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APPLICATION OF ORDINAL LOGISTIC REGRESSION TO THE FINANCIAL LITERACY OF COLLEGE STUDENTS IN MALAYSIA

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ABSTRACT

The aim of this paper is to analyse the demographic characteristics of college students in Malaysia related to financial literacy. One thousand students from public and private higher institutions in Malaysia were interviewed via a structured questionnaire. Students were selected using a convenient random sampling method. The dependent variable in this study is financial literacy; the independent variables are gender, age, level of programme, race, and type of university. An SPSS ordinal logistic regression procedure was utilised using Polytomous Universal Model (PLUM) procedures. The Pearson and Deviance goodness-of-fit indicated that the model has a good fit. The result shows a significant effect only for gender; there are odd ratios of being excellent in financial literacy for males. Positive coefficients indicate that males have higher scores on the dependent variable than females. For this dichotomous variable, the odds ratio is the exponential of the log odds of the slope coefficient; that is, the exponential of 0.417, which is $e^{0.417} = 1.517$. This means that, for males, the odds of scoring higher (being in the knowledgeable category) on the dependent variable (excellent in financial literacy) is 1.5 higher than for females. Thus, based on demographic factors, this study concludes that only gender affected the overall financial behaviour of college students.

Key words: financial literacy, ordinal, odd ratio, demographic

BACKGROUND OF THE STUDY

Once embarked on college life, students find themselves automatically exposed to financial independence as early as the age of 18. Luxurious lifestyles seem to be a necessity rather than a choice. At such a tender age, most of them appear to be reckless about how they manage their money, which can have serious repercussions by the time they reach their mid-twenties. Materialism also contributes to bankruptcy among youth as society sees status more on the surface rather than appreciating the real value of a person. Managing finance is always associated with attitudes towards money and financial literacy. A good attitude towards money is important for the student in terms of governing what to spend and how to save. Previous studies have shown that attitudes to credit and money are good indicators of an individual spending patterns, perceived economic well-being and acceptable debt level (Davies and Lea, 1995; Mohd, Mohamad, Nor and Kamarudin, 2015).

Muzammil (2014) did a write-up on the rise of bankruptcy among young Malaysians in the *Malaysian Digest*. The study revealed that poor financial planning and spending habits were the two main reasons for a failure to repay loans and for credit card debt. According to Nancy Shukri, a Minister in the Prime Minister's Department, there has been a drastic rise in bankruptcy cases since 2007, with 13,238 cases recorded and registered, increasing to 13,855 cases (2008), 16,228 cases (2009), 18,119 (2010), 19,167 (2011), 19,575 (2012) and 21,987

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(2013) (Bernama, 2015). From the figure, it was reported that 1,940 young people below 25 years old were declared bankrupt from 2007 to June 2014, but what most shocking was that nearly 30% of the total were declared bankrupt in the first six months of 2014. Bankruptcy at a young age can be damaging to the individual in terms of proceeding with their future life and can affect their credit rating. Not only does it contribute to psychological factors such as stress and family pressure, it sometimes leads to suicide attempts. Muzammil (2014) in his report also mentioned a study done by Associate Professor Dr. Zahari Ishak from the University of Malaya, who said that bankruptcy among young people is due to internal factors, such as family background, and how they were brought up during their early years.

In July 2012, the Malaysian Ministry of Domestic Trade, Cooperatives and Consumerism launched a Malaysia Student Discount Card (KADSIM) as part of its corporate social responsibility. KADSIM aims to reduce the cost of living for students in higher education institutions in Malaysia. On the same note, a majority of higher institutions in Malaysia have taken the initiative to help their students manage their financial affairs effectively by making it compulsory for them to enrol in a personal and family financial planning course. This course addresses the ways in which an individual or family obtains an income, budgets, saves and spends, taking into account the various financial risks and future life events.

Based on the above issues affecting Malaysian college-going youth, this paper attempts to investigate the base of the demographic profile of college students that have knowledge about financial literacy. The main purpose of the study is to investigate whether demographic factors strongly affect the level of financial literacy; it is thus able to assist policy makers to design effective financial literacy tools.

LITERATURE REVIEW

Definition of “financial literacy”

If we key in the word “financial literacy” into a giant search tool such as Google, it will come up with many definitions. Below are some of them:

According to *Investopedia*:

Financial literacy is the possession of knowledge and understanding of financial matters. Financial literacy used in connection with personal finance matters and often entails the knowledge of properly making decisions pertaining to certain personal finance areas like real estate, insurance, investing, saving (especially for college), tax planning and retirement.

Wikipedia defines it as follows:

Financial literacy is the ability to understand how money works in the world: how someone manages to earn or make it, how that person manages it, how he/she invests it (turn it into more) and how that person donates it to help others.

The *Cambridge English Dictionary* defines financial literacy as “the ability to understand basic principles of business and finance”. However, a basic understanding is not enough at an adolescent level, especially when young people are able to have credit cards under their own name, take out loans and make investments. Thus, they must also understand how finance works and how it can work for them.

The OECD International Network on Financial Education (INFE, 2010) defined financial literacy as follows: “A combination of awareness, knowledge, skill, attitude and behaviour necessary to make sound financial decisions and ultimately achieve individual financial wellbeing.” Ali (2013) defined financial literacy as providing the necessary knowledge, skills and tools for consumers to make informed financial decisions with confidence. He added that

having the ability to make informed decisions allows individuals to build/accumulate, manage and preserve wealth, and thus further strengthen the position of the consumer.

All these definitions have three common aspects in common: 1) the ability to understand; 2) financial knowledge; and 3) financial decisions. Therefore, we can conclude that financial literacy is the ability to apply knowledge about personal finance with the aim of better managing money.

Empirical study of financial literacy

A lack of financial literacy skills has been a widespread phenomenon at a global level in developed economies, such as the United States (Lusardi and Mitchell, 2011), the United Kingdom (Gathergood, 2012; Smith, 2005), Japan and Australia (Smith, 2005), and Canada (Nelson, 2016). Gathergood (2012) found that there is a close relationship between self-control, financial literacy and consumer over-indebtedness among UK consumers; thus, there is limited participation in the stock market and financial preparation for retirement. Some studies have also found such a deficiency in developing countries such as Malaysia (Ali, 2013; Tan, Hoe and Hung, 2011; Mohd, Mohamad, Nor and Kamaruddin, 2015).

A study by Nesleha (2016) on the financial literacy of young people in the Czech Republic revealed that they had various levels of financial literacy. The majority of them were above average, with a significant difference between rural and urban youth, but with no difference between genders. Two major findings in overall financial literacy from this study were, first, that the financial literacy level ran parallel with education level; and, second, that there was no major difference in financial literacy level among genders or between strata (Ali, 2013). Research done by Drolet (2016) using the Canadian Financial Capability Survey 2014, comprising 14 questions on stocks, debt, inflation and other concepts, showed that the overall split between the performance of men and women was statistically significant. Men scored an average of 62 percent on the quiz, while women scored an average of 59 percent. Hira and Mugenda (2000) also found that female students felt they knew less than male students about topics related to finance, such as managing money. An article in the *Wall Street Journal* by Constable (2015) also highlighted the fact that women know less than men about finance, but what is more alarming is that even male's literacy in the subject is low (Constable, 2015). Constable (2015) even claimed that it is more damaging for women to be less literate as they live longer than men do.

Studies conducted using OECD (INFE) 2010 data, with the aim of tackling financial literacy issues in Malaysia, measured financial literacy from the point of view of financial distress and debt management, household preparedness for income shock and measuring the effectiveness of financial literacy. Moreover, Ibrahim, Harun and Isa (2009) found that undergraduate students in UiTM Kedah campus lacked financial knowledge, which resulted in poor use of their money.

On a narrower focus, Mohd et al. (2015) studied financial literacy level among Malaysian "Generation Ys" and found that their financial intelligence level was moderately low. This was due to their lack of ability to apply their financial knowledge in their purchasing, saving and investment decisions. Further, a majority of them appeared not to trust financial advisors but were easily influenced by friends.

METHODOLOGY

Description of the data and coding scheme

A pilot study was conducted in February 2015 to construct a good questionnaire. With a convenient sampling technique, 1,000 students were interviewed via a structured questionnaire for a period of one month, 15 March–15 April 2015, at 12 higher institutions around Malaysia. The students were from six public universities (IPTA), namely University Teknologi MARA (Campus Shah Alam, Perak and Sabah), Universiti Utara Malaysia, Universiti Kebangsaan

Malaysia, Universiti Malaysia Sarawak (Unimas) and Universiti Malaysia Sabah. This study also extended the sample to six private universities (IPTs), namely SEGI College, Universiti Tun Abdul Razak, Kolej PolyTech MARA, INTI International College (INTI College), Universiti Selangor and the Management and Science University.

In this study, the modified binary logistic regression incorporated the ordinal nature of the dependent variable by defining the probabilities of events and all events before it. In this case, a convenient sample of college students was asked to rate their knowledge of financial literacy on the scale of 1 to 7, from *Poor* to *Excellent*. The dependent variables in this study was financial literacy (understanding basic economic terms such as *interest rate*, *inflation* etc.) and the independent variables were type of university, level of educational programme, gender, race, age, and type of financing. In this model, five covariates were included as demographic factors:

- Type of university (public=0, private=1)
- Level of programme (diploma=0, degree=1)
- Gender (male=0, female=1)
- Race (Malay=0, Non-Malays=1)
- Age (>25=0, <26 =1)
- Type of financing (0-Parents, 1-Nonparents)

The Cumulative Proportional Odds Model is a model used to tackle the ordinal dependent variable. The PLUM procedure of SPSS Statistics are dedicated for ordinal regression procedure and was used to run the estimation, in order to output a statistical test to assess the assumptions of proportional odds (Leard Statistics, 2016). In ordinal logistic regression, the event of interest is observing a particular score or less. In this study of financial literacy model, the following odds were observed;

$$\Theta_1 = \text{prob. (score of 1) / prob. (score greater than 1)} \quad (1)$$

$$\Theta_2 = \text{prob. (score of 1 or 2) / prob. (score greater than 2)} \quad (2)$$

$$\Theta_3 = \text{prob. (score of 1, 2 or 3) / prob. (score greater than 3)} \quad (3)$$

$$\Theta_4 = \text{prob. (score of 1, 2, 3, or 4) / prob. (score greater than 4)} \quad (4)$$

$$\Theta_5 = \text{prob. (score of 1, 2, 3, 4, or 5) / prob. (score greater than 5)} \quad (5)$$

$$\Theta_6 = \text{prob. (score of 1, 2, 3, 4, 5, or 6) / prob. (score greater than 6)} \quad (6)$$

The ordinal logistic model for a single independent variable is

$$\ln(\Theta_j) = \alpha_j - \beta X \quad (7)$$

where j goes from 1 to the number categories minus 1.

When there is a positive coefficient for a dichotomous factor, it means that there is a higher score for the first category. A negative coefficient means a lower score is more likely. An association with higher scores means smaller cumulative probabilities for lower score, since they are less likely to occur. Each logit has its own term α_j , but the same coefficient β , meaning that the effect of the independent variable is the same for different logic functions. The α_j term, called the threshold values, is often of not much interest. Their values do not depend on the values of the independent variable for a particular case. They are like the intercept in a linear regression, except that each logit has its own. The thresholds are used in calculations of predicted values (Norušis Marija, 2011).

Ordinal regression does not automatically produce the odds ratios for independent variables. The coefficient used to calculate cumulative predicted probabilities from the logistic model for each case.

$$\text{Prob (knowledge } j) = (1 / 1 + e^{-(\alpha_j - \beta x)}) \quad (8)$$

FINDINGS AND DISCUSSION

Overall model fit

Table 1 shows that the test of parallel lines of proportional odds assumption is not significant, which indicates that the odds are proportional across the response variable ($p= 0.626$). Hence, the proportional odds assumption is satisfied for the financial literacy data.

Table 1: Test of Parallel Lines^a

Model	-2 Log Likelihood	Chi-Square	Df	Sig.
Null Hypothesis	754.368			
General	727.414	26.953	30	.626

The null hypothesis states that the location parameters (slope coefficients) are the same across response categories.

a. Link function: Logit.

Table 2 shows both Pearson and Deviance goodness-of-fit, which indicates the good fit of the model to the observed data with a large observed significance levels, $\chi^2 = (342)=301.312$, $p=.945$ and $\chi^2 = (342)=286.618$, $p=.987$ respectively.

Table 2: Goodness-of-Fit

	Chi-Square	df	Sig.
Pearson	286.618	342	.987
Deviance	301.312	342	.945

Link function: Logit.

Table 3: Model-Fitting Information

Model	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	771.874			
Final	754.368	17.507	6	.008

The models fit, and the likelihood ratio test was applied to test the significance of the model. The final statistically significantly model predicted the dependent variable over and above the intercept-only model, $\chi^2 = (342) = 17.507$, $p < 0.05$.

Parameter Estimates

Table 4 shows the estimation of the parameters of the model. As there were seven category levels in the financial literacy variable, there were six cumulative logits and three equations. The assumption of the proportional odds holds that the constraints in the slope coefficients need to be the same for all the six equations, so only the thresholds differ between them. An example of logistic regression equation for threshold 1 and threshold 6 are as follows: the equations are required if we need to predict the probabilities of the given values of the independent variables.

$$\begin{aligned} \text{Ln}(\text{fin_literacy } 1 \text{ (poor)}) &= -3.568 - (0.207 \text{ (uni_type)} - 0.110 \text{ (level)} + 0.70 \text{ (age)} + 0.417 \\ &\quad \text{(gender)} - 0.184 \text{ (finance)}) \\ \text{Ln}(\text{fin_literacy } 1 \text{ (poor)}) &= 3.023 - (0.207 \text{ (uni_type)} - 0.110 \text{ (level)} + 0.70 \text{ (age)} + 0.417 \\ &\quad \text{(gender)} - 0.184 \text{ (finance)}) \end{aligned}$$

Cumulative odds ordinal logistic regression with proportional odds was runs to determine the demographic profile of college students. From the observed significance levels in Table 5, only gender appeared to have a positive relationship with financial literacy. Males (code 0) were more likely to be knowledgeable than females. This finding supports studies by Hira and Mugenda (2000), and by Drolet (2016), and but not by Ali (2013) and Nesleha (2016). Age, type of university, the level of programme, race and financial provider do not appear to relate to financial literacy.

Table 4 describes the demographic profile of 1,000 respondents, equal number from both public (IPTA) and private institutions (IPTS). A majority of the respondents were females (60.2%); the age group was 18–24 years old (92.2%) and was pursuing degree programmes (79.2%). The IPTA students were mainly Malay (65.9%), and heavily dependent on financial loans from the National Higher Education Fund Cooperation (PTPTN) (43.4%) to finance their studies. Unlike IPTS students, the majority were Malay (40.6%), followed by Chinese (39.8%), and the parents were the main financial provider (40.4%).

Table 4: Profile of Public and Private Institutions

	IPTA		IPTS	
	Frequency	%	Frequency	%
Level of Programme				
Diploma	76	15.2	76	15.2
Degree	370	74.0	422	84.4
Master	54	10.8	2	0.4
Age				
18–24	450	90.0	472	94.4
25 above	50	10.0	28	5.6
Gender				
Male	175	35	223	44.60
Female	325	65	277	55.40
Race				
Malay	329	65.9	203	40.6
Chinese	55	11.0	199	39.8
Indian	5	1.0	66	13.2
Bumiputera Sabah/Sarawak	94	18.8	19	3.8
Other	16	3.2	13	2.6
Main financial provider				
Parents	121	24.2	202	40.4
PTPTN	217	43.4	118	23.6
MARA	13	2.6	133	26.6

JPA	42	8.4	0	0.0
State government	21	4.2	4	0.8
Others	86	17.2	43	8.6

From Table 5, the coefficient value for gender (male=0) is 0.417. This parameter estimate represents the change in the log odds of male than female. The positive coefficients mean for the male was higher than for the female on the dependent variable. For a dichotomous variable, the odds ratio is the exponential of the log odds of the slope coefficient; that is, the exponential of 0.417 became $e^{0.417} = 1.517$. This means that, for males, the odds of scoring more highly (being in knowledgeable category) on the dependent variable (excellent in financial literacy) is 1.5 higher than for females. In short, male students are much more knowledgeable than females. On the 95% confidence intervals, the odds ratio of being in the higher category of the dependent variable for male versus female is statistically significant: $\chi^2 = (1) = 12.641$, $p = 0.00$.

As for the rest of dichotomous variables, the odds ratio of the type of university (0-public) with a positive coefficient reveal that the public higher institutions have a higher knowledge than private higher institutions, log odds of $e^{0.207} = 1.229$. For the level of programme, the negative coefficient indicated the degree students had a higher level of financial literacy, log odds of $e^{0.110} = 1.116$. The positive coefficient value of age signified that students at the age of under 25 had an odds ratio of $e^{0.070} = 1.072$. Log odds for the race of $e^{0.017} = 1.017$ with negative coefficients indicated a higher level of knowledge in the financial literacy among the non-Malays. The last parameter of financial provider shows a negative coefficient which indicates that those with non-parent financial providers have higher odds in term of a financial literacy level of $e^{0.184} = 1.202$. However, other parameters are not statistically significant.

Table 5: Parameter Estimates

	Estimate	Std. Error	Wald	df	Sig.	95% Confidence Interval		
						Lower Bound	Upper Bound	
Threshold	[Fin_literacy = 1]	-3.658	.250	213.328	1	.000	-4.149	-3.168
	[Fin_literacy = 2]	-2.339	.170	189.954	1	.000	-2.672	-2.007
	[Fin_literacy = 3]	-1.229	.144	72.575	1	.000	-1.511	-.946
	[Fin_literacy = 4]	.279	.138	4.084	1	.043	.008	.549
	[Fin_literacy = 5]	1.609	.148	118.733	1	.000	1.320	1.899
	[Fin_literacy = 6]	3.023	.185	267.016	1	.000	2.660	3.385
Location	[Uni_type=0]	.207	.122	2.859	1	.091	-.033	.447
	[Uni_type=1]	0 ^a	.	.	0	.	.	.
	[Level=0]	-.110	.175	.396	1	.529	-.453	.233
	[Level=1]	0 ^a	.	.	0	.	.	.
	[Age=0]	.070	.133	.279	1	.598	-.190	.330

[Age=1]	0 ^a	.	.	0	.	.	.
[Gender=0]	.417	.117	12.641	1	.000	.187	.646
[Gender=1]	0 ^a	.	.	0	.	.	.
[Race=0]	-.017	.120	.021	1	.884	-.252	.218
[Race=1]	0 ^a	.	.	0	.	.	.
[Finance=0]	-.184	.128	2.070	1	.150	-.436	.067
[Finance=1]	0 ^a	.	.	0	.	.	.

Link function: Logit.

a. This parameter is set to zero because it is redundant.

CONCLUSION

This study has developed an empirical model in an attempt to explain the important role of demographic factors to profile financial literacy. Though only gender was found to affect the level of financial literacy, this finding confirms previous studies (Drolet, 2016; Hira and Mugenda, 2000; Falahati and Paim, 2011). Understanding the college student's demographic characteristics will be key for policy makers to design appropriate financial literacy initiatives and undertake policy interventions. As more women become the financial providers at home, it is important that today's women have the knowledge and capability to manage personal and household finances. As suggested by Falahati and Paim (2011), since the results confirmed gender differences in financial matters, it is necessary to develop gender-sensitive policies in financial issues and provide more opportunities for females to participate in economic practices. Education in financial literacy should start from an early age and for current university-goers should incorporate new approaches and techniques to improve the effectiveness of financial literacy. Financial education should include components that provide an understanding of financial products, personal financial management, the danger of reliance on debt, financial independence and smart investing.

A nationwide campaign to achieve wider outreach in promoting financial literacy by engaging university students, especially females, through ground events and activities is to be organised by the Ministry of Higher Education. In this campaign, the Ministry may introduce young icons among female financial controllers, and more so to highlight that Malaysia used to have a female Governor for its Central Bank. Additionally, it aims to develop financial products and financial related issues that are more palatable to female young people, in particular.

Financial advice professionals need to engage more students, especially when they first get their PTPN. Future research is to be conducted; the focus may be on investigating and understanding students' needs and how to influence their attitudes and behaviour towards financial management. Future research can also include other variables to improve the explanatory and predictive power of the financial literacy. Additionally, research could also be done in other geographical areas in Malaysia to include sub-urban and rural areas.

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