349)	0.52 (0.722)
Management degree	0.19 (0.233)	-0.23 (0.281)	0.60 (0.380)	0.49 (0.780)	0.32 (0.555)	-0.78** (0.346)	0.74 (0.544)
Family size	0.016 (0.018)	0.0070 (0.018)	0.033 (0.047)	0.044 (0.048)	-0.024 (0.082)	-0.024 (0.025)	0.067 (0.120)
Single	-0.40 (0.546)	-0.62 (0.833)	-0.25 (0.611)	0.023 (2.299)	-0.69 (0.876)	-1.54 (1.082)	-0.29 (0.854)

(Continued)

Table 8. (Continued)

	All	High_lit	Low_lit	Male_high_lit	Male_low_lit	Female_high_lit	Female_low_lit
Urban	-0.035 (0.159)	-0.0024 (0.267)	0.058 (0.217)	0.19 (0.453)	0.038 (0.344)	-0.60 (0.382)	-0.074 (0.366)
Non decision maker	-0.35* (0.196)	-0.67** (0.257)	-0.17 (0.354)	-0.29 (0.558)	-0.67 (0.483)	-0.87*** (0.303)	0.053 (0.723)
Joint decision maker	-0.24 (0.185)	-0.70*** (0.239)	0.24 (0.310)	-0.61 (0.516)	-0.41 (0.338)	-0.83** (0.366)	0.69 (0.630)
_cons	0.39 (1.144)	0.41 (1.480)	0.23 (1.728)	0.052 (5.076)	-0.88 (2.599)	1.70 (2.427)	2.58 (3.322)
N	155	73	82	30	40	43	42
R ²	0.114	0.303	0.176	0.370	0.337	0.594	0.282

Standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

being a joint decision maker and being enrolled in a Bachelor of Commerce Management Degree significantly influence debt FB of the subjects.

Our results show that RPI, confidence, FLPI, age, income, geographical location and financial decision-making status influence FB of categorized university students. Our findings confirm determinants of behavior portrayed by the theory of planned behavior (Ajzen, 2011). The theory of planned behavior postulates that behavior is influenced by knowledge, perceptions, attitudes and norms. Behavioral aspects are prevalent when an individual maximize utility. Psychological factors that significantly influence FB of university students are risk preferences and confidence. Being overconfident or less confident leads one to make suboptimal choices (Allgood & Walstad, 2016; Kramer, 2016). Factual financial knowledge should be imparted to university students to give them the appropriate confidence to ensure beneficial financial behavior. There is evidence that conform to our findings, risk attitudes significantly influence debt behavior in US households (Brown et al., 2013). Participation in financial decisions influence financial behavior. Our regression analyses could not confirm a significant influence of TPI on FB showing that time preferences do not play a significantly role on FB of university students.

5. Conclusion

This study uses data collected by a financial literacy questionnaire which included a financial literacy test and MPL risk preferences and time preferences experiments on 191 students at University of the Free State in South Africa. The Students were enrolled in undergraduate commercial degrees in the Faculty of Economic and Management Sciences. The analysis is split across financial literacy level and gender. Our results from a *t*-test analysis show that FB, risk preferences, confidence and time preferences of university students significantly differ by their financial literacy level. Low-financial-literacy university students are more risk loving, more overconfident and more impatient than high-financial literacy university students. Our study found out that financial behavior of categorised university students is influenced by confidence, risk preferences and financial literacy perceptions.

Our results go a long to explain why low financial literacy is generally associated with poor financial life outcomes. Being overconfident or less confident might result in someone overlooking market signals that are important in making some beneficial financial decisions. This leads to “cognitive biases” and making short cuts in making financial decisions. This behavior is synonymous with actions that propagate financial crises across the world. In addition, a risk-loving attitude can potentially lead someone to invest in assets that have low probability of a positive return. This behavior is quite prevalent in South Africa. More and more people have been robbed of their hard earned income by investing in “Ponzi schemes” and money pyramids. In a case reported in the news in 2018, South African citizens are believed to have lost a billion rands in a bitcoin “Ponzi” scheme and money pyramids. Some of these losses can be attributed to low financial literacy as our results show that low financial literacy students are risk loving, impatient and overconfident. These traits result in individuals ignoring crucial market information in making decision. Even if the market interest rate of return on investment is low, individuals who participate in “Ponzi schemes” invest their incomes in unbelievably high interest investment scams probably due to overconfidence. These could be signs of low financial literacy, overconfidence and risk loving attitudes. Inability to wait for a higher future return shown by being impatient or present biasedness amongst low financial literacy university students lead individuals to settle for lower return financial choices.

Our findings also show that financial literacy perceptions significantly differ by level of financial literacy. If perceptions differ across groups of people, for example, university students with different levels of financial literacy, then optimization of FB is bound to be different. Our *t*-test results also show that university students’ financial decision status differs significantly across the level of financial literacy. This reflects that active or inactive participation in financial decision matters influences level of financial literacy. Our analysis could not confirm significant difference in RPI, confidence, decision-making status and FLPI by gender of university students. Showing that

gender for university students played no or little role in influencing FB, risk preferences and financial literacy perceptions. In a nutshell, FB of university students with similar levels of financial literacy does not differ by gender.

A set of ordinary least squares regression models show that RPI, confidence and FLPI significantly influence the FB of categorised university students. Confirming the theory of planned behavior theory which argues that behavior is influenced by knowledge, perceptions, attitudes and norms. Our regression analyses could not confirm a significant impact of TPI on FB. Our results also show that the RPI significantly influence debt FB, but does not significantly influence personal finance behavior. Revealing that debt FB of university students is significantly determined by risk preferences. Other variables that significantly influence the FB of university students in our study are age, income, geographical location and financial decision-making status.

Our results partially confirm assertions by traditional financial economics and behavioral financial economics literature. We confirmed that university students use information available to them to make decisions; however, they do not have unlimited cognitive capacity to store and process it, shown by differences across financial literacy level. Our findings are contrary to the rational expectation economic behavior theory assertions, which posits that individuals use all information available to them and have unlimited cognitive capacity to store and process it (García, 2013). Differences in cognitive abilities, psychological factors and confidence levels play a significant role in determining FB of university students, a confirmation of claims by financial behavioral economics. While mandatory availing of financial literacy in public institutions is a welcome move, lifelong participation in the financial activities can go a long way in molding FB. There is greater need to provide factual financial literacy to deliver right dose of confidence in financial decision making by university students. Empowerment programs that allow one to build own income and help one to fully participate in financial decision making could go a long way in improving FB. Understanding FB of individuals requires one to take cognizance of their preferences, perceptions, financial literacy knowledge and psychological factors.

This study has its own set of limitations. University students enrolled in Bachelor of Commerce degrees' financial behavior are not a good representation of South African population financial behavior and financial literacy levels. A study on a South African representative population can shade light on determinants of financial behavior of South African population. Nevertheless, using university students provides an initiating stage to investigate financial behavior of South African population. The instruments used to gather data in this study can also be used to collect data on a South African population representative group.

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Ethical considerations

Permission to carry out the study was granted by the University of the Free State Ethics Committee (Number: UFS-HSD2016/0079). Participation in the experiment was voluntary and students were allowed to stop participating in the experiment at any time. The participants were made aware of the purpose of the study.

Cover Image

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