Testing the Relationship Between Confidence and Effort: A Behavioral Finance Perspective on the Problem of Financial Literacy

DLSU-AKI Working Paper Series 2021-12-080

By: Louie Bernard A. Jacob
Miguel Angelo S. Rabago
Hans Erickson A. Tan
Lawrence B. Dacuycuy
Gerardo L. Largoza
Maria Fe Carmen L. Dabbay
De La Salle University

Testing the Relationship Between Confidence and Effort: A Behavioral Finance Perspective on the Problem of Financial Literacy

Louie Bernard A. Jacob,[1] Miguel Angelo S. Rabago,[2] Hans Erickson A. Tan[3]
Lawrence B. Dacuycuy,[4] Gerardo L. Largoza,[5] Maria Fe Carmen L. Dabbay[6]
De La Salle University,
2401 Taft Avenue, Manila, Philippines
[1]louie_jacob@dlsu.edu.ph
[2]miguel_rabago@dlsu.edu.ph
[3]hans_tan@dlsu.edu.ph
[4]lawrence.dacuycuy@dlsu.edu.ph
[5]gerardo.largoza@dlsu.edu.ph
[6]maria.fe.dabbay@dlsu.edu.ph

This experimental study tested the relationship between confidence and effort with the ultimate objective of discovering how these factors may influence financial literacy. This was done through a modified version of a slider test and ball allocation task. The population consisted of 85 random participants who were primarily approached through social media. A simple OLS regression, along with robustness checks, namely the Tobit model and instrumental variable (IV) regression model using Tobit estimators, were utilized to confirm the causal relationship between confidence and effort.

1. INTRODUCTION

There is a lasting failure to improve financial literacy despite the several financial literacy programs and projects made by the government over the past decade. This failure is because the main factors causing financial literacy problems are still not fully understood by researchers and current policymakers.

Skagerlund et al. (2018) presented a new approach that suggests that financial literacy is driven by numeracy (the ability to process and perform basic numerical concepts and calculations). Because numeracy is developed through practice and effort, improving motivation or willingness to exert effort will likely increase numeracy and therefore develop financial literacy. In this light, psychological factors come into play, and one such factor that has been of interest to behavioral economists is self-confidence.

The objective of this study is to test and verify a causal relationship between confidence and effort, and how information (i.e., feedback) can affect this dynamic. To achieve this goal, an online experiment was conducted to measure participants' willingness to perform an effortful task, known as a slider task, as a function of their self-confidence. Information regarding their ability to do the task was used as an instrumental variable.

2. LITERATURE REVIEW

According to Klapper et al.'s (2014) study, only 25% of Filipinos were estimated to be financially literate. Furthermore, a Financial Inclusion Survey conducted by the *Bangko Sentral ng Pilipinas* in 2019 found that only 8% of respondents could correctly answer a few simple questions regarding interest rates and inflation. Similarly, the Business Diary (2019) published findings showing that among Filipinos that use online financial services, 65% of them occasionally face acute budget gaps, whereas 20% face these budget gaps as a constantly recurring issue. Eighty-seven percent of these respondents claim that failures occur due to their insufficient financial literacy.

These alarming statistics have spurred researchers to find alternative methods to achieve financial literacy. Skagurlund et al. (2018) discovered that the ability to perform numerical calculations, followed by math anxiety, are the two biggest determinants of financial literacy, rather than an understanding of simple financial concepts or the motivation to follow through on sound financial decisions.

Finally, Chen and Schildberg-Hörisch (2019) touched on the motivational value of confidence and effort. Their research suggested that individuals who are either confident or overconfident in their abilities will most likely decide to exert higher effort. They argued that ability belief distributions (the subject's belief in their own ability) are more plausible and robust than point beliefs (information regarding their actual measured ability), thus the former is preferred by experimental economists when identifying relative confidence.

3. FRAMEWORK

Cost-Benefit Analysis of Exerting Effort

Benabou and Tirole (2002) proposed a framework to model the motivational value of confidence. Essentially, effort is exerted when an individual considers the benefit of effort to be greater than its cost. This cost and benefit decision is described by the utility function:

$$u_1 = -c + \beta\delta\theta_1 V$$

where u_1 is the utility function of the individual at present (where time, or t=1). The model assumes an effortful task with a

positive probability success between 0 and 1 described by the variable θ .

The probability of success proxies the ability or skill of the decision-maker at performing the task. Because individuals do not have perfect information regarding their own abilities, they do not have access to θ for decision-making. Instead, they assess the cost and benefit of effort using their own beliefs or self-confidence at present, as represented by the term θ_1.

c is the cost of effort assumed to be a positive value, encompassing both the actual disutility of expending energy and the opportunity cost of investing time in exerting effort. The positive variable V is the value of succeeding in the effortful task. δ and β serve as standard and quasi-hyperbolic discount factors, respectively, with positive values between 0 and 1, which are further explained later.

The Motivational Value of Confidence.
Essentially if the term $\beta\delta\theta_1 V$ is greater than c, then a rational decision-maker would choose to exert effort because the expected benefit is greater than the cost. Because the variable θ_1 is the measure of confidence, and the perceived benefit in exerting effort increases as θ_1 increases, then this framework supports the primary hypothesis that:
H1. Confidence has a motivational value such that greater levels of self-confidence motivate more effort exertion.

The Impact of Information on Confidence
Furthermore, because the model assumes that θ_1 is based on self-confidence, which is based on beliefs and information, then this model also supports a second hypothesis that:
H2. The confidence of people can be affected by the information they receive and, by extension, affects their effort exertion.

The Demand for Information About Personal Ability
Lastly, in this model, it is assumed that effort is exerted in the present, but the reward would only be gained in the following time period (t=2), assuming that the effortful task is a success. Because of this, V is weighted by the discount factors β and δ.

δ is the standard discount factor, which represents the lower value of utility gained in the future compared to receiving the same utility in the present.

β represents the quasi-hyperbolic discount factor. This factor represents the phenomenon that individuals emphasize the value of present utility compared to future utility.

To demonstrate, if a person were to make the decision to exert effort some time in the past (t=0), instead of at present, their utility function for exerting effort would instead contain:

$$u_1 = -c + \delta\theta_0 V$$

β is not included as a variable in this case because making the decision to exert effort as early as t=0 means that the overemphasis in the present utility that would occur if the decision was made at t=1 when effort actually needs to be exerted is not present.

To illustrate, assuming $\theta_0 = \theta_1$ and that δ, and V are equal from t=0 and t=1, then by definition, $\delta\theta_0 V > \beta\delta\theta_1 V$ for all values of β between 0 and positive 1.

This means that a person would need more confidence to choose to exert effort if they were to decide on the present (t=1) than if they were evaluating the exact same situation from the past (t=0).

This commonly leads to the phenomenon of procrastination, where people plan to exert effort in the future, but when the time comes, they suddenly feel like it is not worth exerting effort anymore. Procrastination happens even if the person knew the cost of effort well ahead of time and they previously thought it was worth exerting effort anyway.

Because people know they face the possibility of procrastination when planning for the future, they have an incentive to control confidence so that they will be motivated enough to overcome the urge to procrastinate when it is time to exert effort.

Assuming that information does indeed affect confidence, then by extension, it can be hypothesized that:
H3. Demand for information about personal ability depends on the individuals' demand for future confidence.

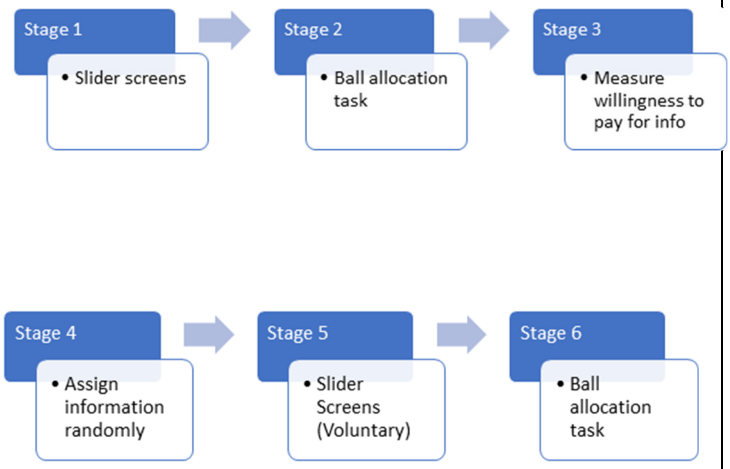
If people need more confidence in the future compared to what they already have, they would want to have more information about their personal ability. This is because new information has a chance of giving them a reason to be more confident. The cost of losing more confidence is negligible for the purpose of motivational value because confidence was not high enough to motivate action even prior to new information.

On the other hand, if someone was already highly confident, they would have no further demand for information about their personal ability because the motivational value of confidence is already present.

4. METHODOLOGY

An online experiment was conducted featuring an effortful task called a slider task. The goal is to put a slider in the middle in exchange for a monetary reward at the end of the experiment for each correct slider. To assess self-confidence, participants allocated balls to bins depending on their belief of how many sliders they thought they got in the slider task. Both tasks are done twice, first as a diagnostic, whereas the second is the actual experiment done after the assignment of treatment groups. The diagnostic task requires participants to answer all sliders, but the experiment itself is optional, with participants volunteering to answer extra screens of sliders.

Figure 1
The Six Stages of the Experiment



The first hypothesis was tested by obtaining the level of effort measured through the number of screens the participants worked on in the second slider task, which will serve as a dependent variable. It was regressed by the participant's self-confidence, which serves as the independent variable. This was measured using the median of the belief distribution from the ball allocation task done in the experimental stage.

For the second hypothesis, the participants were randomly assigned into treatment groups, namely initially underconfident and initially overconfident groups. Afterward, the average effort of the two treatment groups was compared. To further confirm that information does affect confidence, a simple OLS model was used to estimate the effect of being informed on the dependent variable confidence measured in the experimental stage. Lastly, information is also used as an independent variable along with confidence using effort as a dependent variable to confirm that being informed has no effect on effort other than through its effect on confidence.

For the third hypothesis, before randomly assigning the participants to the treatment groups, the participants were asked how much they were willing to pay for information about their performance using their points. The willingness to pay was used as the dependent variable, and the confidence to pay was the independent variable. Confidence was measured by the median of the belief distribution taken from the diagnostic stage. The answer has no bearing in the random assignment to the INFO or NO INFO treatment groups.

Lastly, the OLS estimator was used because the experiment satisfies the assumptions of the linear regression. Furthermore, the experiment ensured exogeneity of the data due to random assignment of treatment groups. Robustness tests using several other estimators, including Tobit and IV models, were done to confirm the reliability of the results further.

5. RESULTS AND DISCUSSION

The results of the experiment show that participants that have more self-confidence choose to exert more effort. The effort level was measured by the number of extra slides volunteered by participants in Stage 5 of the experiment. A causal relationship between confidence and effort was estimated and then found significant in OLS, Tobit, and IV Regression models. This result validates the initial hypothesis that confidence has a motivational value, which causes more effort exertion.

Information was also proven to be a valid instrument and has a causal effect on reported confidence. On average, informed participants reported ~23% fewer percentage points of confidence compared to uninformed participants. This is explained by a large number of overconfident participants in the data set (77 out of 85 participants were considered overconfident), which would have had their overconfidence reduced as a result of being informed about their true abilities.

This change in confidence as a result of being informed had a measurable impact on the effort exerted. Participants who were informed volunteered ~33% fewer extra sliders on average in Stage 5 than uninformed participants. This finding confirms the second hypothesis that information can affect confidence and, as a result of this interaction, indirectly affect motivation and effort exertion.

Interestingly, it was also found that Gender plays a significant role as an instrumental variable that indirectly affects effort exertion through its direct effect on confidence. Women reported much higher levels of confidence, on average, ~13.36 higher percentage points of confidence than male participants. The average effects between genders confirmed that this difference in confidence led to more effort exerted as women answered almost 50% more effort than men did.

Finally, OLS estimation was unable to find a relationship between the demand for information and participant's demand for future confidence. The likely factor for failing to find a relationship is due to the failure of the variable willingness to pay in serving as a proxy for the demand for information.

Table 1
OLS/Tobit Regression Results, N=85
Dependent Variable: Effort

Variable	OLS 1	OLS 2	Tobit
Stage 6 Confidence (Median) (Per 10%)	0.61*** (0.000)	0.62*** (0.000)	1.561*** (0.000)
Touchpad		-0.239 (0.777)	-1.169 (0.592)
Phone		-0.861 (0.176)	-2.710 (0.142)
Constant	0.667*** (0.003)	0.982** (0.021)	-4.822 (0.001)
Adjusted R^2	0.3633	0.3763	

* significant at $\alpha = 0.05$
** significant at $\alpha = 0.01$
*** significant at $\alpha = 0.005$

Table 2
IVTobit Regression N=85
Dependent Variable: Effort

Variable	Info	Info + Gender
Stage 6 Confidence (Median) (Per 10%)	0.80 (0.272)	1.12* (0.065)
Constant	-2.900*** (0.220)	-3.392* (0.066)
Adjusted R^2	1094.168	1093.35

* significant at $\alpha = 0.05$
** significant at $\alpha = 0.01$
*** significant at $\alpha = 0.005$

Table 3
OLS Regression N=85
Dependent Variable: Stage 6 Confidence

Variable	Info	Info + Gender
Information	-22.387*** (0.001)	-24.019*** (0.001)
Gender		13.357* (0.56)
Constant	0.667*** (0.003)	34.484*** (0.000)
Adjusted R^2	0.1127	0.1310

* significant at $\alpha = 0.05$
** significant at $\alpha = 0.01$
*** significant at $\alpha = 0.005$

Table 4
OLS Regression N=85
Dependent Variable: Effort

Variable	Info	Gender	Info + Gender + Confidence
Information	0.939 (0.207)		0.388 (0.550)
Gender		1.218 (0.103)	0.525 (0.399)
Stage 6 Confidence (Median) (Per 10%)			0.62*** (0.000)
Constant	2.889**** (0.000)	1.917*** (0.000)	0.234 (0.686)
Adjusted R^2	0.0191	0.0318	0.3735

* significant at $\alpha = 0.05$
** significant at $\alpha = 0.01$
*** significant at $\alpha = 0.005$

Table 5
Average Number of Extra Slides Answered Per Group

Informed (N=40)	1.95
Uninformed (N=45)	2.98
Male	1.92
Female	3.14

6. CONCLUSION

The main findings of this experiment are that confidence is a significant factor in motivating effort exertion and that information plays a key part in shaping confidence, which by extension plays a part in future motivation. These findings may be of value to anyone concerned with motivation management or studies related to motivation.

With regards to numeracy and financial literacy, this study may present a possible approach to tackle financial literacy problems from a numeracy perspective. Skagerlund et al. (2018) highlighted that approaching financial literacy from the traditional perspective of creating programs aimed to teach financial concepts and motivate attitudes about finance directly has been historically insufficient. Furthermore, they establish that there is growing evidence that building up numeracy skills and reducing anxiety over numbers and mathematical problems, in general, may be a better approach to promoting financial literacy.

The motivational value of confidence and, by extension, information can be utilized to inform and aid in the development of programs that motivate effort and nurture an affinity for practicing numeracy. The idea is that building motivation for individuals to develop numeracy will allow them to learn how to apply these skills to financial literacy even without being taught directly about specific financial concepts.

A significant step forward from previous literature is that this experiment takes place in a much more natural setting. Chen et al. (2019), performed their experiments in a controlled laboratory environment. In contrast, this experiment is taken online by people in the comfort of their own homes with all of the exposure to variations that brings. These conditions work against finding a causal relationship between effort and confidence. Yet, the results were still able to confirm that what was found previously in laboratory experiments is robust in closer to real-world settings.

7. REFERENCES

Bangko Sentral ng Pilipinas. (2019). Financial Inclusion Survey retrieved from: https://www.bsp.gov.ph/Inclusive%20Finance/Financial%20Inclusion%20Reports%20and%20Publications/2019/2019FISToplineReport.pdf

Bénabou, R., & Tirole, J. (2002). Self-confidence and personal motivation. *The Quarterly Journal of Economics, 117*(3), 871–915.

Chen, S., & Schildberg-Hörisch, H. (2019). Looking at the bright side: The motivational value of confidence. *European Economic Review, 120*, Article 103302.

Business Diary. (2019). Lack of financial literacy makes 65% of Filipinos fall short of money retrieved from:

https://businessdiary.com.ph/18848/lack-of-financial-literacy-makes-65-of-filipinos-fall-short-of-money/

Skagerlund, K., Lind, T., Strömbäck, C., Tinghög, G., & Västfjäll, D. (2018). Financial literacy and the role of numeracy–How individuals' attitude and affinity with numbers influence financial literacy. *Journal of Behavioral and Experimental Economics, 74*, 18–25.

Klapper, L., Lusardi, A., & van Oudheusden, P. (2014). *Financial literacy around the world: Insights from the Standard & Poor's ratings services global financial literacy survey*. Retrieved from https://gflec.org/wp-content/uploads/2015/11/Finlit_paper_16_F2_singles.pdf