UITMCNS
SEREMBAN

J E M U R

JOURNAL OF EXPLORATORY MATHEMATICAL UNDERGRADUATE RESEARCH

RECENT **MATHEMATICAL PROJECTS** AT UITM, *SEREMBAN CAMPUS*

Vol. 002 | PREPARED BY: KPPIM, UiTM N. SEMBILAN. | DATE: 05 OCT 2024

EXTREMAL PROPERTIES OF CERTAIN CLASS OF TILTED UNIVALENT ANALYTIC FUNCTIONS

MONTHLY EXPENDITURE OF PTPTN LOAN RECEIVER AMONG SHAH ALAM UNIVERSITY STUDENTS

LABOUR FORCE PARTICIPATION RATE AND UNEMPLOYMENT RATE: A MALAYSIAN PERSPECTIVE

CLASSIFICATION OF AIR QUALITY IN THE KLANG VALLEY USING K-MEANS CLUSTERING

FACTORS AFFECTING STUDENTS' ACADEMIC PERFORMANCE THROUGH ONLINE DISTANCE LEARNING

Photography courtesy of Porapak Apichodilok

THE DETERMINANTS OF PERSONAL LOAN BORROWINGS: CASE STUDY OF ADULTS IN SHAH ALAM

Jaida Najihah Jamidin[1,*], Aiman Zafira Azizul Rahman[2] and Nur Hannah Mohamad Zamshary[3]

[1,2,3] College of Computing, Informatics and Mathematics Universiti Teknologi MARA, Negeri Sembilan, UiTM Seremban Campus, 70300 Seremban, Negeri Sembilan, Malaysia

*jaida5698@uitm.edu.my

Abstract

Increasing trends in having personal loans as a way to bridge the gap between income and consumption cost among Malaysian inspired this study. The outcomes can help to enhance credit quality correctly. This study provides survey evidence to identify the determinants of the personal loan borrowings in Shah Alam, Selangor. To find the most reliable predictor of personal loan borrowings, the logistic regression model was used in this study with six main factors considered in this analysis including age, gender, education level, marital status, occupation and income. Online questionnaires were distributed to the 271 respondents in Shah Alam and convenience sampling was the method of sampling used. The collected data were analyzed by using binary logistic regression analysis. The result proved that gender, income, education level and occupation are the significant factors that contributed to the personal loan borrowings contrarily the other two independent variables appear to be non-significant. In addition, the interpretation of odds ratio makes the logistic regression model particularly appealing for modelling. In this study, male are 18.61% times more likely to take out personal loans. Whereas, for one Ringgit decrease in the income of adults in Shah Alam, the odds of person who take out personal loan is multiplied by 0.861.

Keywords: personal loan, Logistic Regression Model

1. Introduction

Personal loans are unsecured loans for personal use that may be used for any reason, whether it be to pay for a wedding, vacation, or consumer durable. Personal loans are highly convenient and can meet all an individual's needs (Joseph, 2021). A personal loan makes it possible to purchase products and services. Essentially, goods purchased on credit are a debt. Money borrowed from a bank or other financial institution for personal purposes is referred to as a personal loan. Lenders like banks and financial organisations offer personal loans as a sort of consumer lending to help those who are experiencing short-term financial difficulties. It is used to pay for large purchases, family needs, or other significant household costs. These loans might be unsecured or secured by the asset that was acquired, such as collateral, or by a relative who serves as the guarantor (Hashim, 2010). A personal loan is often subject to a flat interest rate, with the rate typically ranking according to the length of the loan or the loan's funding. The whole amount of interest that has accumulated is due in monthly payments, which must be made until the loan's term is up. In addition, the loan is issued for domestic, family, or personal usage rather than for commercial or corporate purposes. The broad availability of personal loans is sometimes blamed for the formation of mass markets for consumer goods

and the attainment of high standards of living by Western consumers (Beares, 1987).

Malaysians might take advantage of several government benefits, including a first mortgage loan, medical coverage, several incentives and more. Even though they get many benefits, data reveal that household debt has not decreased since Malaysia's household debt to GDP ratio is still high. As of December 2021, Malaysia's household debt as a percentage of GDP was 89%, up from 89.6% in June 2021. In 2020, the Malaysia's household debt-to-GDP ratio reached a new high of 93.2% (Hazim, 2022). This showed that a household utilised around half of its income to pay down debt. As a result, after paying off the debt, there would be less money left over for emergencies, food, transportation, and education. The family would struggle to pay the bills if the working person got sick or lost his job, the risk of loan default increased. In addition, according to research on the ratio of household debt to disposable income, Malaysia was one of the highest levels in the world at 140.4 %, followed by Singapore at 105.3 %, the United States at 123.3%, and Thailand at 52.7 % (Ong, 2010). This shows that each household in Malaysia had loans that are, on average, 1.4 times larger than their annual income (Ong, 2010).

Recent research has found that the key reason for the rise in personal bankruptcies is the inability to repay loans (Mien & Said, 2018). This was because people often found it tough when it was time to make their monthly loan payments due to the high interest rates. On the other hand, some of the contributing causes resulted from inadequate financial planning. The danger of financial crisis and economic instability might then increase the challenges in developing countries during the global financial crisis. Hence, investigating the factors that influence personal loans in Malaysia was important since this study might help peoples to avoid getting into debt problem in the future.

2. Methodology

2.1. Description of Data

The data used in this study was collected from a survey of 271 respondents in Shah Alam. The dataset includes variables such as gender (categorical, male or female), age (continuous, years), and income (continuous, RM). Educational level was coded as "diploma level," "bachelor's degree level," "master's degree level," and "Doctor of Philosophy (PHD) level. In the meantime, marital status was classified as "single," "married," "separated," or "widowed." For personal loan borrowings, 1 if the person takes the personal loan and 0 if the person does not take the personal loan. Besides, the study was conducted from July 2022 to September 2022. The study focused on the Malaysian population aged 18 and above.

2.2. Research Framework

The purpose of theoretical framework is to present the relationships that propose in the study based on the researcher's speculation. It describes a summary of theory on a particular problem that was developed through a review of variables involved. As part of this study, there are one dichotomous dependent variable involved which is the personal loans borrowing and eight independent variable that includes gender, age, education level, marital status, occupation and household income. The theoretical framework of this study is shown in Figure 2.1.

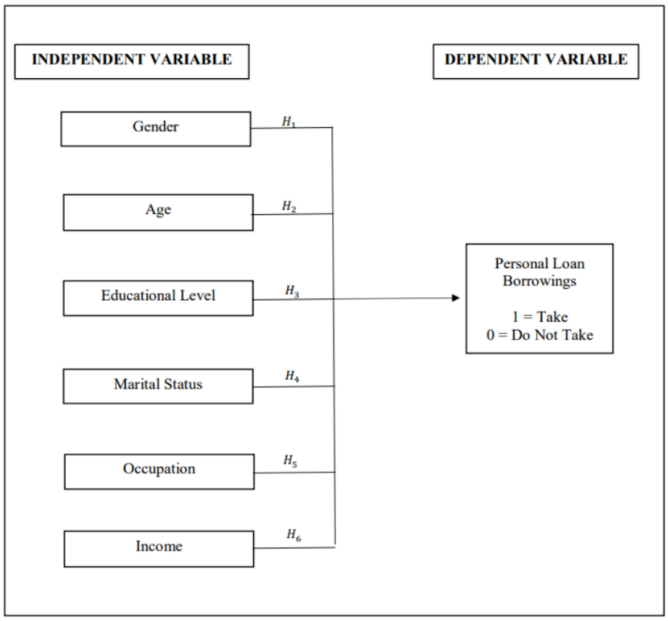

Figure 1: Research Framework

2.3. Logistic Regression Analysis

Logistic regression analysis is one of the regression analyses for the binary classification, which includes two class values for the dependent variable. This analysis' main goal is to define variables and identify the relationship between the dependent binary variable and independent variables. In addition, logistic regression analysis is not the same as linear regression, in that logistic regression produces a constant output, whereas linear regression produces a continuous output. The output of logistic regression only contains a limited number of possible values, and it can only predict between two possible outcomes.

The general form of logistic regression model is:

$$logit\ (P) = \log\left[\frac{P(X)}{1-P(X)}\right]$$

$$= B_0 + B_1X_1 + B_2X_2 + \cdots + B_kX_k + \varepsilon$$

From the general model, it can be simplified into a preceding model which p can be calculated using the following formula:

$$P = \frac{e(B_0 + B_1X_1 + B_2X_2 + \cdots + B_6X_6 + \varepsilon)}{1 + e(B_0 + B_1X_1 + B_2X_2 + \cdots + B_6X_6 + \varepsilon)}$$

where,

p = probability of success dependent variable

B_0= constant of the equation
$B_0, B_1, \dots, B_k$= the coefficient of independent variable
X_1= Age
X_2= Gender
X_3= Education Level
X_4= Marital Status
X_5= Occupation
X_6 = Income

For the model's evaluation, five criteria are considered. The logistic regression model is evaluated using these five criteria which are the Omnibus Test, Hosmer and Lemeshow Test, Predictive Efficiency Model, Wald Statistics, and lastly Cox and Snell R^2 and Nagelkerke R^2.

The Omnibus Test was used to assess the overall model accuracy. The researcher applies the Omnibus Test to examine if any regression coefficients are significantly different from all other coefficients, apart from the coefficient B_0. The null hypothesis (H_0) in this study was that all the regression coefficients were equal to zero, whereas the alternative hypothesis (H_1) was that they were not equal to zero. The null hypothesis (H_0) is rejected and the alternative hypothesis (H_1) is accepted if the p-value for the Omnibus Test is less than 0.05. This revealed that data from independent variables could aid in more precise forecasting of the factor of indebtedness.

Hosmer and Lemeshow Test can be used to check the goodness of fit, in which the researchers intended to see if the data was a good fit test for the logit model or not. The null hypothesis (H_0) was that the logistic regression model matched the data well, whereas the alternative hypothesis (H_1) was that the logistic regression model suited the data poorly.

Classification table compared the logistic regression model's predicted value for the dependent variable with the data set's actual observed value. If the aggregate percentage is 60%, it is a good indicator of predictive efficiency. In addition to the overall percentage, sensitivity, specificity, and accuracy can be used to evaluate the predictive efficiency model. Sensitivity refers to the likelihood that the test will correctly identify personal loan borrowings, or the likelihood that any given set of personal loans will be identified by the test (refer to '1'). While specificity refers to the likelihood that the test will correctly identify someone who is debt-free (refer to "0"),

Wald Statistics displays the statistical significance of each independent, regressor, or predictor variable. Each regression coefficient is evaluated independently by the Wald Statistics, with the null hypothesis (H_0) being a regression coefficient equal to zero and the alternative hypothesis (H_1) being a regression coefficient that is not equal to zero.

Cox and Snell R^2 and Nagelkerke R^2 method displays the amount of variation in the anticipated variable that the model can account for. The range of values is $0 < R^2 < 1$. Depending on the situation, different R^2 values will be considered "good." Even a relatively low R^2 of 0.5 may be seen as quite powerful in some domains, such as the social sciences.

2.4. Odds Ratio

Odds ratio referred as an analysis that measures the relationship between an input and an outcome. It reflects the probability that an outcome will occur given a certain input, as opposed to the odds that the outcome would occur in the absence of that input. The predicted increase in the likelihood of the outcome per unit increase in the value of the exposure is known as the regression coefficient in a logistic regression. In other words, the odds ratio for a one-unit increase in input is determined by the exponential function of the regression

coefficient.

The conversion from probability to odds is call as monotonic transformation, which means that as the probability increases, so do the odds. The probability scale ranging from 0 to 1. In this study, the value of '1' means the people are taking personal loans while value of '0' refers to people who are not taking personal loans. Therefore, the probability P(X) can be determined as follows:

$$P(X) = \frac{Number\ of\ outcome}{Number\ of\ all\ outcome}, where\ 0 < P < 1$$

The odds ratio shows that an event is likely to occur in comparison to not occurring. As a result, probability is used to represent the likelihood of something happening or not happening.

$$P(X) = \frac{Probability\ of\ People\ Taking\ Personal\ Loans}{Probability\ of\ People\ Not\ Taking\ Personal\ Loans} = \frac{P(X)}{1 - P(X)}$$

Therefore, the odds ratio shows that the change in odds depends on the outcome when the values of a predictor increased by one unit.

3. Result and Discussion

3.1. Criteria for Model Evaluation

For the model's evaluation, Omnibus Test, Hosmer and Lemeshow Test, Predictive Efficiency Model, Wald Statistics and Cox and Snell $R^2$and Nagelkerke $R^2$are considered. The logistic regression model is evaluated using these five criteria.

Table 1: The Results of Criteria for Model Evaluation

The Criteria for Model Evaluation	Full Model
Omnibus Test	0.00
Hosmer and Lemeshow Test	0.886
Predictive Efficiency Model (%)	69.7
Cox and Snell R^2	0.15
Nagelkerke R^2	0.205

Based on Table 1, the Omnibus Test, Hosmer and Lemeshow Test, Predictive Efficiency Model and Cox and Snell R^2 and Nagelkerke R^2 results show that the full model met all evaluation model criteria. According to the Omnibus Test results, it is possible to predict the determinant of personal loan borrowings more accurately using data from independent variables. As the overall percentage for the complete model is more than 60%, it demonstrates an excellent predictive efficiency, according to Predictive Efficiency Model percentage. Also, the Hosmer and Lemeshow Test expresses that the model adequately described the data

because the p-value is above the 5% level of significance. Furthermore, for Cox and Snell R^2Nagelkerke R^2, both R^2 values indicate that all the variance in personal loan borrowing, which is between 15% and 20.5%, can be explained from all independent variables.

3.2. Fitting Logistic Regression Model

Logistic Regression Model (LRM) estimates the probability of an event occurring, which in this study the probability of someone's taking personal loan, based on the independent variables which are Age, Gender, Education Level, Marital Status, Occupation and Income. As for the indicator, the researcher used Female for Gender, SPM for Education Level, Widowed for Marital Status and Employed for Occupation. Table 2 shows full model coefficient which includes the estimated coefficients and the p-values.

Table 2: Full Model Coefficient

Variable	Estimated Coefficient	P-Value
Age	0.031	0.153
Gender (Male)	0.621	0.038
Education Level (Diploma)	-0.193	0.763
Education Level (Bachelor's degree)	-0.91	0.122
Education Level (Masters' Degree)	0.282	0.671
Education Level (PHD)	0.154	0.836
Marital Status (Single)	1.751	0.169
Marital Status (Married)	2.279	0.061
Marital Status (Separated)	2.148	0.129
Occupation (Self-Employed)	1.499	0.126
Occupation (Retired)	-0.486	0.635
Income	-0.149	0.04
Constant	-3.31	0.111

According to Table 2, the variables marital status and age are not statistically significant in explaining the determinants of personal loan borrowings because their significant value is greater than 0.05. Out of the six factors mentioned in the previous study's literature review, it can be concluded that the four variables of gender, education level, occupation, and income are the main factors that contribute significantly to personal loan borrowings. The logistic model equation used to predict personal loan borrowings is shown below.

Z= - 3.31 + 0.031 Age + 0.621 Gender (Male) - 0.193 Education Level (Diploma) - 0.91 Education Level (Bachelor's Degree) - 0.282 Education Level (Master's Degree) - 0.154 Education Level (PHD) + 1.751 Marital Status (Single)+ 2.279 Marital Status (Married) + 2.148 Marital Status (Separated) + 1.499 Occupation (Self-Employed) - 0.486 Occupation (Retired) - 0.149 Income.

3.3. Interpreting Odds Ratio

The odds ratio is another way to describe the likelihood that people will take out a personal loan. The odds ratio for the full model is shown in Table 4.9.

Table 3: Full Model Odds Ratio

Variable	Odds Ratio
Age	1.032
Gender(Male)	1.861
Education Level (Diploma)	0.824
Education Level (Bachelor's Degree)	0.403
Education Level (Masters' Degree)	1.326
Education Level (PHD)	0.167
Marital Status (Single)	5.763
Marital Status (Married)	9.769
Marital Status (Separated)	8.571
Occupation (Self-Employed)	4.479
Occupation (Retired)	0.615
Income	0.861

The output for the odds ratio shows that married people were 9 times more likely to take out personal loans. When compared to the widowed, divorced people are 8.571 times more likely to take out personal loans. Meanwhile, it seems single people are 5.763 times more likely to take out personal loans compared to widows. Self-employed people are 4.479 times more likely than employed people to take out personal loans. Furthermore, an older person in Shah Alam, a male, and a master's degree holder had a one-time higher odds ratio. Since the odds ratio is higher than 1.0, married individuals, divorced individuals, single individuals, self-employed individuals, age, being male, and being a master's degree holder may be major factors in personal loan borrowing.

4. Conclusion

Knowing what factors affect personal loans is important since many people with loans seldom have access to large disadvantages. Having a personal loan is related with a higher chance of increased debt load, additional monthly payment, potential credit harm, and higher payments than credit cards. This disadvantage extends beyond the financial world to lifestyle and bankruptcy (Esty, 1997). Therefore, taking out a personal loan may have an impact on bankruptcy legislation. Even while financing is surprisingly widespread across all income levels and occupations, education level is still a key consideration when applying for a personal loan. The last factor that may affect personal loan borrowing is marital status.

The study's findings demonstrate that its two goals were adequately attained. This study first determined the key elements that influence the borrowing of personal loans. In order to expose the contributing causes, this study also analysed the relative odd of the incidence of personal loan borrowing.

Based on the findings in the study, some recommendations would benefit for further research. Firstly, it is recommended to increase the sample size so that the findings will have

better representative of the population. Since the number of samples used in this study is small, so the likelihood of encountering significant value on which the study is based is low. Secondly, future studies thus encourage that more variables should be added, or different factors must be used in variation that impact personal loan borrowings. Since this study more focus on the socioeconomic factors, hence it is recommended another study be done using new methods and variables. This study was intended to serve as a foundation for subsequent research into personal loan borrowings issue.

As this study has limitations on online surveys, future researcher needs to consider to extent to face-to-face for more reliable study. As a result, it should be explored in future study using face-to-face surveys to address the causes of personal loan borrowings, with a focus on economic reasons, society, and nation. To produce useful information in research, the future researcher should also generate accurate results in the analysis and be aware of the possibility of bias. To assure the validity and accuracy of the study findings, more accurate data analysis results are required.

References

Beares, P. (1987). Consumer lending. American Institute of Banking, American Bankers Association.

Hashim, M. (2010). Personal finance. UPENA.

Hazim, A. (2022, Apr). Retrieved from https://themalaysianreserve.com/2022/04/07/malaysias-debt-to-gdp-ratio-could-stabilise-at-65-5-this-year/

Joseph, J. (2021). A Study on Personal Loan at Bajaj Finserv Limited. *International Journal of Innovative Research in Technology*, 8(6): 442-451

Mien, T. S., & Said, R. (2018). A cross-sectional household analysis of household consumption patterns: An indirect approach to identify the possible factors of personal bankruptcy. *Jurnal Ekonomi Malaysia*, 52(3), 231–246

Ong, T. K. (2010). Household debt: Blame the cars, not a home. The edge.