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Exploring The Role of Information Disclosure in Influencing Credit Card User's Repayment Decisions among Malaysians

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Abstract

Bound rationality theory is used to study the role of information disclosure in influencing credit card user's repayment behaviour in Malaysian. Eight types of information disclosure analysed on the actual credit card users which divided into three prior define groups. Data collected by using the survey response of 413 card users in the northern region of West Malaysia. The finding of the discriminant analysis confirms that minimum payment due is the most contributing information disclosure which discriminant amongst the groups. Conditional on attributes of the data, quadratic discriminant analysis (QDA) outclassed the other discriminant analysis. QDA-resubstitution enable the credit card users to correctly classified repayment behaviour at 85 percent. Addition to that, for prediction purposes, 84 per cent of credit card users were correctly classified. The findings of this study highlight the importance of information disclosure in influencing credit card repayment decision. These findings have implications for policy maker, card users and issuers.

Keywords: Credit Card, User's Repayment Behaviour, Information Disclosure, Bound Rationality, Discriminant Analysis.

Introduction

Credit card allows the user to enjoy the ease of "buy-now-pay-later" concept, earn cashback rewards and bonuses. Min and Kim (2003) postulates that credit card is manly used for two purposes, day-to-day transactions and borrow money. In case of day-to-day transaction, credit card enables to use unsecured credit as per limit set by credit card companies. To borrow money, credit card user withdraws cash money for short-term loan. Moreover, based on credit card repayment behaviour, users are divided into mainly two categories - transactors and revolvers. Credit card transactors pay full payment and hence avoid incur interest charges. On the other hand, credit card revolvers pay minimum payment of their balance and incur interest charges. In line with revolvers decision making, credit card classified revolvers the way they choose repayment decision (Jørgensen and Igel, 2021). In

addition, this classification can be helpful for the credit card issuers to detect potential bankruptcy and can block the user's card in time to limit repayment burden.

In case of Malaysia, credit card is becoming one of the widely used payment method over other than conventional payments such as cash, cheque and bank transferred. A report by Bank Negara Malaysia (BNM) (2019), showed that principal credit card in circulation increased from 7.2 million to 9.1 million between the year 2015 to 2020. Credit card transactions has increased from RM 349 million to RM 510 million (Ringgitplus, 2021). Rising trend of credit card usage in Malaysia has become a concern since bankruptcy related to credit card loan has also increased by 43 percent in 2018 compared to 2012 in the recent years (WorldBank, 2019). Furthermore, data released by Counselling and Debt Management Agency (AKPK) shows that nearly 70% of individuals who seek counselling services during the first half of 2016 have problems in credit card repayment (The Malaysian Reserve, 2019). This shows that factors influencing credit card repayment decision needs to be delved into to get a better understanding about it.

According to Stigler (1961), information disclosure is the simplest and least distorting policy intervention that facilitates users in making better decision. Information disclosure is prescribed as possible solution to overcome the problems (Healy & Palepu, 2001). Previous studies have looked at the role of information disclosure in influencing credit card repayments. The theory of "bound rationality" highlights the role of information in decision making. The theory postulates that information is heterogeneous, and users value them differently (Selton, 1990). Due to that, users unable to process the entire information and thereby choose simple-minded solution. On the other hand, asymmetric information argued that one party may have more information than the other, putting the less informed individuals in a disadvantage. In the context of credit card repayment, the card issuer has more information than the card users. This puts users in a vulnerable position and hence users urged to choose simple-minded solution and avoid complex calculation.

In with this, Bank Negara Malaysia requires credit card issuers to disclose important information to the users at the various stages of the contract. With regard to the monthly statement, the following information is mandated: outstanding balance, the minimum repayment, the amount credited and charged (interest and other non-interest charges), warning on paying only the minimum payment, standard illustrative examples of the time required to pay off outstanding balances and total interest incurred based on different repayment amounts (Bank Negara Malaysia, 2019). Existing study by (Keys & Wang, 2019; Salisbury & Zhao, 2019; Stavins, 2018; d'Astous & Shore, 2017; McHugh & Ranyard, 2016; Hershfield & Roese, 2015; Jones et al., 2015; Salisbury, 2014; Daniel, 2014; Navarro-Martinez et al., 2011; Stewart, 2009) shows how information effect on the credit card repayment behaviour. However, lack of studies has looked at the effectiveness of the information in influencing on credit card repayment behaviour in the context of Malaysia. Most studies on credit card repayment behaviour in Malaysia have mainly focused on macroeconomic factors, card users attributes, financial knowledge and financial literacy and demographic profile, accordingly (Theong et al., 2018; Ramayah et al., 2002; Chong, 2017; Wei et al., 2018; Jusoh & Lin, 2012; Hamid & Loke, 2021; Loke et al., 2011).

The study analyses how various types of information that are currently presented on the monthly bank statement influences credit card repayments. The following information are considered: minimum monthly payment, payment due date, statement balance, annual per centage rate (APR), finance charge, finance fee and charges, interest free rate and notice on paying only minimum monthly repayment. In addition, the study also aims to find out which

information disclosure most discriminant among the three categories of repayment groups which includes pay minimum or less than minimum, pay more than minimum and pay full payment. Furthermore, information disclosure is also tested to see whether respondents can be correctly classified into repayment group by applying the application of quadratic discriminant analysis (QDA). The result obtained from the classification is used for prediction which will provide useful insights of repayment behaviours for new credit card users. Our study contributes to the current state of knowledge in the field of consumer's finance in two major ways. Firstly, there is lack of studies that have investigated the role of information in credit card repayments behaviour from the perspective of an emerging market economy. Secondly, lack of studies has analysed the role of information disclosure to order to correctly classified the users into repayment group as well as predicting credit card repayments behaviour.

Objective of the Study

- The main objective of the study is to investigate the effect of information disclosure on credit card repayment behaviour in Malaysia.

The rest of the paper is structured as follows. Section 2 reviews the relevant literature, and Section 3 explains the methodology. Section 4 provides the data analysis, while section 5 includes the discussion and conclusions. The final section addresses the implications of the findings.

Literature Review

Several theories considered information as the pivot point which influence a consumer's decision-making (e.g., utility maximization, bound rationality and asymmetric information). Utility-maximization approach assumed that the consumer has perfect information regarding the available options for choice, perfect foresight of the consequences from choosing the options which enable to make best possible decision (Wheeler, 2020). Contrary to that, Simon rejected the idea of utility-maximization and introduced a new concept – “bound rationality” related to consumers decision-making (Selten, 1990). According to Wall (1989), Simon's bounded rationality can be categories based on two main statements. First, and foremost, Simon argued that human is bounded or limited because of imperfect information. Addition to that, human brain is incapable to process the large amount of information due to limited cognitive capacity. Consequently, the user chooses a simple-minded solution. Second, user's intrinsic behaviour always in search of new alternative solution which he abstracts form the modification of existing decision rules or from the experience. It is due to that; the new solution is deemed necessary as he observes the goals are not being met. During the search of new solution, the satisficing mode is undertaken. The search process terminated when he found a solution which is good enough and enable to achieve aspiration level.

Several studies have been conducted to show that credit card user choose simple-minded solution to make credit card repayment (Chapman & Johnson, 1999; Keys & Wang, 2019; Navarro-Martinez et al., 2011; Stewart, 2009). One of the study, Stewart (2009) explained the phenomenon of simple-minded solution based on the information related to the credit card minimum repayment behaviour provided in the bank statement. According to him, a credit card user accepted the given minimum payment information as the bounded information and considered as an initiative point to make credit card repayment. Intuitively, user found that information is heterogeneous and face complexity to process. Thereby, to avoid complexity,

the user chooses the available information as a simple-minded solution. Consequently, user choose to pay minimum payment, which merely enables them to reduce the size of partial payment and caused to increase repayment burden. Similarly, information related to repayment due date is another example of simple-minded solution. For example, a study by Salisbury (2014), information related to repayment due date giving less impact on credit card user repayment decisions. It is due to the reason that, repayment due date is calculated on the interest compounding rate (APR), which in general user has a limited cognitive capacity to process. Therefore, the user chooses for the simple-minded solution. Literature confirms that repayment due date encourage the users to make minimum payment (Navarro-Martinez et al., 2011; Salisbury, 2014). Moreover, by paying minimum repayment, the users got cash in hand for other purposes; expenses, saving and/or investment. However, minimum repayment raises serious concern on the user's future repayment ability.

Besides, the information of minimum payment and payment due date, the bank statement also contains other information such as the information related to the future interest cost and bounded message. According to bound rationality theory the user's intrinsic behaviour urged the satisfied mode to search for new goals based on past information, which is good enough and lead to achieve aspiration level. This transition may urge the users to correctly classified themselves in the repayment group. Intuitively, according to Salisbury (2014), information related to interest rate charged on full payment encourage the users to increase the repayment and achieve aspiration level which enable them to reduce repayment burden. Similarly, the supporting arguments provided by Bannier et al (2019) which confirmed that credit card users take information related to interest payment in a positive way to achieve aspiration level. According to them, credit card users pay full payment to avoid credit card interest payment and hence succeed to achieve aspiration level. Contrary to that, a study by Navarro-Martinez et al (2011), found that future interest rate has no substantial positive effect on credit card repayment pattern. Another way to urge the users to set new goals is by updating with a new-bounded information. The user's information processing capability can be modified by updating with a bound message over time based on user's past repayment pattern. For example, Gabaix, laibson, Moloche and Weinberg (2006) found that the bounded message over a time encourage the credit card user to reduce the information constraint and classified them into correct repayment group. For example, Bursztyn, Fiorin, Gottlieb and Kanz (2018) found that the bounded message containing on the divine message which said: "non-payment of debts by someone who is able to repay is an injustice" has a positive effect on the user's repayment behaviour and encourage them to correctly classified into repayment group.

In wider aspects, there are several studies available which focused on the prediction of groups membership and the factors most discriminant among the groups (Boedeker & Kearns, 2019; Ramayah et al., 2010; Iqbal & Shetty, 1994; Fisher, 1936; Fulcomer et al., 1974). For example, one of the study by Hirschman (1979) used discriminant analysis to study credit card repayment behaviour member over alternative payment system. Furthermore, according to Fulcomer et al (1974), linear discriminant analysis and quadratic discriminant analysis techniques used to study the group based categories to find out the most contribution factor. A study by Boedeker and Kearns (2019), found that discriminant analysis as the most suitable technique over other techniques, such as logistic regression, multinomial logistic regression, random forests, support -vector machines and the *K*-nearest neighbour algorithm, due to the nature of the data.

Based on the above discussions, this study aims to contribute to the literature in several ways. Firstly, the study shed a light on which information disclosure most discriminant amongst the groups on credit card repayment behaviour in Malaysia. Secondly, the role of information disclosure to correctly classified the repayment group. Thirdly, the study contributes in terms of method by applying quadratic discriminant analysis (QDA) since so far there is no study which used this technique in case of Malaysia. Lastly, the accurate prediction of the classification of the users based on the information disclosure may avoid fruitless expenses and aid appropriate referral to treatment. In studying the relationship between information disclosure and credit card repayments in Malaysia, this study aims to find support for the following hypotheses:

Hypothesis 1: Information disclosure influences credit card repayment decision.

Hypothesis 2: Information disclosure enables the credit card users to be correctly classified into repayment group.

Methodology

This study used the discriminant analysis (DA) to analysis credit card repayment group which we have categories a priori. The objective of the DA is to classify an observation, or several observations into known groups (Härdle & Hlávka, 2007; Hirschman, 1979; Tate, 2010). Furthermore, DA technique identify the variable which contributes most to discriminant into priori define groups (Boedeker & Kearns, 2019). The study used the parametric methods for making predictive classification. Tibshirani and Friedman (2013) provides the strong argument in order to apply parametric method for large and diversify set of classification task, such as linear discriminant analysis (LDA) and quadratic discriminant analysis (QDA). Discriminant rule can be judge based on the lowest test error rate. The lowest test error rate, the better the probability of the prediction (Härdle & Hlávka, 2007). According to Fulcomer, Schönemann and Molnar (1974), the bayes discriminant rule classify on covariance matrix and define the prior information about the probability of the population e.g., unequal covariance matrix preferred to QDA.

In the mathematical formulation of the problem, the study allocates an observation to one of the populations $\tau_k, k = 1 \dots k$. A discriminant rule is a separation of the sample space (in general B^p) into disjoint sets B_k such that if a new observation falls into the region, B_k , it is identified as a member of population τ_k . Let π_j denote the prior probability of class j . Note that $\sum_j \pi_j = 1$.

The Bayes discriminant rule allocates (x) to the populaion τ_k that gives the largest value of $\pi_i f_i(x)$,
 $\pi_k f_k(x) = \max_{i=1, \dots, j} \pi_i f_i(x)$. The Bayes discriminant rule can be formally defined by Equation 1:

$$B_j = ((x): \pi_i f_i(x) \geq \pi_i f_i(x) \text{ for } i = 1, \dots, J) \quad \text{Equation 1}$$

Data for this study were collected using a self-administered survey. 500 questionnaires were distributed, and 413 completed questionnaires were used for analysis. Data were collected in the northern region of West Malaysia. Only credit card users who make a payment decision took part in the study. The questionnaire contains questions on information disclosure on credit card usage and repayment practices. The latter is the dependent variable of this study. It is measured using a categorical scale. This variable is used to assess credit card repayment behaviour, pay only minimum or less than minimum = 0, pay more than minimum = 1 and pay full payment = 2.

The information disclosure is related to the credit card repayment behaviour based on reviewing the bank statement received each month. The information disclosure are based on the Bank Negara Malaysia's credit card information policies, such as: payment due date, statement balance, minimum payment due, annual percentage rate, fee and charges, interest free period, finance charges, notice on paying only minimum monthly repayment. A five-point Likert scale ranging from 1= "never" to 5 = "always" is used.

The study finds out which information disclosure is the strongest predictor which discriminant between the groups. Aftermath, to classified between these groups related, this study applies three different discriminant analysis such as Linear discriminant analysis (LDA), Quadratic discriminant analysis (QDA) and logistic discriminant analysis (LogDA) (Boedeker & Kearns, 2019; Fulcomer et al., 1974; Hirschman, 1979). Out of three discriminant analyses, the best technique is trace out by error count and covariance matrix criteria. In addition, to find out the efficacy of the selected technique to predict for the future groups, this study divided the data into two groups, one for the training purpose and other for the testing purpose. For the precise measurements, the different ratio of training set and testing set is applied for example, 60 and 90 per cent as training set and 40 and 10 per cent as testing set. The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy restrictions.

Descriptive Analysis and Results

As shown in Table 1, the sample comprises of 157 males and 231 females which comprise 38 per cent of male participation and 62 per cent female participation in this survey. A higher per centage of the respondents are aged below between 31-40 years old (52.17). The second higher per centage 33.09 of them are aged between 21-30 years, while 9.18 per centage are aged between 41- 50 years. A smaller percentage of the respondents only have secondary level education (6.5 per centage). Respondents with a diploma or degree are 362 people (87.65 per centage) and those with masters and above are 25 people (6.05 per centage). Almost three quarter of the respondents are 305 earning an income which falls in the category of B-40 (household income Bottom forty; based on the Malaysian Statistical department) (RM 2,000 to RM 5,000) and remaining earning higher income are 109 people (26.32%) which falls in category of M-40 (middle forty; based on the Malaysian Statistical department) (RM 5001 to RM 11,000).

Table 1 Demographic Profile of Respondents

Variables	Number of observations	Per centage
Gender		
Male	157	38.01
Female	256	61.99
Age		
21-30 years	137	33.09
31-40 years	216	52.17
41-50 years	38	9.18
51-60 years	18	4.35
More than 60	5	1.21
Education		
SPM	26	6.30
Diploma	131	31.72
Degree	213	55.93
Postgraduate degree	25	6.05
Income		
RM 2000- RM 5000	305	73.68
RM 5001- RM 10,000	109	26.32

Table 2 shows information related to credit card and payment criteria. Pay minimum or less than minimum payment is equal to RM 126.18, contains 43 observations with 10 per cent present in the data.

Table 2: Credit Card Repayment Groups

Credit card	Criteria	Observations	Per centage
Pay minimum or less than minimum payment	RM 126.18 and/or less than.	43	10.34
Pay more than minimum payment	Between RM 126.8 to RM 2523.50	342	82.21
Pay full payment	RM 2523.50 and above.	31	7.45

Pay more than minimum payment is equal and greater than to the payment made based on RM 126.18 and less than RM 2523.50, contains 342 observations with 82 per cent present in the data. Pay full payment is based on the payment greater than RM 2523.50 and above, contains 31 observations with 7.45 per cent present in the data.

From Table 3 below, this study used independent sample T-test to determine review bank statement when making payment decision between male and female credit cardholders. Table shows that at the significance level, the p-value is less than 0.05 for the payment decision. Thus, the null hypothesis is not referring to the credit card when making decision payment. This proves that there is significant difference in refer to statement when making credit card repayment decision between male and female. It shows that female has higher tendency to review bank statement when making repayment decision than male.

Table 3: T-Test, Difference between Male and Female to Review Bank Statement before Payment

	Mean		t-value	p-value
	Male	Female		
Refer to statement when making repayment decision	3.382 2	3.6814	-4.4131	0.000

Table 4, presents the discriminant Function 1 & 2, adjusted Discriminant Function 1, and the relative contribution of each of the variables; rank based on Adjusted Function 1. The discriminant coefficients in column Adjusted Coefficient 1 of Table 4 are measure for each of the variables using equation 1. The coefficients are computed such that the power of the discriminant function is maximized. In order to observe the relative contribution of each variable, we adjusted each coefficient by multiplying the standard deviation of the corresponding variable. The size of the adjusted coefficients reveals the contribution of a variable to the discriminant function relative to other variables. The largest contributor to the discriminant function is the minimum payment due, with an adjusted coefficient of 1.0625, followed by interest free period, notice on paying monthly minimum payment at third, fees and charges at fourth, annual per centage rate at fifth, payment due date at sixth, statement balance and finance charge at seventh and eighth, respectively.

Based on the list for coefficients (and the constant) of the unstandardised canonical discriminant function in Table 4, the discriminant function follows:

Table 4: Unstandardised Canonical Discriminant Function

	Discriminant Function1 Coefficient	Discriminant Function2 Coefficient	Adjusted Discriminant Function1 Coefficient	Rank based on Adjusted Function1 Coefficient
Payment due date	-0.2491	-0.7026	-0.1733	6
Statement balance	-0.7095	0.6856	-0.5268	7
Minimum payment due	1.4171	-0.449	1.06250	1
Annual percentage rate (APR)	-0.1315	0.3880	-0.1068	5
Fees and charges	-0.1197	-0.147	-0.0948	4
Interest free period	0.1523	0.7609	0.11689	2
Finance charges	-0.9315	0.3778	-0.7800	8
Notice on paying only minimum monthly repayment	-0.1205	-1.700	-0.09403	3
Constant	2.2312	2.5986		

$$D1 = 2.231 \text{ cons} - .249(\text{pdd}) - .71(\text{sb}) + 1.41(\text{mpd}) - .013(\text{apr}) - .119(\text{feC}) - .152(\text{ifp}) - .932(\text{fc}) - 0.120(\text{npr}) \quad \text{Equation 2}$$

Where: Pdd = Payment Due Date, sb = Statement Balance, mpd = Minimum Payment Due, apr = Annual Percentage Rate, fc = Fee and Charges, ifp = Interest Free Period, fc = Finance Charges, npr = Notice On Paying Only Minimum Monthly Repayment.

The large eigenvalues are associated with a strong function (.15 to 2 is acceptable). From Table 5 given below, the eigenvalues for discriminant function 1 is 0.15, which is stronger than function 2's eigenvalues 0.0282. Canonical correlation indicates that discriminant function 1 moderately discriminated between groups while discriminant function 2 weakly discriminated between groups. Thereby, the study preferred discriminant function 1 over discriminant function 2. A small value of likelihood in discriminant coefficient function 1 confirms that the three group means appear to differ between those who make pay minimum or less than minimum payment, pay more than minimum payment and pay full payment. A high p-value indicates that discriminant function 1 discriminated well ($p < 0.000$).

Table 5: Discriminant Coefficient & Eigen Values

Discriminant Coefficient 1&2	Canon Corr	Eigen Value	Variance		Likelihood Ratio	F	Df	Df2	Prob>F
			Prop	Cumul					
1	0.356	0.145	0.836	0.836	0.8492	4.268	16	80	0.0000
			9	9					
2	0.165	0.028	0.163	1.000	0.9725	1.624	7	40	0.1267
			1						

Furthermore, for the estimation techniques, the study employed three discriminants analysis¹ and confirmation of the techniques based on the result obtained from the test. Firstly, the study employed covariance matrix test to find out the best suitable technique between the LDA and QDA. The estimation result obtained from the Table 12, (see appendix) confirmed an unequal covariance matrix between the group which supports that attribute of the data preferred QDA over LDA. Secondly, the lowest test error rate is employed to confirm among the techniques. Therefore, classification analysis is carried out based on the three-discriminant analysis for the further confirmation and the result based on the lowest test error rate.

Classification gives information about actual group membership vs predicted group membership. Based on the Equation 1, Table 6 provides the result of quadratic discriminant analysis which classify the users into one of the most appropriate groups and reduces the chance of likelihood of a possible misclassification. Besides, Table 7 shows the lowest test error count. According to Table 6, the combination of these variables is better at classified those who pay more than the minimum payment 10 (23.3 per cent) observations are correctly classified, pay more than the minimum payment 325 (95.87 per cent) observations are correctly classified and those who pay full payment 12 (41.38 per cent) observations are correctly classified at priors .10, .82 and .08, accordingly. Besides, the general, resubstituting classification Tables 6 usually give an overly optimistic view of how well you would classify an unknown observation.

¹ In order to find out the most suitable discriminant analysis, this study employed three discriminant analysis such as linear discriminant analysis (LDS), quadratic discriminant analysis (QDA) and logistic discriminant analysis (LogDA). Based on the attributes of the data and the results of the covariance matrix and lowest test error rate, the study confirms that QDA outclass the other two techniques. Therefore, the further analysis is carried out by employed QDA technique.

Table 6: Resubstitution Classification Summary (Classification size 411)

Quadratic Discriminant Analysis					
True Decision	Pay minimum or	Pay more than	Pay full payment	Total	
Payment of outstanding balance	less than minimum payment	than Minimum payment			
Pay minimum or less than minimum payment	10 (23.3)	32 (74.4)	1 (2.33)	43 (100)	
Pay more than Minimum payment	3 (0.88)	325 (95.87)	11 (3.24)	339 (100)	
Pay full payment	2 (6.90)	15 (51.72)	12 (41.38)	29 (100)	
Total	15 (0.24)	372 (90.57)	12 (41.38)	411 (100)	
Priors	0.10	0.82	0.08		

According to Table 7, quadratic discriminant analysis correctly classified 85 per cent of original grouped cases by all the independent variables (minimum due date, statement balance, finance charges, interest free period, notice on paying only minimum monthly repayment, fees and charges, payment due date and average per centage rate).

Table 7: Error Count, Classification 100 Per Cent

Quadratic Discriminant Analysis				
	Pay minimum or less than minimum payment	Pay more than minimum payment	Pay full payment	Total
Error rate	.76	.04	.59	.15
Priors	.10	.82	.08	

Thereby, the study applies another technique of classification such as leave-one-out classification. Leave-one-out classification result is provided in Table 8 which provides a more realistic assessment for classification success. The classification leave-one-out (LOO) Table 8 shows the classification of the quadratic discriminant analysis. However, the LOO does not support the logistic discriminant analysis. Furthermore, the study relies on the result of quadratic discriminant analysis for classification. Besides, the quadratic discriminant classification combination of these variables is better to classify the groups. For example, Table 8 shows that pay more than minimum payment 4 (9.3 per cent) observations are correctly classified, pay more than the minimum payment 319 (94.10) observations are correctly classified and who pay full payment 6 (20.69) observations are correctly classified at priors .10, .82 and .08 respectively.

Table 7: Classification leave-one-out (LOO) size 411

Quadratic Discriminant Analysis				
True Decision of outstanding balance	Pay minimum or less than minimum payment	Pay more than Minimum payment	Pay full payment	Total
Pay minimum or less than minimum payment	4 (9.30)	36 (83.72)	3 (6.98)	43 (100)
Pay more than Minimum Payment	5 (1.47)	319 (94.10)	15 (4.42)	339 (100)
Pay full payment	3 (10.34)	20 (68.97)	6 (20.7)	29 (100)
Total	121 (29.5)	375 (91.24)	24 (5.84)	411 (100)
Priors	0.10	0.82	0.08	

From Table 9 below, confirms that quadratic discriminant analysis correctly classified 81 per cent of original grouped cases by all the independent variables (minimum due date, statement balance, finance charges, interest free period, notice on paying only minimum monthly repayment, fees and charges, payment due date and average per centage rate).

Table 8: Error Count, Leave-One-Out

Quadratic Discriminant Analysis				
	Pay minimum or less than minimum payment	Pay more than minimum payment	Pay full payment	Total
Error rate	.90	.05	.79	.19
Priors	.10	.82	.08	

In line with the previous studies (such as, Boedeker & Kearns, 2019; Fulcomer et al., 1974; Hirschman, 1979), the study confirms that discriminant analysis such as QDA outclass the other technique such as LogDA.

Furthermore, in order to evaluate the performance and efficacy of a quadratic discriminant model to predict, the study divided data into two sets i.e., training set and testing set. Data sets are divided with the ratio of 60 and 90 per cent for the training purpose and the remaining 40 and 10 per cent for the testing purpose given in Table 10.

Table 9: Classification: Training; 60 & 90 per cent, test 40 & 10 percent

Quadratic Discriminant Analysis										
<i>@ 60 Per cent</i>										
<i>@ 90 Per cent</i>										
True Decision Payment of outstanding balance	Pay minimum or less than minimum payment	Pay more than Minimum payment	Pay full payment	Total						
Pay minimum or less than minimum payment	13 (30.95)	8 (19.05)	28 (66.67)	33 (78.57)	1 (2.38)	1 (2.38)	42 (100)	42 (100)		
Pay more than minimum payment	7 (3.76)	6 (1.96)	173 (93.01)	295 (96.4)	6 (3.23)	5 (1.63)	186 (100)	306 (100)		
Pay full payment	2 (12.50)	2 (10.53)	8 (50.00)	10 (52.6)	6 (37.50)	7 (36.84)	16 (100)	19 (100)		
Total	22 (9.02)	16 (4.36)	209 (85.66)	338 (92.1)	13 (5.33)	13 (3.54)	244 (100)	368 (100)		
Priors	0.17	.11	0.76	.84	0.07	.05				

Note: The observations value @60 per cent represented in italic.

Table 11 shows that QDA accurately count error as the training set data ratio increases, e.g., at 60 per cent quadratic discriminant model error count is 24 per cent, and at 90 per cent the model error count is 16 per cent.

Table 10: Error count Classification 60 & 90 per cent, training 40 & 30 per cent

Quadratic Discriminant Analysis						
	Minimum payment or less than minimum	More than minimum payment	Full payment	Total		
Error rate @ 60	.69	.10	.68	.24		
Error rate @ 90	.81	.04	.68	.16		
Priors	0.17	.11	0.76	.84	0.07	.05

Note: The observations value @60 per cent represented in italic.

Discussion and Conclusion

Malaysian household credit card transaction is increasing as credit card provides the easy loan. Credit cards enable the users to access the credit for consumption, which usually end up having massive debt accumulation. This biased decision making leads the users to financial burden and bankruptcy. Stigler (1961), confirms that information disclosure is the simplest and least distorting policy intervention that facilitates users in making better decision. Therefore, this study analyses the role of information disclosure in influencing credit card user's repayment behaviour. BNM requires credit card issuers to disclose information on the monthly bank statement (e.g., minimum monthly payment, payment due date, statement balance, annual per centage rate (APR), finance charge, finance fee and charges, interest free rate and notice on paying only minimum monthly repayment) to facilitate credit card users to

make repayment decisions. Credit card repayment behaviour is categories into three groups namely; pay minimum or less than minimum, pay more than minimum and pay full payment. Literatures showed that credit card users' behaviour highly influenced by the information stated on the monthly bank statement (Derrien et al., 2016; Navarro-Martinez et al., 2011; Stewart., 2009). The study used Simon's theory – bound rationality related to credit card user's decision based on bounded or limited information. According to bound rationality, human brain is incapable to process the large information and choose the simple-minded solution, however the intrinsic behaviour urges to search new goals which is good enough and lead to achieve high aspiration level.

The empirical findings are based on a survey dataset, 413 completed questionnaires were used for analysis. Data were collected in the northern region of West Malaysia. For estimation purposes, the study used three discriminant analyses to find out the best suited technique conditional with the attribute of the data. Out of three, the Quadratic Discriminant Analysis (QDA) is preferred over other technique based on the error count and unequal covariance matrix criteria as defined by previous literature (Boedeker & Kearns, 2019; Tate, 2010; Fulcomer et al., 1974). Addition to that, the adjusted coefficient discriminant analysis ranked is calculated by utilising the standard deviation of each coefficient. The study found that minimum payment due as the most contributing information disclosure which discriminant amongst the groups, followed by interest free period ranked as second, notice on paying monthly minimum payment at number ranked at third, fees and charges ranked at forth, annual per centage rate ranked at fifth, payment due date ranked at sixth, statement balance and finance charge ranked at seventh and eighth, respectively. The most contributing information disclosure - minimum payment due confirms that each group tends to choose simple-minded solution. Our result are in line with the theory and previous studies which stated that human brain choose the simple-minded solution (Chapman & Johnson, 1999; Stewart, 2009). Intuitively, this study supports the hypothesis 1 which stated that information disclosure influences credit card users' repayment decision. Moreover, credit card user's intrinsic behaviour urged them to reduce the credit card repayment burden, due to that user's endeavour to choose other alternative payment options based on the information disclosure. Classification technique allows us to distinguish between the actual payment group to the alternative (predicted) payment group. The classification is carried out based on the technique of QDA-resubstitution and QDA leave-one-out. The study accepts the result of QDA-resubstitution due to lower error rate .15 compared to .19 from QDA leave-one-out classification. Result obtained from the QDA-resubstitution, 10 observations are correctly classified who pay minimum or less than minimum. However, three (3) observations who pay more than minimum and two (2) classifications who pay full payment are misclassified in this group (who pay minimum or less than minimum). Similarly, 325 observations are correctly classified who pay more than minimum. On the other hand, 32 observations who pay minimum or less than minimum and 15 classifications who pay full payment are misclassified in this group (who pay more than minimum). Likewise, 12 observations are correctly classified who pay full payment. Contrary to that, one (1) observation who pay minimum or less than minimum and 11 classifications who pay more than minimum are misclassified in this group (who pay full payment). In line with bound rationality theory, credit card users face cognitive evaluation and incapability to process the large amount of information disclosure, as a result misclassified in repayment groups. This result support our hypothesis 2 which stated that information disclosure enables the credit card users to be correctly classified into repayment group.

Prediction based on the QDA, may be helpful to improve the repayment behaviour. The study finds out the efficacy of the QDA for the prediction purposes. Owing to that, data are divided into two sets. One part of the data is used for the training set and the other used as a testing set. As the ratio of training set increase from 60 per cent to 90 per cent, the model error rate decrease form .21 per cent to .16 per cent. Hence, the study concluded that forecasting based on the QDA can be useful to predict the future user's repayment error and provide insights to the credit card issuers to improve the credit card repayment behaviour.

Implications

The above findings provide some implications to the Bank Negara Malaysia, local and international credit card banks, and government agencies. The information disclosure enables the stakeholders to understand credit card users' repayment behaviours in Malaysia. Firstly, the finding from this study enables government to understand the strongest predictor which discriminant between the repayment group behaviour based on the information disclosure. Secondly, from the classification result, it is clear that QDA is a better option for the prediction purposes, conditional on the attributes of the data. In addition, the outcome from this study also able to imply the credit card issuers should employ different discriminant technique for prediction to re-evaluate the requirement of granting credit card by taking into consideration of the user's repayment behaviour. In addition, credit card issuers are recommended to carry out awareness campaign (such as: print and mass media, social media etc) to keep up to date the credit card users. This enables to produce a financially healthier and well-informed users related to their repayment behaviour.

Our findings highlight the importance of information disclosure in facilitating credit card repayment behaviour. Hence, such information must be made available to the users in every payment on all platforms. Currently, more users are opting for online banking in dealing with their bill payments. As such, all the relevant information must be made available to users to facilitate their decision making. At present, users are presented with very minimal information when they make credit card repayments online. The regulators need to look into this matter to ensure that users who make online payments are not disadvantaged when it comes to making their repayment decisions.

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References

- Bank Negara Malaysia. (2019). *Credit card*.
<https://www.bnm.gov.my/documents/20124/938039/PD+Credit+Card.pdf>
- Bannier, C. E., Gärtner, F., & Semmler, D. (2019). *Does credit card repayment behavior depend on the presentation of interest payments? The cuckoo fallacy*.
<https://www.qmul.ac.uk/busman/media/sbm/research/researchcentres/behavioural-finance-working-group/Bannier,-G%C3%83%C2%A4rtner-&Semmler-2019,-Does-credit-card-repayment-behavior-depend-on-the-presentation-of-interest-payments.pdf>
- Boedeker, P., & Kearns, N. T. (2019). Linear Discriminant Analysis for Prediction of Group Membership: A User-Friendly Primer. *Advances in Methods and Practices in Psychological Science*, 2(3), 250–263. <https://doi.org/10.1177/2515245919849378>

- Bursztyn, L., Fiorin, S., Gottlieb, D., & Kanz, M. (2018). Moral Incentives in Credit Card Debt Repayment: Evidence from a Field Experiment. *Journal of Political Economy*, 127(4), 1641–1683. <https://doi.org/10.1086/701605>
- Chapman, G. B., & Johnson, E. J. (1999). Anchoring, Activation, and the Construction of Values. *Organizational Behavior and Human Decision Processes*, 79(2), 115–153. <https://doi.org/10.1006/obhd.1999.2841>
- Chong, F. N. (2017a). Factors Affecting Credit Card Debt Payment in Malaysia. *International Journal of Business and Economics*, 16(1), 21–30.
- d’Astous, P., & Shore, S. H. (2017). Liquidity Constraints and Credit Card Delinquency: Evidence from Raising Minimum Payments. *Journal of Financial and Quantitative Analysis*, 52(4), 1705–1730. <https://doi.org/10.1017/S0022109017000412>
- Daniel, A. K. (2014). Avoiding the Anchor: An Analysis of the Minimum-Payment and 36-Month Disclosures Mandated by the CARD Act and How to Improve Cardholder Repayment Patterns. *Texas Law Review*, 93, 1201.
- Fisher, R. A. (1936). The Use of Multiple Measurements in Taxonomic Problems. *Annals of Eugenics*, 7(2), 179–188. <https://doi.org/10.1111/j.1469-1809.1936.tb02137.x>
- Fulcomer, M. C., Schönemann, P. H., & Molnar, G. (1974). Classification by linear and quadratic discriminant scores. *Behavior Research Methods & Instrumentation*, 6(4), 443–445. <https://doi.org/10.3758/BF03200398>
- Gabaix, X., Laibson, D., Moloche, G., & Weinberg, S. (2006). Costly Information Acquisition: Experimental Analysis of a Boundedly Rational Model. *American Economic Review*, 96(4), 1043–1068. <https://doi.org/10.1257/aer.96.4.1043>
- Hamid, F. S., & Loke, Y. J. (2021). Financial literacy, money management skill and credit card repayments. *International Journal of Consumer Studies*, 45(2), 235–247. <https://doi.org/10.1111/ijcs.12614>
- Härdle, W. K., & Hlávka, Z. (2007). *Multivariate Statistics: Exercises and Solutions*. Springer-Verlag. <https://doi.org/10.1007/978-0-387-73508-5>
- Healy, P. M., & Palepu, K. G. (2001). Information asymmetry, corporate disclosure, and the capital markets: A review of the empirical disclosure literature. *Journal of Accounting and Economics*, 31(1), 405–440. [https://doi.org/10.1016/S0165-4101\(01\)00018-0](https://doi.org/10.1016/S0165-4101(01)00018-0)
- Hershfield, H. E., & Roese, N. J. (2015). Dual payoff scenario warnings on credit card statements elicit suboptimal payoff decisions. *Journal of Consumer Psychology*, 25(1), 15–27. <https://doi.org/10.1016/j.jcps.2014.06.005>
- Hirschman, E. C. (1979). Differences in Consumer Purchase Behavior by Credit Card Payment System. *Journal of Consumer Research*, 6(1), 58–66. <https://doi.org/10.1086/208748>
- Iqbal, Z., & Shetty, S. (1994). *A Multivariate Analysis of Employee Layoffs.: EBSCOhost*. <http://web.b.ebscohost.com.proxy.ub.umu.se/ehost/pdfviewer/pdfviewer?vid=1&sid=9726e08c-225d-44a6-92a9-ec6c5d0ccd18%40sessionmgr103>
- Jones, L. E., Loibl, C., & Tennyson, S. (2015). Effects of informational nudges on consumer debt repayment behaviors. *Journal of Economic Psychology*, 51, 16–33. <https://doi.org/10.1016/j.joep.2015.06.009>
- Jørgensen, R. K., & Igel, C. (2021). Machine learning for financial transaction classification across companies using character-level word embeddings of text fields. *Intelligent Systems in Accounting, Finance and Management*, 28(3), 159–172. <https://doi.org/10.1002/isaf.1500>
- Jusoh, Z., & Lin, L. (2012). Personal Financial Knowledge and Attitude towards Credit Card Practices among Working Adults in Malaysia. *Undefined*.

- <https://www.semanticscholar.org/paper/Personal-Financial-Knowledge-and-Attitude-towards-Jusoh-Lin/17aff6d0b196cdc53bf185d22fed3c5e44190b2>
- Keys, B. J., & Wang, J. (2019). Minimum payments and debt paydown in consumer credit cards. *Journal of Financial Economics*, 131(3), 528–548.
<https://doi.org/10.1016/j.jfineco.2018.09.009>
- Loke, Y. J., Yen, S. T., & Tan, A. K. G. (2011). Credit Card Averters and Amassers: Evidence from Malaysia*. *Asian Economic Journal*, 25(4), 397–412. <https://doi.org/10.1111/j.1467-8381.2011.02068.x>
- McHugh, S., & Ranyard, R. (2016). Consumers' credit card repayment decisions: The role of higher anchors and future repayment concern. *Journal of Economic Psychology*, 52(C), 102–114.
- Min, I., & Kim, J.-H. (2003). Modeling Credit Card Borrowing: A Comparison of Type I and Type II Tobit Approaches. *Southern Economic Journal*, 70(1), 128–143.
<https://doi.org/10.2307/1061635>
- Navarro-Martinez, D., Salisbury, L. C., Lemon, K. N., Stewart, N., Matthews, W. J., & Harris, A. J. L. (2011). Minimum Required Payment and Supplemental Information Disclosure Effects on Consumer Debt Repayment Decisions. *Journal of Marketing Research*, 48(SPL), S60–S77. <https://doi.org/10.1509/jmkr.48.SPL.S60>
- Ramayah, T., Ahmed, N. H., Abdul-Halim, H., & Zainal, S. R. M. (2010). Discriminant analysis: An illustrated example. *African Journal of Business Management*.
- Ramayah, T. R., Nasser Noor, N. N., Mohd. Nasurdin, A., & Lim, H. C. (2002). *Cardholders' Attitude And Bank Credit Card Usage In Malaysia: An Exploratory Study*.
<https://core.ac.uk/display/85126825>
- Ringgitplus. (2021). *Credit card see positive growth in Malaysia:9.1 Million credit cards in circulation*. <https://ringgitplus.com/en/blog/credit-cards/credit-cards-see-positive-growth-in-malaysia-9-1-million-credit-cards-in-circulation.html>
- Salisbury, L. C. (2014). Minimum Payment Warnings and Information Disclosure Effects on Consumer Debt Repayment Decisions. *Journal of Public Policy & Marketing*, 33(1), 49–64. <https://doi.org/10.1509/jppm.11.116>
- Salisbury, L. C., & Zhao, M. (2019). Active Choice Format and Minimum Payment Warnings in Credit Card Repayment Decisions: *Journal of Public Policy & Marketing*.
<https://doi.org/10.1177/0743915619868691>
- Selten, R. (1990). Bounded Rationality. *Journal of Institutional and Theoretical Economics (JITE) / Zeitschrift Für Die Gesamte Staatswissenschaft*, 146(4), 649–658.
- Soman, D. (2001). Effects of Payment Mechanism on Spending Behavior: The Role of Rehearsal and Immediacy of Payments. *Journal of Consumer Research*, 27(4), 460–474.
<https://doi.org/10.1086/319621>
- Stavins, J. (2018). *Credit Card Debt and Consumer Payment Choice: What Can We Learn from Credit Bureau Data?* Federal Reserve Bank of Boston.
<https://www.bostonfed.org/publications/research-department-working-paper/2018/credit-card-debt-and-consumer-payment-choice.aspx>
- Stewart, N. (2009). The Cost of Anchoring on Credit-Card Minimum Repayments. *Psychological Science*, 20(1), 39–41. <https://doi.org/10.1111/j.1467-9280.2008.02255.x>
- Stigler, G. J. (1961). The Economics of Information. *Journal of Political Economy*, 69(3), 213–225.

- Tabachnick, B. G., & Fidell, L. S. (2013). *Using Multivariate Statistics*.
<https://www.pearson.com/us/higher-education/product/Tabachnick-Using-Multivariate-Statistics-6th-Edition/9780205849574.html>
- Tate, R. L. (2010). Generalized Discriminant Analysis: Some Illustrations. *Multivariate Behavioral Research*. https://doi.org/10.1207/s15327906mbr1801_6
- The Malaysian Reserve. (2019). *Credit cards, personal loans landing Malaysians in debt trap*.
- Theong, M. J., Osman, A. F., & Yap, S. F. (2018). Household Indebtedness: How global and Domestic Macro-economic Factors Influence Credit Card Debt Default in Malaysia. *Institutions and Economies*. <https://ijie.um.edu.my/index.php/ijie/article/view/11949>
- Wall, K. D. (1989). A BOUNDED RATIONALITY DECISION PROCESS MODEL. *IFAC Dynamic Modelling and Control of National Economics, Edinburgh*.
- Wei, C.-Y., Chin, L.-K., Kuah, Y.-C., & Chia, M.-S. (2018). ATTRIBUTES OF ACADEMICIANS' CREDIT CARD USAGE BEHAVIORS IN MALAYSIA. *Journal of Contemporary Issues and Thought*, 8, 73–85. <https://doi.org/10.37134/jcit.vol8.8.2018>
- Wheeler, G. (2020). Bounded Rationality. In E. N. Zalta (Ed.), *The Stanford Encyclopedia of Philosophy* (Fall 2020). Metaphysics Research Lab, Stanford University. <https://plato.stanford.edu/archives/fall2020/entries/bounded-rationality/>
- WorldBank. (2019). *Malaysia economic monitor: Making ends meet*. <https://openknowledge.worldbank.org/handle/10986/32810> License: CC BY 3.0 IGO

Appendix

Table 112: Group Covariance Matrices

	Payment due date	Statement balance	Minimum payment due	Annual percentage rate (APR)	Fees and charges	Interest free period	Finance charges	Notice on paying only minimum monthly repayment
Payment due date	0.6157							
Statement balance	0.2746	0.3123						
Minimum payment due	0.3389	0.1534	0.4352					
Annual percentage rate (APR)	0.4313	0.1124	0.3367	0.7874				
Fees and charges	0.3981	0.2398	0.2730	0.3389	0.5581			
Interest free period	0.3876	0.2364	0.2746	0.4230	0.2990	0.5105		
Finance charges	0.3228	0.1872	0.2874	0.2270	0.3837	0.2829	0.4707	
Notice on paying only minimum monthly repayment	0.4662	0.2287	0.2547	0.4607	0.3848	0.4485	0.3256	0.5891

Pay more than minimum payment

	Payment due date	Statement balance	Minimum payment due	Annual percentage rate (APR)	Fees and charges	Interest free period	Finance charges	Notice on paying only
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								minimum monthly repayment
Payment due date	0.3920							
Statement balance	0.3195	0.4927						
Minimum payment due	0.3254	0.3211	0.5045					
Annual percentage rate (APR)	0.2705	0.2384	0.2621	0.5532				
Fees and charges	0.2714	0.2899	0.2958	0.3140	0.5683			
Interest free period	0.2330	0.2609	0.2579	0.3336	0.3258	0.4936		
Finance charges	0.2952	0.3255	0.3374	0.3564	0.4473	0.3436	0.6214	
Notice on paying only minimum monthly repayment	0.2538	0.2965	0.2817	0.3548	0.3392	0.3561	0.4070	0.5202

Pay full payment

	Payment due date	Statement balance	Minimum payment due	Annual percentage rate (APR)	Fees and charges	Interest free period	Finance charges	Notice on paying only minimum monthly repayment
Payment due date	1.2783							

Statement balance	0.5973	1.3202						
Minimum payment due	0.8288	0.4741	1.4212					
Annual percentage rate (APR)	0.8645	0.6884	1.3140	1.6355				
Fees and charges	0.4667	0.9200	0.5690	0.7475	1.118 2			
Interest free period	1.1441	0.8707	1.2131	1.3202	0.809 1	1.743 8		
Finance charges	0.8337	0.7426	0.8448	1.0591	0.805 4	1.259 9	1.455 7	
Notice on paying only minimum monthly repayment	0.7315	0.4754	0.9828	1.1613	0.577 6	1.020 9	0.959 4	1.3645