Role of Self Deception, Overconfidence and Financial Aliteracy in Household Financial Decision Making

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The purpose of this study is to investigate the extent to which self-assessed financial knowledge is formed from biases and how such irrationality impacts the financial behavior. It also examines the role of overconfidence and financial aliteracy on financial decisions. The argument presented in this study is that people often do not have a full understanding of their own level of financial knowledge due to psychological biases which inhibit one's ability to make good financial decisions. This research employs the data from the 2015 National Financial Capability Study (NFCS) and finds that self-assessment of financial literacy, a driver of financial behavior is a manifestation of both real knowledge and biases i.e., some component of self-assessed financial competence is self-deceptive induced by biases. This study finds that self-assessed financial competence has negative impact while real financial knowledge has a positive impact on financial behavior. Moreover, self-assessment of financial literacy due to knowledge has a positive impact on financial behavior while self-assessed financial competence due to biases leads to imprudent behavior and low financial satisfaction. Individuals with less understanding of their own level of financial knowledge due to overconfidence and aliteracy, are more likely to engage in imprudent financial decisions, irrespective of their real financial literacy. These results vary across gender, income level and ethnicity. An important question that is aimed to answer in this research is not whether financial literacy matters in household financial decisions, but rather the mechanism in which biases lead to incorrect self-assessment of financial competence which dictates imprudent financial behavior.

INTRODUCTION

Why two groups with dissimilar financial knowledge indulge in similar imprudent financial behavior? During the years preceding the financial crisis, the behavior of big names on Wall Street who lost heavily in subprime mortgage investments were as naïve and foolish as those of the man on the street. Both groups made the same faulty assumption: home prices would forever have an upward trend. There are several other examples of not so much difference in actual behavior of financial savvy groups and common man with less knowledge of complex financial world. Such imprudent financial behavior is also displayed by households with similar financial literacy. On the other hand, there are also situations where individuals with dissimilar financial literacy have successfully demonstrated responsible behavior. It is not difficult to find several median income households with less formal education displaying prudent financial behavior similar to the ones associated with financial savvy individuals.

The question that arises from these phenomenon is that whether financial literacy alone is sufficient to dictate prudent financial behavior? People that we would characterize as more financially astute are not necessarily professional money managers. Does there exists some other factors which causes one to act in a responsible manner or otherwise when it comes to financial decisions? It is not surprising that the causal aspect of relationship between financial knowledge and corresponding financial behavior remains one of the largest gaps in the literature on financial education. Studies have advocated addressing this area as a top priority for research and funding agencies.

The general notion is that improved financial literacy would lead to prudent financial decision making; however, empirical evidence on this linkage provide inconclusive results[1]. There is some evidence that financial literacy may be positively related to actual financial behavior but such relationship is more complicated as knowledge alone does not automatically result in prudent actions. An individual may display a responsible financial behavior irrespective of the level of his/her financial education.

Graham, et al. (2009) introduced the concept of self-assessment of financial competence as a determinant of trading behavior of individual investors. They argue that people are more willing to bet on their own judgements when they *feel* "skillful" or "knowledgeable." This research is based on Graham et al. (2009), and argues that if psychological bias is deeply ingrained, it should affect multiple aspects of financial decision making and not just investments. Other studies suggest the role of financial attitudes as significant determinants of financial behavior (Perry and Morris, 2005; Courchane, 2005; Robb and Woodyard, 2011; Rotfeld, 2008; Perry, 2008; Hilgert et al., 2003). While these studies provide important insights, they merely conjecture that self-assessment of financial knowledge is directly linked to actual financial literacy. These studies implicitly make a strong assumption that financial attitudes are manifestation of only real financial knowledge. However, it is quite possible that self-assessed competence of financial knowledge are driven by biases, and do not fully represent real financial knowledge thereby leading to imprudent financial decisions.

The purpose of this study is to provide an empirical investigation on whether self-assessment of financial knowledge is formed from biases and how such irrationality impacts the financial behavior. In addition, this research directly measures the two biases which are inherent in self-assessed financial competency: (i) *overconfidence* (financial illusion) and (ii) financial *aliteracy*, and investigates their relative impact on actual financial behavior of American households. The argument presented in this study is that people often do not have a full understanding of their own level of financial knowledge due to psychological biases which inhibit one's ability to make good financial decisions. Some component of these self-assessments could be truly justified by actual financial literacy but a portion of it may stem from irrational beliefs, psychology, emotions, gender and demographics. Is financial literacy the main driver of financial behavior, or, self-perceived *over and under assessment* of financial knowledge causes individuals to take imprudent financial decisions? Can financial behavior of two individuals with similar knowledge might be different if one perceives him/her to be more financial savvy than the other? Answers to questions are important since by identifying and controlling the biases which drives self-assessment of financial competence one can control the financial behavior.

Accordingly, the following research questions are formulated: (i) to what extent financial behavior is driven by self-assessed competence of financial knowledge? (ii) Is self-assessed financial competence generated from real financial knowledge, or, irrational biases, or a combination of both? If irrationality does have a role, then what is the relative impact of self-assessed knowledge induced by real financial knowledge and self-deceptive financial literacy driven by biases impact the actual financial behavior? (iii) Is there any impact of *overconfidence* (financial illusion) and financial *aliteracy* on actual financial behavior?

This research employs the data from the 2015 National Financial Capability Study (NFCS) which was conducted to assess Americans' ability in dealing with financial capability. The sample size consists of over 27,500 households of different age group, gender, education, marital status, income and demographics. This study develops a measure of financial behavior by utilizing key questions related to retirement planning, credit card management, investments and risk tolerance.

The major findings of this research are as follows: (i) self-assessed financial competence has negative impact while real financial knowledge has a positive impact on financial behavior. (ii) self-assessed financial competence is driven by both real financial knowledge and irrational biases i.e., some component represents self-deceptive financial knowledge, (iii) prudent financial behavior is positively impacted by self-assessed knowledge driven by real literacy while negatively impacted by self-deceptive financial literacy formed from biases (iv) there are significant negative impact of overconfidence (financial illusion) and financial aliteracy on prudent financial behavior - the impact of overconfidence seems to be higher than financial aliteracy (v) the results vary across gender, income level and ethnicity of individuals.

Overall, this study finds that elf-assessment of financial literacy due to biases leads to imprudent financial behavior and low financial satisfaction. Individuals with less understanding of their own level of financial knowledge due to overconfidence and aliteracy, are more likely to engage in imprudent financial decisions, irrespective of their real financial literacy. An important question that is aimed to answer in this research is not whether financial literacy matters in household financial management, but rather the mechanism in which financial knowledge and biases lead to incorrect self-assessment of competence which dictates imprudent financial behavior.

A major contribution of this study is provide a direct test on the impact of household biases on actual financial behavior by extracting measurable components of overconfidence and financial aliteracy from self-assessed financial knowledge. Unlike many empirical studies of behavioral finance, which rely on proxies for underlying psychological biases, this study directly measure biases related to self-assessed financial competence through a recent and extensive survey evidence.

The remainder of the paper is organized as follows: section two provides the theoretical framework while sections three presents the data and the relevant variables. The model is presented in section four and section five discusses the empirical results which is followed by concluding remarks in section six.

Theoretical framework

Studies such as Perry and Morris (2005), Courchane (2005), Robb and Woodyard (2011), Rotfeld (2008), Perry (2008); Hilgert et al. (2003) suggest that financial *attitudes* such as self-assessment of one's financial knowledge, confidence and satisfaction are significant determinants of actual financial behavior. These attitudes are suggested to act as a conduit between financial literacy and behavior. Overall it is argued that when subjective probability distributions are ambiguous, he behavioral factors such as perceived competence can play an important role in explaining behavior. The take away from these studies is that people tend to bet on their own judgement, in spite of is being ambiguous, if they feel knowledgeable in an area whereas, when individuals do not feel competent, they prefer to bet on the unambiguous chance event.

The impact of effects of ambiguity aversion is conditional on the subjective competence level of individuals. Graham et al. (2009) related the notion of biases to the concept of self-assessment of competence or individual's own perception of financial literacy. They study the impact of self-assessment of competence on trading behavior and find a strong link between self-assessed financial literacy and the propensity to trade. They argue that "people are more willing to bet on their own judgements when they *feel* "skillful" or "knowledgeable." The competence effect predicts that the likelihood that a person will invest according to her own judgment increases with her perceived knowledge about money matters.

However, it is quite possible that self-assessed competence of financial knowledge are driven by biases, and do not fully represent actual financial knowledge thereby leading to imprudent financial decisions. People often do not have a full understanding of their own level of financial knowledge due to psychological biases which inhibit one's ability to make good financial decisions. Some component of these self-assessments could be truly justified by actual financial literacy but a portion of it may stem from irrational beliefs, psychology, emotions, gender and demographics. This is a major argument on which this research rests.

Accordingly, there could exist two scenarios when the self-assessed financial knowledge is less driven by actual literacy and more by irrational beliefs, cognitive errors and biases: (i) Financial Illusion and (ii) Financial Aliteracy.

A person may display financial *illusion* when his/her self-perception on financial knowledge is *more* than his/her real financial knowledge. Such individuals tend to display overconfidence and ignorantly hold belief that one knows more than one actually does. This is a tendency to overestimate one's actual ability. A prime example would be the fact that a large group of individuals continue their costly attempts to beat the market because they are fooled by biases and because they seek the expressive and emotional benefits of attempts to beat the market (Statman, 2014). The cost of active investing (to beat the market) as estimated by French (2008) totals to over $100 billion every year by the society. Evidence that individuals follow the advice of Warren Buffet, John Bogle and recently Shiller to buy and hold low cost index funds is scant. Barber and Odean (2013) show that a large group of individuals ignore the prescriptive advice to buy and hold low fee well diversified portfolios, but instead trade frequently, have perverse stock selection ability, incur unnecessary costs and losses and unduly influenced by media and past experience. They suggest that these behavior mainly stem from overconfidence or financial illusion. Graham, Harvey and Huang (2009) have related this notion of overconfidence or financial illusion to the concept of self-assessment of competence or self-perception of financial literacy.

A person may display financial *aliteracy* when his/her self-perception on financial knowledge is *less* than his/her real financial knowledge. The concept of financial aliteracy is introduced by Rotfeld (2008). A financial aliterate person tends to underestimates his/her knowledge related to money matters or, perceives himself/herself to be less informed and knowledgeable in financial matters. For example, a finance professor possessing an understanding of investments would nonetheless prefer to just have the money placed in money market in retirement account; a CFO of a firm would hire a financial planner to manage his/her personal retirement account; scholars in many areas with great understanding in their own respective fields would not conduct a small amount of research to make his/her own financial decisions.

Even when people possess knowledge and information, they ignore it, do not use it, or respond to the wrong cues of what might be the correct decision (Belsky and Gilovich 1999; Lwin and Williams 2006; Norberg, Horne, and Horne 2007). Wall Street professionals many of whom are financial advisors to their clients are not necessarily savvier when it comes to management of their own money. According to recent annual filings employees at the five largest banks lost substantial value in retirement accounts mainly due to holding own company's stocks in their portfolio. They seem to have ignored the basic investment tenet: diversification.

The above argument is consistent with behavioral finance (Black, 1986) which suggests that psychological and emotional factors affect financial decisions. This broader paradigm includes financial decisions based *solely* on real knowledge as a special case (Hirshleifer, 2001; Shleifer and Summers, 1990) and an individual's outlook is due to a combination of rational expectations and irrational beliefs, cognitive errors and biases.

Most of the theoretical and empirical studies on behavioral finance have focused on stock markets and empirical evidences on anomalies are well documented[2.]. However, behavioral finance has been applied in financial planning literature to a lesser degree. It is merely conjectured that better financial attitudes probably due to greater financial literacy are associated with prudent financial behavior. Little empirical work is done to examine the ways in which financial a literacy ignorance, mistaken confidence and self-deceptive knowledge and satisfaction impact household financial decisions. This research attempts to contribute to the literature by empirically investigating whether tenets of behavioral finance are relevant in financial education research.

Data and variables

This study employs the data from the 2015 National Financial Capability Study (NFCS) which was conducted to assess Americans' ability in dealing with financial capability. The sample size consists of over 27,500 households of different age group, gender, education, marital status, income and demographics. The NFCS was funded by the Financial Industry Regulatory Authority (FINRA) Investor

Education Foundation and conducted by Applied Research and Consulting. In consultation with the U.S. Department of the Treasury and President Bush's Advisory Council on Financial Literacy, the FINRA Investor Education Foundation commissioned the first national study of the financial capability of American adults in 2009. The 2012 Study similarly developed in consultation with the U.S. Department of the Treasury, other federal agencies and President Obama's Advisory Council on Financial Capability updated key measures from the 2009 Study and deepened the exploration of topics that are highly relevant today. The 2015 Study continues in this vein and consists of both national and state-by-state surveys. This research uses the data from the national study and recodes it to develop the following relevant variables:

(i) Self-assessed financial knowledge (SFK): This variable represents the self-assessed competence in financial knowledge i.e., individual's own perception on his/her financial literacy. Using seven point scale, the FINRA survey measures this variable by the following question:

(a) *On a scale from 1 to 7, where 1 means very low and 7 means very high, how would you assess your overall financial knowledge?* This study recodes the responses for "don't know" and "prefer not to say" as "0" in the scale.

(ii) Real financial knowledge (RFK): This variable in the survey measures the actual financial literacy of the respondents based the questionnaire used in Lusardi, Mitchell and Curto (2010). To evaluate financial knowledge, respondents were exposed to a series of questions covering fundamental concepts of economics and finance that may be encountered in everyday life, such as calculations involving interest rates and inflation, principles relating to risk and diversification, the relationship between bond prices and interest rates, and the impact that a shorter term can have on total interest payments over the life of a mortgage. The following five questions are used to measure the financial literacy:

(a) *Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, how much would you be able to buy with the money in this account?*

(b) *If interest rates rise, what will typically happen to bond prices?*

(c) *Suppose you had $100 in a savings account and the interest rate was 2% per year. After5 years, how much do you think you would have in the account if you left the money to grow?*

(d) *A 15-year mortgage typically requires higher monthly payments than a 30-year mortgage, but the total interest paid over the life of the loan will be less.*

(e) *Suppose you owe $1,000 on a loan and the interest rate you are charged is 20% per year compounded annually. If you didn't pay anything off, at this interest rate, how many years would it take for the amount you owe to double?*

(f) *Buying a single company's stock usually provides a safer return than a stock mutual fund.*

This study recodes the correct responses as "1" and "0" otherwise. The total correct percentage score (out of 6) is calculated to measure a single variable representing the real financial knowledge (higher score represents better financial knowledge.)

(iii) Self-assessed financial condition (SFC): This variable measures self-perception on satisfaction with current financial conditions. The survey measures the overall satisfaction with personal financial condition with the following question on a ten-point scale:

(a) *Overall, thinking of your assets, debts and savings, how satisfied are you with your current personal financial condition? (1 = Not at all satisfied, 10 = Extremely satisfied)*

(iv) Financial behavior (FB): In order to capture the actual financial behavior the recommendations of Huston, (2010) and Robb and Woodyard, (2011) is followed. Accordingly, the key questions on best practices related to financial planning are employed (such as income versus spending, emergency funds, retirement planning, debt management, budgeting, college funding, etc.) Specifically, the following questions from the survey are used to measure this variable:

(a) *Over the past year, would you say your [household's] spending was less than, more than, or about equal to your [household's] income?*

(b) *In a typical month, how difficult is it for you to cover your expenses and pay all your bills?*

(c) *Have you set aside emergency or rainy day funds that would cover your expenses for 3 months, in case of sickness, job loss, economic downturn, or other emergencies?*

(d) *Have you ever tried to figure out how much you need to save for retirement?*

(e) *In the past 12 months, have you [has your household] experienced a large drop in income which you did not expect?*

(f) *How many times have you been late with your mortgage payments in the past 12 months?*

(g) *How confident are you that you could come up with $2,000 if an unexpected need arose within the next month?*

(h) *Do you [or your spouse/partner] have any retirement plans through a current or previous employer, like a pension plan, a Thrift Savings Plan (TSP),or a 401(k)?*

(i) *Do you [or your spouse/partner] regularly contribute to a retirement account like a Thrift Savings Plan (TSP), 401(k) or IRA?*

(j) *Are you setting aside any money for your children's college education?*

(k) *In the past 12 months, which of the following describes your experience with credit cards? - I always paid my credit cards in full.*

(l) *Does your household have a budget? A household budget is used to decide what share of your household income will be used for spending, saving or paying bills.*

The study recodes good practice as "1" and "0" otherwise. The total score (on a scale of 1-12) is calculated to measure a single variable representing the actual financial behavior (higher score represents prudent financial behavior.)

(v) *Control variables:* The following six control variables are employed: (a) *Gender* (male =1, female = 0); (b) Age (scale 1-6 for six groups); (c) *Ethnicity* (white = 1, non-white=0); (d) *Education* (scale 1-7 for seven groups of educational level in an increasing order); (e) *Marital status* (married = 1, otherwise = 0); (f) *Income* (scale 1-8 for eight groups of annual income in an increasing order.)

Table 1 reports the descriptive statistics of the above mentioned variables. The mean of the *SFK* appears to be on a higher side at 5.14 on a scale of 1-7 while the average *RFK* is almost in the middle at approximately 55%. Apriori, this gives an indication that the self-assessed competence in financial knowledge is exaggerated as compared to the real financial knowledge. It suggests that on an average, people tend to believe that they are more financially literate than what they really are. Although, the standard deviation for *SFK* is higher than those of *RFK*, the coefficient of variation for SFK is much lower at 0.28 as compared to that of *RFK* at 0.50. This suggests that although most of the people tend to believe that they are adequately competent in financial knowledge, there exists a high variability.

The mean of *SFC* is 5.68 on a scale of 1-10 which seems to be lower than that of *SFK* (5.14) on a scale of 1-7. This indicates that although people's self-assessed financial competence is high, their self-assessed satisfaction with their financial conditions is on a lower side. Interestingly, the coefficient of variation is similar to *RFK* at approximately 0.5 indicating that both self-assessed satisfaction on financial conditions and real financial knowledge varies substantially among the individuals.

Although both *SFK* and *SFC* are self-assessments, there is a fundamental difference between the way these two perceptions are formed. The self-assessment of financial literacy is mainly cognitive in nature and could be more driven by biases, while the self-assessment of financial situations is based on actual financial situations of a household. An individual may not be aware that he/she lacks financial knowledge but the same person may have a better grasp of his/her financial conditions based on his/her household financials such as income, debt, expenses, etc.

The mean score of *FB* is 5.23 on a scale of 1-12, indicating an imprudent financial behavior by most of the respondents. However, unlike the case of *SFK*, the coefficient of variation of this variable is high at 0.55 indicating that there exists substantial variation in the manner in which people tend to behave when it comes to money matters. Overall, these four variables indicate that people's self-assessment of financial literacy (high SFK with low variation) is higher than what is justified by their real knowledge (low RFK with high variation) which probably causes them to indulge in imprudent behavior (low FB) leading to low financial satisfaction (low SFC with high variation).

Among the control variables, the average age is at a level of 3.68 which represents 40-50 years of age group. Similarly, the average educational level of 4.52 represents groups with some college, no degree and an associate degree. The average income of the respondents is at a level of 4.4 which represents

annual income in the range of approximately \$40,000- \$60,000 (almost the median income of an American household). The binary variables indicate that the marital level of respondents are evenly split with currently 55% married and 45% not married. Similarly, 55% of the respondents are men and 45% women while the ethnicity of the sample is mainly white at around 72%.

TABLE 1
DESCRIPTIVE STATISTICS

	Mean	Median	Max	Min	Std. Dev.	Skewness	Kurtosis
SFK	5.1364	5.0000	7.0000	0.0000	1.4299	2.7908	-1.3730
RFK	0.5490	0.5000	1.0000	0.0000	0.2779	-0.7903	-0.2164
SFC	5.6832	6.0000	10.0000	0.0000	2.8196	-0.9994	-0.3316
FB	5.2333	5.0000	12.0000	0.0000	2.8887	-0.9031	0.1772
AGE	3.6811	4.0000	6.0000	1.0000	1.6433	-1.2076	-0.0773
EDU	4.5274	4.0000	7.0000	1.0000	1.6947	-1.0086	-0.2070
INC	4.4080	5.0000	8.0000	1.0000	2.0475	-0.9685	-0.1091

Binary variables	Number	D=0	D=1
MAR	27564	15271	12293
GEN	27564	12557	15007
ETH	27564	7728	19836

Table 2 reports the cross correlations of the four main variables of the study. The correlation between self-assessed financial knowledge and real financial knowledge is very low at 0.28. The weak relationship of financial behavior with both real financial literacy and self-assessed competence in financial knowledge is suggested by low correlations of approximately 0.37. The relationship between self-assessed financial conditions with financial behavior is somewhat higher at 0.56 while with real financial knowledge is very low at 0.15. Overall, these low correlations indicate that each of these four variables are quite distinct in nature.

TABLE 2
CROSS-CORRELATIONS

	SFK	RFK	SFC	FB
SFK	1			
RFK	0.28	1		
SFC	0.39	0.15	1	
FB	0.37	0.38	0.56	1

Model

The first research question of this study is to examine to what extent financial behavior is driven by self-assessed competence of financial knowledge. The model is as follows:

$$FB = C + \beta_1 SFK + \beta_2 RFK + \beta_3 SFC + \sum_{i=1}^{6} \alpha_i C_i + \varepsilon \qquad (1)$$

where, FB is the financial behavior, SFK is the self-assessed financial knowledge, SFC is the self-assessed financial conditions and C_i represents the six control variables: age, gender, education, marital status, income and ethnicity.

The next step is to investigate the extent to which irrationality plays a role in the formation of self-assessed financial competence. Also, if irrationality does have a role, then what is the relative impact of self-assessment of financial knowledge induced by real financial knowledge and self-deceptive financial literacy driven by biases impact the financial behavior. In other words, how which financial behavior is driven by rational component of self-assessed financial competence (perception due to real financial knowledge) and the irrational component of self-assed financial competence (perception driven by biases)?

To accomplish this, an approach similar to the one suggested in Brown and Cliff (2005), Baker and Wurgler (2006) and Verma and Soydemir (2006, 2009) is employed. The two-step process is as follows: the first step is to generate two separate variables that represent the two components of the self-assessed financial competence – first component is due to real financial knowledge while the second component is due to biases. Accordingly, first the following equation in which self-assessed financial competence is regressed against real financial knowledge is estimated:

$$SFK = C + \beta_1 RFK + \sum_{i=1}^{6} \alpha_i C_i + \varepsilon \qquad (2)$$

The fitted values of equation (2) without control variables captures the rational component of SFK (i.e. $\widehat{SFK}$) or, the portion of self-assessed financial knowledge that is truly justified by real financial knowledge. The residual of this equation without control variables capture the irrational component of SFK (i.e. ε) which is not driven by the real financial knowledge i.e., induced by biases.

The next step is to analyze the extent to which the financial behavior is affected by these two decomposed components of self-assessed financial competence (rational perceptions driven by real financial knowledge and self-deceptions induced by biases) with control variables. Accordingly, the following equation is estimated:

$$FB = \beta_0 + \beta_1 \widehat{SFK} + \beta_2 \varepsilon + \sum_{i=1}^{6} \alpha_i C_i + + \varphi_t \qquad (3)$$

Here, the parameters β_1 capture the effect of rational component of self-assessment of financial knowledge while β_2 capture the effects of irrational component or self-deceptive perception of financial literacy on financial behavior. The six coefficients represented by α_i relate to the control variables.

The next step is to analyze the impact of overconfidence and financial aliteracy on financial behavior. To accomplish this, in the first step, two new variables (overconfidence and financial aliteracy) are generated from the residuals obtained in equation (2). Specifically, the irrational component of self-assessment of financial knowledge (ε) is decomposed into two components to capture *overconfidence* (financial illusion) and financial *aliteracy* as follows:

(i)Financial illusion (*FI*): This variable represents the ignorance which a person might have on his/her financial literacy due to irrational cognitive errors and biases. A person may display financial *illusion* when his/her self-perception on financial knowledge is *more* than his/her actual financial knowledge. Such overconfidence will be represented by the scenario when SFK > $\widehat{SFK}$) and computed as positive residuals of equation (2). In summary, a person will display financial illusion when his/her self-assessed literacy is greater than his/her true financial knowledge i.e., positive values of (SFK - $\widehat{SFK}$).

(ii) Financial aliteracy (*FA*): This variable is an irrational financial perception on financial literacy when one underestimates his/her knowledge. A person who is financially literate perceives him/her to be less informed and knowledgeable in financial matters. A person may display financial *aliteracy* when his/her self-perception on financial knowledge is *less* than his/her actual financial knowledge. This bias therefore will be represented by the scenario when SFK < $\widehat{SFK}$) and computed as negative residuals of equation (2). In summary, a person will tend to display financial aliteracy when his/her self-assessment of financial knowledge is less than the financial competence what he/she truly possess i.e., negative values of residuals (SFK - $\widehat{SFK}$).

In the second step, these two biases are included in the equation describing the financial behavior as follows:

$$FB = C + \beta_1 FI + \beta_2 FA + \sum_{i=1}^{6} \alpha_i C_i + \varepsilon \qquad (4)$$

The parameters in the above equation would capture how financial behavior is driven by two biases: overconfidence (financial illusion) and financial aliteracy.

Estimation results

Table 3 reports the regression results for equation (1) with and without the control variables. In the first column, the financial behavior variables is regressed against *SFK* and *RFK*. The impact of self-assessed financial knowledge is significant and negative while the effect of real financial knowledge is positive and significant. Also, the magnitude of the impact of the real financial knowledge is greater than the impact of self-assessed financial competence on financial behavior. The negative effect of SFK gives supports the notion that self-assessed financial knowledge which is an individual's own perception may be driven by biases and may not fully represent his/her financial knowledge and such misplaced perceptions can lead to imprudent financial decisions possible. On the other hand, the positive effect of *RFK* supports the well accepted argument that there is no substitute to financial literacy when it comes to decisions related to money matters. The second regression includes the six control variables. The signs and significances of SFK and RFK does not change in the second regression. Among the control variables GEN and EDU are significant with negative and positive coefficients respectively. This suggests that women are more likely to display prudent financial behavior than men. Also, educational level plays an important role in better household financial management. In both the regressions, there is an insignificant impact of SFC suggesting that self-assessed financial satisfaction due to condition does not necessarily contribute to better financial behavior.

TABLE 3
REGRESSION RESULTS

$$FB = C + \beta_1 SFK + \beta_2 RFK + \beta_3 SFC + \sum_{i=1}^{6} \alpha_i C_i + \varepsilon$$

	FB	FB
Constant	0.2478***	1.4908***
	(0.0523)	(0.0567)
SFK	-0.2201***	-0.1733***
	(0.0104)	(0.0093)
RFK	2.8682***	1.5769***
	(0.0501)	(0.0499)
SFC	0.4885	0.3650
	(0.2451)	(0.2748)
GEN		-0.0216
		(0.0024)***
AGE		-0.0365
		(0.1177)
EDU		0.1441***
		(0.0079)
MAR		0.2728
		(0.3274)
INC		0.4798
		(0.5375)
ETH		0.1697
		(0.1275)
R-squared	0.4110	0.5352
S.E. of regression	2.2171	1.9697
F-statistic	6411	3525

Having established that financial behavior is negatively driven by self-assessed financial knowledge, the next step is to investigate if irrationality has a role to play in the formation of such perceptions. Table 4 reports the regression results for equation (2) where self-assessed financial knowledge is regressed against the real financial knowledge with and without the control variables.

TABLE 4
REGRESSION RESULTS

$$SFK = C + \beta_1 RFK + \sum_{i=1}^{6} \alpha_i C_i + \varepsilon$$

	SFK	SFK
Constant	4.3480***	3.7397***
	(0.0183)	(0.0315)
RFK	1.4360***	0.9772***
	(0.0297)	(0.0335)
GEN		-0.1265***
		(0.0167)
AGE		0.0462
		(0.5323)
EDU		0.0492***
		(0.0054)
MAR		0.0795
		(0.0887)
INC		0.0960
		(0.0849)
ETH		-0.0771***
		(0.0188)
R-squared	0.0778	0.1122
S.E. of regression	1.3731	1.3474
SSR	51964	50026
F-statistic	2328	498

The results of the first regression suggest a significant impact of *RFK* indicating that real financial knowledge does play a positive role in formation of perceptions related to financial literacy. However, the R-squared of this regression is less than 8% indicating the almost 92% of the self-assessments could be due to reasons beyond the real financial knowledge. This finding indicates that some component of self-assessments could be truly justified by actual financial literacy but a portion of it may stem from other factors which are not rooted in financial knowledge such as beliefs, psychology, emotions, gender and demographics. In other words, there exists self-deceptive financial literacy. Among the control variables, in addition to GEN and EDU, there are significant negative impact of ETH self-assessed financial knowledge. Specifically, GEN has positive sign indicating the men are most likely to display higher self-assessment of financial literacy. Also, EDU and ETH have negative coefficients suggesting the less education and non-white ethnicity lead to higher self-assessed financial competence. In other words, men, low education and non-white ethnicity could be displaying more biases in formation of these perceptions.

The next step is to analyze the relative impact of rationally and irrationally generated self-assessed financial knowledge on financial behavior. Accordingly, equation (3) is estimated in which the fitted values and residuals representing the rational perceptions driven by real financial knowledge and self-deceptions induced by biases respectively are introduced as explanatory variables. Table 5 reports the results of the regression with and without the control variables. The financial behavior variable seems to be driven by both by rational as well irrational components of self-assessed financial knowledge as both the coefficients are significant. However, the impact of rational component is positive while that of the irrationally generated self-assessed financial knowledge is negative and higher. These results indicate that self-deceptions induced by biases leads to imprudent financial behavior while self-assessments based on real knowledge leads to prudent financial management decisions. However, poor financial decisions due

to irrational self-assessed financial competence outweighs the benefits of rationally formed perceptions on financial literacy.

These results provide an important determinant of imprudent financial decision and lends support to the findings of Graham, et al. (2009). Poor financial behavior is not necessarily due to low financial literacy but due to incorrect self-assessment of knowledge. Individuals with less understanding of their own level of financial knowledge due to psychological biases are the ones more likely to engage in imprudent financial decisions irrespective of his/her real financial literacy. Consistent with the results of the first regression (equation 1), the control variables GEN and EDU are significant with negative and positive coefficients respectively suggesting that women and individuals with higher education are more likely to display prudent financial behavior.

TABLE 5
REGRESSION RESULTS

$$FB = \beta_{0+}\beta_1\widehat{SFK} + \beta_2\varepsilon + \sum_{i=1}^{6} \alpha_i C_i + \varphi_t$$

	FB	FB
Constant	8.7798***	5.2775***
	(0.1987)	(0.1738)
$\widehat{SFK}$	0.9282***	1.3165***
	(0.0386)	(0.0376)
ε	-2.5792***	-3.4004***
	(0.0112)	(0.0097)
GEN		-0.1339***
		(0.0269)
AGE		-0.0151
		(0.0085)
EDU		0.1586***
		(0.0086)
MAR		0.2946
		(0.3101)
INC		0.6239
		(0.7190)
ETH		0.1616
		(0.3102)
R-squared	0.2178	0.4383
S.E. of regression	2.5549	2.1652
SSR	179907	129185
F-statistic	3837	2688

Since biases have a role to play in formation of self-assessment of financial literacy and such irrational self-assessments does lead to imprudent financial behavior, the next step is to address the relative impact of two important biases: overconfidence (financial illusion) and financial aliteracy. Accordingly, equation (4) is estimated to analyze the impact of financial illusion and financial aliteracy on financial behavior with and without the control variables. The results are reported in table 6.

TABLE 6
REGRESSION RESULTS

$$FB = C + \beta_1 FI + \beta_2 FA + \sum_{i=1}^{6} \alpha_i C_i + \varepsilon$$

	FB	FB
Constant	5.4963***	0.6314***
	(0.0256)	(0.0563)
FI	-0.4511***	-0.4886***
	(0.0271)	(0.0218)
FA	-0.3734***	-0.4232***
	(0.0188)	(0.0153)
GEN		-0.3066***
		(0.0271)
AGE		0.0463
		(0.0585)
EDU		0.2294
		(0.0086)
MAR		0.2941
		(0.2307)
INC		0.6730***
		(0.0080)
ETH		0.2736
		(0.2308)
R-squared	0.0819	0.4138
S.E. of regression	2.7680	2.2120
SSR	211171	134834
F-statistic	1229	2431

Both FI and FA have negative and significant impacts suggesting that the existence of overconfidence and financial aliteracy leads to imprudent financial behavior. The impact of overconfidence on household financial decision is consistent with Daniel, Hirshleifer, and Subrahmanyam, (1998), Gervais and Odean (2001), Odean, (1998; 1999) who suggest that investors are miscalibrated (or overconfident) about the precision of their information and trade too much and to their detriment. Similarly, the negative impact of financial aliteracy lend support to the argument of that even when people possess knowledge and information, they ignore it, do not use it, or respond to the wrong cues of what might be the correct decision (Rotfeld, 2008, Belsky and Gilovich 1999; Lwin and Williams 2006; Norberg, Horne, and Horne 2007). The impact of overconfidence seem to be higher than that of financial aliteracy on imprudent financial decisions. Consistent with previous findings, gender and education level play a crucial role in better financial decision.

Overall, the findings suggest the following people's self-assessment of financial literacy is much higher than their real knowledge which probably causes them to indulge in imprudent behavior leading to low financial satisfaction. Individuals with less understanding of their own level of financial knowledge due to psychological biases such as overconfidence and aliteracy, irrespective of his/her real financial literacy are more likely to engage in imprudent financial decisions

CONCLUSION

People often do not have a full understanding of their own level of financial knowledge due to psychological biases which inhibit one's ability to make good financial decisions. Some component of these self-assessments could be truly justified by actual financial literacy but a portion of it may stem from irrational beliefs, psychology, emotions, gender and demographics. Is financial literacy the main driver of financial behavior, or, self-perceived *over and under assessment* of financial knowledge causes individuals to take imprudent financial decisions? This study attempts to shed light on these important questions. The purpose is to investigate the extent to which self-assessed financial knowledge is induced by biases and how such irrationality causes imprudent financial behavior. It also examines the role of overconfidence and financial aliteracy on financial decisions. This research employs the data from the 2015 National Financial Capability Study (NFCS) which was conducted to assess Americans' ability in dealing with financial capability. The sample size consists of over 27,500 households of different age group, gender, education, marital status, income and demographics.

The major findings of this research are as follows: (i) self-assessed financial competence has negative impact while real financial knowledge has a positive impact on financial behavior, (ii) self-assessed financial competence is driven by both real financial knowledge and irrational biases i.e., some component represents self-deceptive financial knowledge, (iii) prudent financial behavior is positively impacted by self-assessed knowledge driven by real literacy while negatively impacted by self-deceptive financial literacy formed from biases (iv) there are significant negative impact of overconfidence (financial illusion) and financial aliteracy on prudent financial behavior - the impact of overconfidence seems to be higher than financial aliteracy (v) the results vary across gender, income level and ethnicity of individuals.

Overall, this study finds that elf-assessment of financial literacy due to biases leads to imprudent financial behavior and low financial satisfaction. Individuals with less understanding of their own level of financial knowledge due to overconfidence and aliteracy, are more likely to engage in imprudent financial decisions, irrespective of their real financial literacy. An important question that is aimed to answer in this research is not whether financial literacy matters in household financial management, but rather the mechanism in which financial knowledge and biases lead to incorrect self-assessment of comapetence which dictates imprudent financial behavior. Biases seems to corrode the positive impact of financial literacy on prudent financial decisions.

ENDNOTES

1. Studies vary in the way knowledge and behaviors are measured. See Braunstein and Welch (2002); Carswell (2009); Collins (2007); Haynes-Bordas et al. (2009); Scott (2010); Borden et al. (2008); Chen and Volpe (1998); Jones (2005); Robb (2010); Robb and Sharpe (2009); Lusardi and Mitchell (2006); Rooij et al. (2011).
2. The role of psychology in stock valuation is well documented by Black (1986), Trueman (1988), DeLong, Shleifer, Summers and Waldman (DSSW) (1990, 1991), Shleifer and Summers (1990), Lakonishok, Shleifer and Vishny (1991), Campbell and Kyle (1993), Shefrin and Statman (1994), Palomino (1996), Barberis, Shleifer and Vishny (1998), Daniel, Hirshleifer and Subramanyam (1998); Hong and Stein (1999) and Sias, Starks and Tinic (2001). Nofsinger (2010) provides an extensive review of theoretical and empirical studies on behavioral finance.
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