MEASURING FINANCIAL LITERACY: A CASE STUDY OF SELF-ASSESSMENT AMONG UNDERGRADUATE STUDENTS IN HUNGARY

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Abstract: *This paper analyses the educational self-assessment of Hungarian undergraduate business economics students, focusing primarily on the concept of financial literacy as students predict and evaluate their own performance in written examinations relative to their externally assessed achievement. The main purpose of this study is to explore whether high-achieving students are more accurate in their self-assessment when predicting and evaluating their financial knowledge.*
In the pre- and post-examination predictions the higher achieving students actually seem to predict and evaluate their examination results more accurately than their lower-achieving fellows. Although we found no substantial differences in self-estimation by gender, females seemed to less likely to overestimate their financial knowledge after taking exams. Our conclusion also allows policy makers to identify potential needs in relation to specific features of financial literacy and provides evidence about which groups of people are in need of supplementary support, not only in higher education but in other contexts as well.
Keywords: self-assessment; overestimation; human capital; higher education; financial literacy
JEL classification: E52, G02, G38

1. Introduction

From time to time the great economic crises shed light on the negative consequences of making decisions without adequate financial knowledge. Financial literacy is especially critical nowadays for promoting desired financial behaviours, such as reaching a verdict on deliberated decisions which result in prudent saving and budgeting, or on the use of bank loans (IBRD, 2009). The OECD (2005) defines financial literacy as the ability to use knowledge and skills to manage financial resources effectively for a lifetime. Thus, financial education is the process by which people improve their understanding of financial products, services etc. to become more aware of risk and return, so they are empowered to make informed choices, to avoid undesirable consequences, or to recognize where to apply for help, and take other measures to improve their present and long-term financial well-being (PACFL, 2008). Greater financial literacy, together with financial education, can reduce the likelihood that customers at any income level will not purchase products or services that they do not need or that are not in their personal interest. Consequently, financially competent consumers are more likely to save their money, compare financial products and services, and discuss daily financial routines with their family.
Messy and Atkinson (2012) also highlighted that most people have fairly straightforward financial knowledge; they also indicated that certain respondents are often over-confident in several countries. In this case, they give incorrect answers rather than admitting that they cannot distinguish an appropriate response. Researches in behavioural finance has also suggested that many

households do not in fact save their earnings optimally, nor realize that their investment decisions may lead to unacceptable living standards (Yoong et al. 2009). Moreover, an inaccurate self-assessment of creditworthiness also has supplementary negative consequences. Zorn et al. (2008) also demonstrated that inaccurate self-assessment of financial risks can lead to a higher annual percentage rate on a mortgage.

Our motivation to write this paper comes from the fact that in higher education a large proportion of students seem to be prone to irrationally evaluate their own (financial) knowledge (see Macdonald. 2004). However, there is still no existing consensus on whether students' self-assessment ability is obviously learnable (e.g. Zimmerman and Schunk 2001; Ross 2006 etc.) or not during higher education, and White et al. (2003) pointed out that specific student groups are exposed to the phenomenon of inaccurate self-assessment. Therefore, our study focuses on the measurement of business students' financial knowledge to predict and evaluate their own performance in written examinations relative to their externally assessed achievement.

However, there is no agreement in the literature in respect of the relationship between students' measured performance and the accuracy of their self-assessment. Kruger and Dunning (1999), Karnilowicz (2012) and Kun (2015) etc. concluded that higher achieving students are more accurate in their self-assessment than low achievers, but O'Neill et al. (2006) has rejected this phenomenon. Unfortunately, the notion of accuracy in several studies is still confusingly determined by referring to measurement by self-assessment. In this paper, accuracy is defined as the results of the absolute difference between the student-estimate and the ultimate tutor-estimate exam scores and is used to describe the student's self-estimation ability independently of its direction (over and underestimation). Messy and Atkinson (2012) also indicated that there is a positive relationship between education and financial literacy. More highly educated individuals are more likely to exhibit positive behaviours and attitudes as well as show advanced levels of financial knowledge.

Based on the findings of the literature reviewed above, and assuming that (H1) higher achieving students assess their examination results more accurately (measured by the absolute value of the self- and tutor-assessment differences) than their lower achieving fellows, the current study forms four additional sub-hypotheses:

H11: Higher achieving students predict their examination results more accurately (measured by the absolute value of the pre-examination assessment results) than their lower achieving colleagues.

H12: Higher achieving students evaluate their examination results more accurately than their lower achieving colleagues.

H13: Higher achieving students overestimate their own pre-examination performance less than their lower achieving colleagues.

H14: Higher achieving students overestimate their own post-examination performance less than their lower achieving colleagues.

The purpose of this study is to explore the idea that high-achieving students are more accurate in self-assessing their financial knowledge. Our research represents an analysis of written examinations taken at the University of Debrecen focusing on business economics students' self-assessment as regards their

financial knowledge. We have also paid particular attention to variations in gender. In the following sections, we first present the data available and the methods applied. Finally, we attempt to draw a number of brief conclusions from the results of our research, which will hopefully clarify empirical and policy debates on the contributions higher education makes to financial literacy.

2. Sample and methods

Our estimations are based on a sample of 142 bachelor (43 men and 99 women) BA students from the Faculty of Economics and Business at the University of Debrecen, Hungary. At the time of the examination 50 students were studying on the International Business Economics, 30 on the Tourism and Business and 72 on the Trade and Marketing majors. Their compulsory Finance course provided the basic concepts of financial management i.e. how people and firms think about the behaviour of financial markets, and also helped them understand financial statements and decisions.

The examination was carried out on a specific date and at the same time. Moreover, two different test versions (identified as A and B) were also chosen, taken by 73 and 69 students. Consequently, eliminating infrequent effects deriving from the differences among the test versions and majors, these factors are always considered as dummy variables during our analyses. All test versions had the same structure, with 10 true or false (T/F), and 20 multiple-choice (MC) questions (one or more correct answers from four choices). Each correct response was worth one point. Before the students started their examination they were asked to predict their total T/F and MC scores. To motivate them to predict more accurately, they were offered a higher percentage in a later test as a bonus if they could estimate well; specifically, 10 per cent for a perfect hit for both questions, and 5 percent if the approximation was within a ±1 point range. After the tests had been completed, they were also requested to make their final estimation of the same test scores so as to correct their former prediction if they desired. Moreover, students were informed that only their second estimation was involved in the final valuation process to determine bonus points. In this way, the pre- and post-examination assessments made it possible to research how students are able to reconsider their financial knowledge after the test.

In order to exemplify the robustness check of our estimations we measured self-assessment regarding financial knowledge using various methodologies. In this paper, besides some descriptive statistics, (linear and binary logistic) regression models are frequently analysed to highlight distinctions among our evaluations.

3. Results

Figure 1 and 2 show that only the higher-achieving students (whose final test performance was higher than 50% and whose final grade was more than 2) can achieve additional (5% and 10%) test bonuses after the pre- and post-evaluation.

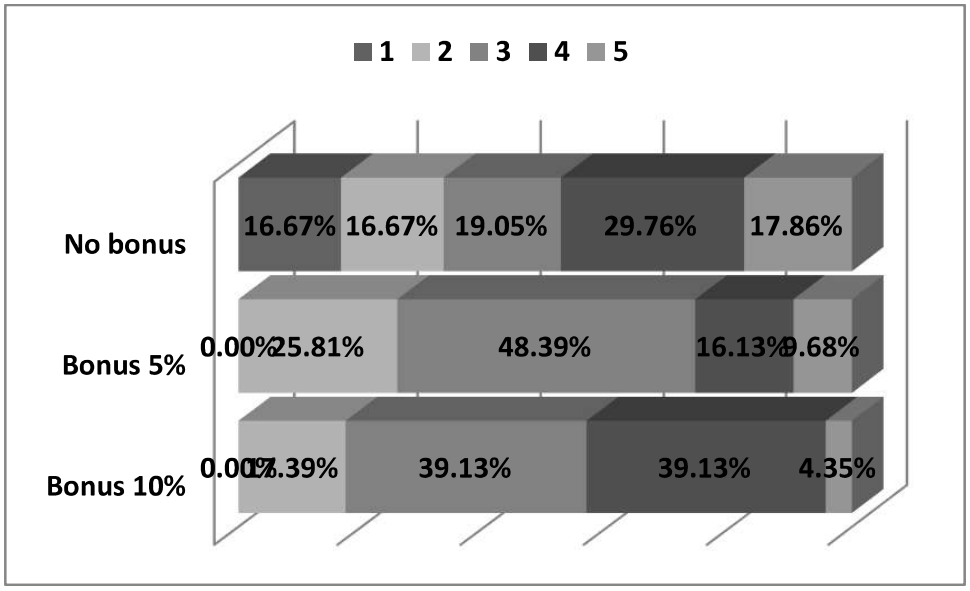

Figure 1. Frequencies of pre-estimated test scores by final grades and bonuses
Source: based on own calculations.

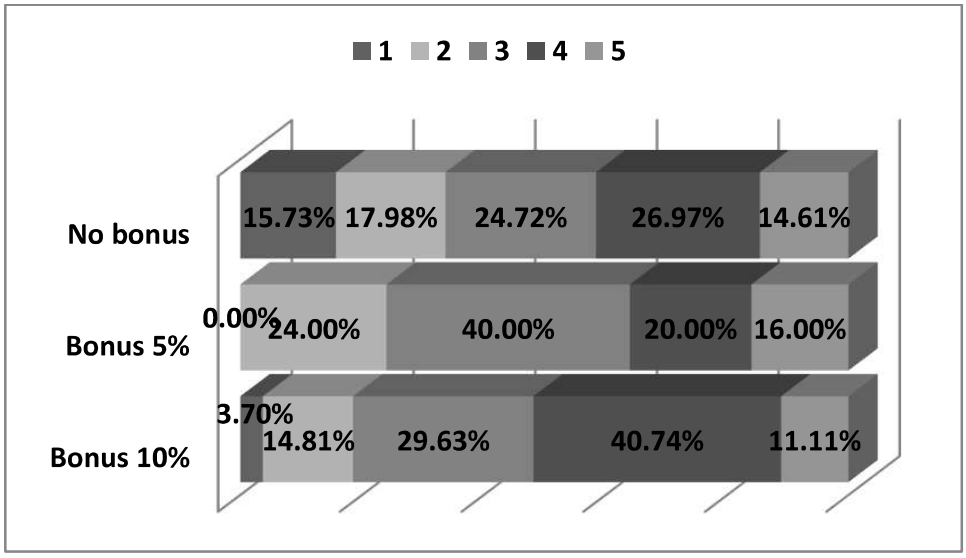

Figure 2. Frequencies of post-estimated test scores by final grades and bonuses
Source: based on own calculations.
Note: 1 – less than 50%, 2 – 50-59%, 3 – 60-69%, 4 – 70-79%, 5 – more than 80%

According to our hypotheses regression models should be tested, where the first dependent variable is the accuracy of the students' pre- and post-estimations. The variables of ADIFTTPRE and ADIFTTPOST measured by the absolute difference value of the student-estimated test scores and the tutor-assigned test scores. If the students are overestimated their total test scores before and after the exam OETTPRE and OETTTPOST dummies are also used.
The FINALSC substituted the tutor-assigned test score as an independent variable among others. In our regression models the dummies of SEX, MAJOR1, MAJOR2 and MAJOR3 are selected to maximise the 'goodness of fit' (R^2, as the percentage

of the response variable variation that is explained by a linear regression model). Consequently, the pre- and post-accuracy of self-assessment are estimated independently in two models.
The first (Model 1) contains all the available independent variables and the other (Model 2) is restricted to those that are significant at least at the 10% p-level. Moreover, there are additional coefficients that are not included in our restricted models to evaluate self-assessment features of financial knowledge. Hence, the validity of our conclusions is limited by the bias caused by the exclusion of certain of these variables.

Table 1: Results of the linear regression models for the pre- and post-examination of self-assessment

Independent variables	**ADIFTTPRE**		**ADIFTTPOST**	
Dependent variables	**Model 1**	**Model 2**	**Model 1**	**Model 2**
CONSTANT	**11.037**	**11.045**	**5.305**	**6.39**
	(3.645)* **	**(3.640)*** **	**(1.959)***	**(6.284)*** **
FINALSC	**-0.127**	**-0.127**	**-0.138**	**-0.171**
	(-2.022) **	**(-2.026)** **	**(-2.462)** **	**(-3.367)*** **
SEX	0.598		0.544	
	(1.212)		(1.234)	
MAJOR1	**-5.805**	**-5.445**	0.411	
	(-2.161) **	**(-2.038)** **	(0.171)	
MAJOR2	**-6.197**	**-5.747**	-0.459	
	(-2.231) **	**(-2.155)** **	(-0.191)	
MAJOR3	**-5.388**	**-4.908**	0.073	
	(-1.971)*	**(-1.811)***	(0.849)	
R^2	0.095	0.085	0.104	0.075
Adjusted R^2	0.062	0.059	0.071	0.068
Durbin Watson	1.908	1.898	1.986	1.903

Source: based on own calculations.
Note: Heteroscedasticity robust t-statistics are in parentheses. Letters in the upper index refer to significance: ***: significance at 1 per cent, **: 5 per cent, *: 10 per cent. P-values without an index mean that the coefficient is not significant even at the 10 per cent level

Statistics of the regression models are shown in Table 1 for the pre- and post-test estimations. In Model 1 and Model 2 we found a significant linear connection between the accuracy of students' prediction and the tutor's assessment. Essentially, the effect of tutor-assigned final scores on the absolute value of the differences of self and tutor assessment does not seems to be large, but in both

models the student results correlated negatively with accuracy. Consequently, we can accept the H11 and H12 hypotheses; the higher achieving students seem to be able to predict and evaluate their examination results more accurately than their lower achieving fellows. Thus, in these models, gender (SEX) has no significant effect on accuracy and the dummy dependent variables of the majors still have a significant negative relationship with accuracy.

Essentially, the additional (H13) and (H14) sub-hypotheses, which focus directly on self-estimation regarding the extent of estimation errors, are not independent of their positive sign. In this case, we are also assuming that higher achieving students tend to overestimate their examination results. Hence, the difference between the students' evaluated and the tutor-assigned score is positive. However, in order to identify the relationship between the students' achievement and the accuracy with which they overestimate their own performance, ceteris paribus, a binary logistic regression method might be an appropriate tool for our financial analysis.

Table 2: Results of the binary logistic regression models for the pre- and post-examination of self-assessment

Independent variables	**OETTPRE**		**OETTPOST**	
Dependent variables	Model 1	Model 2	Model 1	Model 2
CONSTANT	-19.281	-0.233	-12.961	**0.656**
	(0.000)	(1.366)	(0.000)	**(3.691)**
FINALSC	**-1.822**	**-1.422**	**-1.343**	**-1.082**
	(30.094)* **	**(28.575)*** **	**(23.554)*** **	**(21.809)*** **
SEX	0.261		**-1.251**	**-0.941**
	(0.316)		**(7.713)*** **	**(5.188)** **
MAJOR1	18.058		20.063	
	(0.000)		(0.000)	
MAJOR2	19.835		21.315	
	(0.000)		(0.000)	
MAJOR3	18.801		20.409	
	(0.000)		(0.000)	
Cox and Shell R^2	0.334	0.267	0.256	0.212
Nagelkerke R^2	0.447	0.357	0.341	0.282
R^2 change	0.284	0.224	0.213	0.173
Omnibus χ^2test	57.251***	43.809***	41.931***	33.546***
HL χ^2test	4.188	3,002	3,693	7.161

Source: based on own calculations.

Note: Heteroscedasticity robust Wald-statistics are in parentheses. Letters in the upper index refer to significance: ***: significance at 1 per cent, **: 5 per cent, *: 10 per cent. *P*-values without an index mean that the coefficient is not significant even at the 10 per cent level. HL: Hosmer and Lemeshow χ^2 test.

In all observed models (see Table 2), the dependent variable indicates the likely hood of students' over-assessment. Those cases where the students evaluate their own performances accurately are estimated without an error and left out of the sample. The proportion of variance explained by the predictors (measured by Cox and Shell's, Nagelkerke's pseudo R^2 and R^2 change) of the binary logistic regression models are relatively high – indeed high enough to agree with our results. Consequently, we can accept the H13 and H14 hypotheses, as well. However, for every one-unit increase in the tutor-assigned test scores (so, for every additional point, and holding all other independent variables constant), we expect a 1.422 and a 1.082 decrease in the logs of pre- and post-examined self-assessment differences. Thus, in the post assessments, there is a lower correlation between the higher-achieving students' self-assessment and their final score. Meanwhile, there is no significant relationship between gender and the pre-estimated over self-assessment. Nevertheless, in Model 2 of the post-estimation we found that the female students' probability of overestimation is (EXP(-0.941)=-0.381) significantly lower than males.

4. Conclusions

Making adequate financial decisions is especially critical for today's globalized financial markets. These challenges primarily focus on ensuring better financial education to expand access to products and services for consumers. Not surprisingly, governments are currently interested in searching for effective methodologies to improve the level of financial literacy and initiating many processes to create or lead national strategies for financial education to provide learning opportunities among their future supporters.

In this study the first objective was to analyse how students can estimate their examination results regarding their financial knowledge. In our models the higher achieving students seemed to predict and evaluate their examination results more accurately and tend to overestimate their examination results more than their lower achieving fellows. Consequently, enhancing financial education for better financial literacy is one effective policy response for both sexes to empower consumers in financial markets. Generally, our results highlighted that policy-makers should concentrate on reducing 'skill-gaps' by motivating low-skilled workers to learn more and improve their financial knowledge.

In our opinion, more efforts are still needed to strengthen consumer protection and to develop and enforce financial knowledge. We also agree with Zia and Xu (2012), who revealed that improving the effectiveness of financial literacy programs will require better integration of new valuable insights from both behavioural economics and social research.

Our further research can open the door to investigating financial literacy by additional socio-demographic groups. Moreover, we expect to implement further analysis in the coming year to explore and expand the extent to which other determinants may explain the assessment of financial knowledge at international level.

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