Assessing Basic Financial Knowledge of Undergraduate Students: A Survey-Based Analysis

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A sample of undergraduate students at a private, liberal arts university in the Pacific Northwest were surveyed to determine contributing factors to financial knowledge. Respondents were asked questions on a variety of concepts related to personal finance such as the time value of money, impacts of inflation, and home mortgage repayment plans. We find that Caucasian students, majoring in business-related disciplines have the highest levels of financial knowledge while non-Caucasian, non-business majors the least. The most influential predictors of financial knowledge in the sample are the respondent's self-assessment of their level of financial knowledge and their race. These results suggest that targeting financial education initiatives to those aware of their own limited financial knowledge could yield improvements in their understanding of financial issues. The educational experience could be tailored to meet the needs of those that would derive the greatest benefits from it. Such an approach would have the additional benefit of having a lower cost than providing financial education for all.

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INTRODUCTION AND PURPOSE

Extensive research has been published on the deficiency in financial literacy of younger populations and their need for financial education. Major emphasis has been given to defining the deficiency, targeting *when* financial education is most beneficial, and describing the outcomes of both financial literacy and illiteracy. What has not been clearly defined is answering the questions, "who is most at-risk" and "how can a targeted financial education program maximize limited resources by focusing on those who are most at risk?" Being university professors, the authors are most concerned with the dynamics of financial education during the college years. With certainty, students in the 18-25 age group find themselves on the brink of financial independence where the stakes of not exhibiting prudent financial behaviors are much higher. As Jobst (2012) argues, the college years could accurately be described as the last opportunity for this age group to gain the financial knowledge needed for competency before becoming adults.

The benefits of financial literacy are numerous. Hogarth (2002) maintains:

Well-informed, well-educated consumers should make better decisions for their families, increasing their economic security and well-being. Secure families are

better able to contribute to vital, thriving communities, further fostering community economic development. Thus, financial literacy is not only important to the individual household and family, it is also important to communities. (p. 16)

It appears that, given the personal and communal benefits, colleges and universities might find financial education initiatives as an important piece in helping develop students into successful leaders of families and productive members of their communities.

Universities seek to educate students and equip them for productive and meaningful lives. One could argue that for this outcome to happen, individuals need to be financially savvy enough to navigate a life of financial independence, including basic money management tasks and working within the existing financial services structure. The results of this study are significant because they provide colleges, universities and financial educators the ability to spread limited resources across a vast student population in order to permit maximum impact. This strategy can be implemented by identifying students who are most at risk for lacking basic financial skills and targeting financial education efforts to those students.

The purpose of this study and resulting paper is to discover what indicators might exist that would help identify students who are most at risk of having low levels of financial knowledge. The study builds upon previous studies that find certain demographic variables to be good predictors and others to not be significantly related to financial knowledge and literacy. The authors seek to test previous findings and introduce a few other variables not found in the literature.

LITERATURE REVIEW

There are mixed opinions about the level of financial literacy among college students, but a majority of the literature points to lower levels of financial literacy (Braunstein & Welch 2002; Chen & Volpe, 1998; Mandell & Institute, 2008; Perry, 2008). One of the largest and most comprehensive financial literacy studies of college students was the work conducted by Chen and Volpe. Their study revealed that only 53% of the college students in their sample correctly answered questions about personal financial topics. This number supports the conclusion that college students suffer from low financial literacy and are unprepared to handle the financial decisions they will need to make upon graduation. Mandell and Institute find that high school students exhibited even lower levels of financial literacy, which is a concern and a cause for intervention. Comparatively, college student financial literacy levels are significantly higher (approximately 65% as exiting seniors) and literacy increases with each year of higher education. According to Mandell and Institute, college students graduate with a moderate level of financial proficiency, yet it could be argued that scoring 65% does not correspond to a level of proficiency needed to make good financial decisions.

An important question that has emerged in the literature is, "does financial education work?" Again, reviews are mixed. Fox, Bartholomae, and Lee (2005) illustrate

the difficulty that programs have had in isolating the direct effect of finanical eduation independent of other factors. Furthermore, these researchers indicate the difficulty in establishing an apporiate length of programming and determining whether short-term benefits are lasting. Cole, Paulson, and Shastry (2014) find that mandating personal finance courses for high schoolers does not impact financial outcomes. Hogarth (2002) also finds difficulty in measuring effectiveness.

However, there have been some positive findings. Bernheim, Garrett, and Maki (2001) found that students who had gone through mandated state financial education curriculums achieved higher asset accumulating into adulthood. Both Bernheim and Garrett (2003) and Todd (2002) found that increased savings rates have been associated with individuals who have been exposed to workplace financial education. Danes and Haberman (2004) provide some encouraging evidence of sucessful outcomes from the National Endowment for Financial Education High School Financial Planning Program Curriculum. They found that participants of the program "showed statistically significant increases in all financial knowledge, behavior, and confidence questions" (p. 2), while 40% began setting financial goals after going through the program. Even three months after completing the program, the majority of participants indicated sustained knowledge, changes in spending patterns, and increased savings behavior.

A small segment of research has been directed at explaining the differences in financial literacy levels of college students. Goldsmith and Goldsmith (1997) and Chen and Volpe (2002) found that women tend to show lower levels of financial literacy compared to male counterparts. Wagland and Taylor (2009) do not find meaningful differences in the financial literacy of male and female undergraduates in Australia. In Chen and Volpe (1998), non-business majors, students with little work experience, students in the lower class ranks and those students under age 30, all tend to have lower levels of financial knowledge. Furtuna (2007) found that only a students' major was statistically significant in predicting financial literacy. Students majoring in a non-business disciplines had lower financial literacy scores. Gender, age, work experience, or class rank were not statistically significant predictors of financial literacy in Fortuna's study.

Finding variables that are correlated with financial illiteracy among college students could have powerful implications. To this point, much of the debate within the financial education movement has revolved around the question of, when is the best time to offer intervention (i.e. high school versus college)? A targeted approach to financial education could have more value, whereby the education initiative is offered to groups of students who are either believed, or known, to have lower levels of financial literacy and knowledge.

According to the FINRA Investor Education Foundation (2009), an increasingly complex financial system has made financial literacy more important. The recent financial crisis, in part, demonstrated some of the complications that are present in the marketplace. With more financial choices and information available, there is a greater ability to leverage one's understanding of finance to improving their well-being. Conversely, an inadequate level of financial knowledge brings with it the distinct possibility of poor decision making.

The United States Treasury Department, Federal Deposit Insurance Corporation, and Federal Reserve System have placed financial capability as a political priority. The Financial Literacy and Education Commission (FLEC) was created as a cross-department governmental roundtable to help improve financial capability within the United States (U.S. Department of the Treasury, 2012). Due to the debt levels associated with higher education, much attention is being paid to undergraduate students. In a special report from the White House (2012), low financial literacy levels are argued to contribute to excessive debt, inappropriate wealth accumulation, and depleted retirement savings. Braunstein and Welch (2002) find that the financially illiterate are at a disadvantage by broadly lacking knowledge of completing even day-to-day financial responsibilities that leads to a lack of savings for things such as homes, education, or retirement.

A growing body of research has outlined many of the benefits to financial literacy and knowledge. Harnisch (2012) shows that successful financial education can reduce financial defiencies allowing for better decisions regarding houshold budgets, savings, indebtedness, and investments. Futher, through education, improving the financial literacy of a population can, as Frederichs and Rohrke (2000) state, increase access to capital, consumer protection, and an individual's likelihood to save, thus increasing net worth. One critical component to a student's future success is the ability to save financial resources. Lusardi and Mitchell (2011a, 2011b) find a positive relationship between the level of financial literacy and planning for retirement. Our study contributes to this literature by uncovering specific characteristics that influence the level of financial knowledge.

SURVEY

The survey applied is based upon a financial literacy instrument developed by the FINRA Investor Education Foundation. According to the FINRA Investor Education Foundation (2009), their survey is focused on accounting for four financial concepts: making ends meet, planning ahead, managing financial products, and financial knowledge and decision-making. The data collected for our study includes information on demographics, understanding of financial concepts as developed in the FINRA study, and the respondent's ability to self-assess their level of financial knowledge.

SAMPLE

The survey was administered over a two-week period during the fall of 2012. A male acted as the surveyor and randomly asked individuals in the University's main eating area to fill out the survey. All surveys were completed in-person, using a hard-copy instrument. A total of 84 surveys were completed. There were no issues with incomplete surveys. Sixty-four percent of the respondents were male and 35% were female. The average age of respondents is 20.39 years. Students that are either junior or senior-level, according to their number of college course credits, make up 74% of the sample. Students were also asked their race. Due to the relatively small sample size, the measure of race was reduced to Caucasian or non-Caucasian. Seventeen percent of

respondents reported being non-Caucasians. Seventy-one percent of the respondents were non-business related majors. Furthermore, 26% of the respondents use some kind of investing tool and 96% have some form of an account at a financial institution. The reader should keep in mind that the sample is not representative of the national population of undergraduate students (i.e. males and upper-classmen are over represented in our sample).

The questions used to measure financial knowledge and percentages of correct responses are:

1. Suppose you have $100 in savings account earning 2 percent interest a year. After five years, would you have more than $102, exactly $102 or less than $102? *81% correct.*
2. Imagine that the interest rate on your savings account is 1 percent a year and inflation is 2 percent a year. After one year, would the money in the account buy more than it does today, exactly the same or less than today? *88% correct*
3. If interest rates rise, what will typically happen to bond prices? Rise, fall, stay the same, or is there no relationship? *37% correct*
4. True or false: A 15-year mortgage typically requires higher monthly payments than a 30-year mortgage but the total interest over the life of the loan will be less? *85% correct*
5. True or false: Buying a single company's stock usually provides a safer return than a stock mutual fund? *80% correct*

The average score was 3.71 correct out of five. Only 21% of respondents answered every question correctly.

Following the five financial questions, participants were asked how many questions they believed they answered correctly. The average was 3.14 correct out of five. Respondents were also asked to rate their ability to understand math concepts (on a Likert-scale with 5 being the highest and 1 being the lowest); the average response was 3.55 out of five.

Though the survey is a standard instrument in the literature it does have weaknesses worth acknowledging. The type and number of questions a respondent must answer correctly to be deemed financially literate, or possess a sufficient level of financial knowledge, is still an open question in the literature. A common criterion applied is that an individual must answer questions 1, 2, and 5 correctly to be deemed financially literate. By including questions 3 and 4 in the survey we are able to ascertain respondent's command of higher-level financial concepts. Answering either of these questions correctly is evidence that the respondent has a level of financial knowledge beyond simple literacy. As such, a score of four *or* higher on the survey is the threshold applied in this study to differentiate between those with high and low levels of financial knowledge. For the remainder of the paper the high versus low categorization of financial knowledge will be applied.

An additional concern endemic to the literature, and particularly relevant to our study, is that the questions asked are not specific to the financial issues the average

undergraduate faces during this stage of life. The student financing their education through debt need not be aware of the relatively safety of a stock mutual fund compared to an individual stock or the differences between 15 and 30 year mortgages. These are not relevant to their current financial status; thus answers may be influenced by a degree of rational ignorance. Mortgages and the specifics of mutual funds are subjects which can be learned about when they do become relevant. While these limitations deserve being aware of, and prompt future extensions to the study, the use of FINRA's survey allows us to consider our results in the light of the wider literature. Table 1 presents the percentages of those with high or low levels of financial knowledge across a variety of dimensions.

TABLE 1

Percentage of Respondents Possessing High or Low Levels of Financial Knowledge

	High Financial Knowledge	Low Financial Knowledge
Male	74%	26%
Female	87%	13%
Caucasian	24%	76%
Non- Caucasian	7%	93%
Business Major	42%	58%
Non-Business Major	13%	87%
First-Year	13%	88%
Sophomore	21%	79%
Junior	32%	68%
Senior	16%	84%

Note: To be considered to have a high level of financial knowledge, 4 out of the 5 financial concept questions must be answered correctly.

RESULTS

In order to determine the impact that an individual's characteristics have on their financial knowledge a probit regression model is applied. This methodology allows for predicting financial knowledge based upon the control variables considered. The

dependent variable in the estimation is a binary interpretation of financial knowledge (=1 if a high level of financially knowledge, = 0 a low level).

Explanatory variables considered were demographics, education, and personal discernment. The demographic and education categories include the respondent's sex, race, age, year of schooling (first-year, sophomore, etc.), and major. *Sex* is treated as a binary indicator variable (=1 if male, = 0 if female). *Race* is considered in the same manner (=1 if non-Caucasian, = 0 if Caucasian). The survey was only taken by traditional undergraduate students. As a result, age and year are highly correlated, $r = .76$, $p < .01$. In order to isolate the impact of higher education on financial literacy, and to avoid issues of multicollinearity, only *Year* is included as a regressor. The inclusion of *Major* allows for the impact of major-related courses within the University's School of Business to be accounted for (=1 if non-business major, = 0 if business major).

Personal discernment is included to gauge whether respondents have an accurate understanding of their own financial knowledge. *Prediction* is a measure of how many questions the respondent believes they answered correctly. *Math* is the respondent's self-reported math competence on a scale of one to five; one corresponds to "not well at all" and five "near mathematician." *Math* is included because FINRA (2009) tests whether respondents that believe they are better at math are also more financially literate. Somewhat surprisingly, *Math* is not highly correlated with *Prediction*, $r = 0.42$, $p < 0.01$. It appears that respondents are not basing their predictions on their command of mathematics.

Prior to discussing our findings the reader should be reminded of the small sample used in the study, $n = 84$. Compounding the statistical concerns associated with a small number of observations are the aforementioned sampling issues, and the context of the study; a single university in the Pacific Northwest. In light of these caveats, our findings and conclusions should be considered exploratory.

Results from the estimation of the probit model are reported in Table 2. The likelihood ratio test indicates that as a group, the estimated slope coefficients are statistically significant ($\chi^2(6) = 32.11$, $p < 0.001$). The McFadden *R*-square indicates that approximately 29% of the variance is explained by the model. The reader is reminded that estimated coefficients do not predict the marginal impact of a change in an explanatory variable on financial knowledge. Coefficients are the change in the *z*-value in the cumulative standard normal distribution.

A number of the explanatory variables are found to be statistically significant. Of the estimated slope coefficients, *Race* has the largest absolute value. The model predicts that a respondent's race has the largest marginal impact on the predicted probability of financial knowledge. Its sign indicates that non-Caucasians are expected to have a lower level of financial knowledge than Caucasians. *Prediction's* coefficient indicates that respondents have an accurate interpretation of their own financial literacy. Those that predict they will do better on the survey do. *Year's* positive coefficient indicates that undergraduates' financial knowledge increases during their higher education experience.

Sex, *Major,* and *Math* are found to be statistically insignificant. An insignificant coefficient indicates that in isolation, a marginal change in the explanatory variable will not change the predicted probability of financial knowledge. In and of themselves, neither a respondent's sex nor self-defined math skills impact their level of financial knowledge. Additionally, the statistical insignificance of *Major*'s coefficient suggests that being exposed to courses specifically related to finance is not important. Given that studies with larger samples have found these variables to be statistically significant and that the likelihood ratio test conducted in our study indicates the collective importance of the explanatory variables we do not have a high level of confidence in these results. It is possible that these results are a function of the issues associated with our sample.

TABLE 2.

Summary of Regression Analysis for Variables Predicting Financial Knowledge of Undergraduate Students

Binary Probit Model		
Variable	Parameter Estimate	SE
Constant	-1.69**	0.77
Year	0.30*	0.18
Sex (Female Omitted Category)	-0.05	0.37
Race (Caucasian Omitted Category)	-1.17**	0.47
Major (Business Majors Omitted Category)	-0.62	0.40
Prediction	0.56***	0.16
Math	0.01	0.19
McFadden R-square	0.32	

$* \ p < 0.05; \ ** \ p < 0.01; \ *** \ p < 0.001$

In Table 3, various statistical "individuals" are created and their expected probability of possessing high or low levels of financial knowledge are calculated. Variation across *Race*, *Major,* and *Sex* are considered. Median values of *Year*, *Prediction* and *Math* are applied; 3, 3, and 4, respectively.

Financial knowledge exhibits notable variation across these representative individuals. As evident from Table 3, there is a minimal difference between sexes. A respondent's race has the biggest impact on the predicted probability of financial knowledge. The difference between "identical" non-Caucasian and Caucasian individuals is approximately 40 percentage points. For example, student 1 as compared to student 5. The largest difference found in Table 3 is between a non-Caucasian, non-business major and a Caucasian pursuing a business degree; approximately 64 percentage points.

TABLE 3
Predicted Probability of Possessing High Financial Knowledge for a
Representative Individual

Student	Characteristics	Probability
1	Male, Non-Caucasian with Non-Business major	0.18
2	Female, Non-Caucasian with Non-Business major	0.19
3	Male, Non-Caucasian with Business major	0.39
4	Female, Non-Caucasian with Business major	0.41
5	Male, Caucasian with Non-Business major	0.60
6	Female, Caucasian with Non-Business major	0.62
7	Male, Caucasian with Business major	0.81
8	Female, Caucasian with Business major	0.82

Note: Results calculated for a respondent with median values of *Year*, *Prediction*

and *Math*.

IMPLICATIONS

The general findings of our study are consistent with the literature. This study's contribution to the literature is the uncovering the importance of self-assessment. The self-assessment variable (*Prediction*), is the most statistically significant variable in the model. Individuals that believe they have a high level of financial knowledge did better on the survey. The authors believe financial educators can leverage this novel finding in their attempts to improve the financial lives of their students.

Understanding that individuals are aware of their own level of financial knowledge gives financial educators an opportunity. The opportunity suggests a way to move from the typical "wide net" approach, where financial education is provided for all, to a more targeted strategy. The mixed findings in the literature related to the relationship between financial education and financial behavior suggests that the wide net approach may be not be most effective.

A screening process could be used to determine individual's self-assessed level of financial knowledge. An exhaustive survey need not be completed; students would be asked to rate their level of financial knowledge in a fashion similar to the survey applied in this study. Institutions who use such a process would then be able to distinguish between those with a high and low level of financial knowledge. Students rating themselves below a certain point could be offered, or required to take, a financial education course or workshop in the hopes of increasing their level of financial knowledge. Presenting students with information regarding the benefits to financial knowledge would further motivate their decision to take the course or attend the workshop. As research continues to develop, and more advanced techniques to measure financial capability are created, the screening process can be refined and improved upon.

The private sector is increasingly using data to inform their strategic decisions. For years marketing campaigns have targeted categories of individuals, airlines and hotels are aware of the school calendar and adjust their prices during periods of high demand, Coca-Cola famously recorded weather conditions and raised soda prices accordingly. The intuition behind leveraging the insights of data could be applied to financial education. Personal finance courses or workshops could be marketed in a way to make individuals aware of their level of financial knowledge and what they seek to gain from improving it. The authors are not suggesting implementing discriminatory measures, but rather we believe the aforementioned screening process and targeting of at risk individuals need not be at the sake of others. All students need to be financially literate in order to successful in their professional and personal lives. Policy makers and educators are obligated to adopt feasible approaches to facilitate this end. A more targeted approach to financial education could be more effective and less expensive than more comprehensive initiatives.

CONCLUSION

Prior to summarizing our findings the reader should be reminded of important limitations of the study. First, the small sample and relatively homogenous group the survey was administered to suggest that the results are not definitive. Increasing the sample size and expanding the scope of the survey are obvious extensions of the research. Either or both of these undertakings would result in more robust findings while bolstering the external validity of our results. Second, while the survey administered is standard in the literature it is not without weaknesses. In the context to this study some of the questions are not immediately relevant to the average college student. Respondent's answers may be influenced by a degree of rational ignorance. Some of the financial concepts are germane when one has no income to save. Of course ignorance becomes problematic when decisions related to saving and investment must be made.

While the aforementioned weaknesses temper the conclusiveness of our results, the study has uncovered ways in which educational institution administrators can take steps to help increase the financial knowledge of their students. With the aforementioned targeted approach in mind, administrators can seek out those that stand to benefit the most from financially education initiatives. Through this more efficient approach, one

can only speculate the long-run impacts this may have on students. Students would not only graduate with the academic knowledge gained through their higher education experience but also the skills necessary to manage their financial futures.

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