Determinants of Consumer's Debt Repayment Patterns

Scoring systems have been widely used by creditors to predict consumers' credit risk. However, few empirical studies have examined the validity of the model adopted in many scoring systems. Using the 1995 Survey of Consumer Finances, a multivariate logistic regression analysis revealed that households headed by people who are younger, with a lower annual income, nonwhite, unmarried, with more children, renters, short-term planners, and larger *total debt/total assets* ratio are more likely to have debt payment difficulties.

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Introduction

Since the new bankruptcy law was enacted in 1979 (Luckett, 1988), the number of personal bankruptcy filings has continued to rise sharply. Consumer debt is usually a large part of consumer's total outstanding debt. To cope with losses, some credit issuers have tightened their standards to reduce the potential risk. More credit companies have adopted credit-scoring systems to help evaluate if a credit applicant is qualified to get credit. This is an effective way for creditors to prevent major losses. Although credit-scoring systems are widely used in the credit industry, there are few empirical studies to examine if the mathematical model is valid and effective when being used to predict a person's ability to handle debt. The variables and weight used in the model are decided largely on creditors' experience or common sense without any theoretical support. Therefore, to improve the effectiveness of credit-scoring models, the purpose of this study is to reexamine factors identified in previous research that are related to debt repayment patterns.

Literature Review

How to better predict and evaluate credit risk has drawn much attention from researchers. Studies using the Survey of Consumer Finances (SCF) data have established an excellent foundation. Sullivan and Fisher (1988) examined the relationship between a set of socio-economic variables and consumer's credit risk by using univariate analysis. They found that those with payment difficulties were likely to be aged 45 to 54, with lower levels of education, female, unmarried with children, or renters. Further, the univariate analysis revealed that income and credit risk were only marginally related. Regardless of the level of income, the amount of liquid assets was negatively related with payment difficulties. The ratio of total debt to income was inversely related to debt payment difficulties. The ratios of *consumer debt to income, monthly mortgage payment to income*, and *monthly consumer debt payment to income* were positively related to debt payment difficulties. The number of credit cards was inversely related with debt payment difficulties.

Canner and Luckett (1990) pointed out that the univariate approach is unable to fully account for the interrelationships among variables such as income, age and education. Therefore, to more precisely reflect the relationship among the socioeconomic variables, they employed the multivariate technique of logit analysis. They found that some of the variables that were significant in univariate analysis were not significant in a multivariate approach. The important findings of their study were: the credit turndown history was the most significant predictor of debt payment difficulties; family size was positively related with debt payment difficulties; and white people were less likely to have debt payment difficulties than other racial groups. But, in contrast to previous studies, household income, amount of liquid assets, and the ratio of *debt payment to income* were not significant. The authors explained that the rather weak explanatory power of these variables was probably due to the fact that creditors have already done a competent job of accounting for income in the loan approval process.

Canner and Cyrnak (1986) used a multivariate logistic regression to discriminate between convenience users and installment users. The dependent variable was the same as in the studies mentioned above, consumers' repayment patterns. In their model, independent variables included: family income, ratio of monthly debt payment plus monthly rent payments for non-homeowners to monthly income, ratio of liquid assets to family income, education level of household head, age of household head, race, and an interaction term for race and income. More

important, Canner and Cyrnak (1986) included the attitudinal variable, which was a sum of positive answers to nine questions about possible reasons for borrowing. The findings of their studies were consistent with previous studies. Income, ratio of *non-credit installment debt and rent payments to income*, ratio of *liquid assets holdings to income*, age and race were significant. The attitudinal variable proved to be one of the most powerful predictors in the model. The more positive attitude toward credit meant that respondents were more likely to be installment users.

Some researchers with psychological backgrounds have also explored the effect of some psychological factors on consumers' payment behaviors. Lea, Webley and Walker (1994) found that debtors were more likely to believe that they had less money than their friends, relatives and people at work, more likely to report missing appointments, more likely to have poor money management skills, and less likely to possess durable goods. However, consumers' attitude toward debt did not differ significantly among consumer groups with different payment patterns, which was in contrast to the results obtained in their previous studies and by some other researchers.

Livingstone and Lunt (1992) in Great Britain used discriminant function analysis to discriminate consumers with personal debt and those who were not in debt. They argued that "discriminant function analysis provides the most parsimonious linear description of the underlying differences between categorical groups". Based on the discriminant analysis, some variables were selected and used in the subsequent multivariate regression analysis. They found that consumers' social class and external locus of control were most powerful in predicting debtors and non-debtors. Contrary to previous studies conducted in the United States, no other socioeconomic variables were significant in their study, such as number of children at home, disposable income, and education.

Although many previous studies have examined the consumer debt problem from different perspectives and with different statistical methods, their findings are not consistent with each other. In addition, no convincing explanation was given for the inconsistency. The actual relationship between consumers' debt payment patterns and those socioeconomic factors are still unknown. In addition, no study has taken into account all of the possible relevant variables simultaneously. Also, some of the previous studies used the SCF data while others collected data. The differences in the samples could be one of the reasons that their findings were not always consistent. Economic and social situations have changed a lot in the US since the 1980s and it can be expected that consumers' attitude, behaviors, and economic conditions may have also changed. Therefore, it is important to reexamine and further investigate this issue with the latest information available from the 1995 SCF data.

The current study differs from previous studies in the following ways. First, consumers' credit history was not included because whether respondents have been turned down or not in the previous years is more the effect of their paying habit instead of the cause of their paying habit. Therefore, it is inappropriate to use respondents' credit history to predict paying habit. Second, consumers' attitude toward credit is measured differently from previous studies. Many previous studies have used the sum of the questions (i.e., a scale) about specific attitudes toward credit, however, no reliability and validity of this scale has been reported. Because of this, only respondents' general attitude toward credit was used in this study.

Finally, when measuring consumers' debt burdens, some previous studies have used total debt, total liquid assets, and total assets. However, consumers' debt burden cannot be fully reflected by just looking at one side of their balance sheet. A higher amount of debt may not necessarily indicate a heavier debt burden because the consumer may have a higher income or larger amount of assets. To more accurately measure consumers' debt burden, both consumers' debt and their financial status should be considered, such as households' net worth and all types of financial ratios. Also, it has been argued that it is inappropriate to look at total debt to yearly income in assessing consumer debt capacity because the individual does not repay total debt within one year (Apilado and Morehart, 1980). Three variables were used to measure respondents' debt burdens: net worth (total assets minus total liabilities), *liquid assets/total debt* ratio, and *total debt/total assets* ratio.

Methodology

Data

The 1995 Survey of Consumer Finances is the most recent national survey data available that provides detailed and complete information about consumers' financial situations in the United States (Kennickell, 1997). It has been widely used by researchers in this area and has proven to be a reliable and efficient way to gather information. The survey included 4,299 households. The data set contains 5 implicates to allow for variance in imputing missing data. To handle the huge data set more easily, only the first implicate was extracted and used for the current study.

Statistical Analysis

Dependent Variable

The dependent variable was consumers' payment patterns according to the answer to the question, "Now thinking of all the various loan or mortgage payments you made during last year, were all the payments made the way they were scheduled, or were payments on any of the loans sometimes made later or missed?". There were three responses: "always pay debt as scheduled", "sometimes got behind or missed payments", and "inappropriate". The dependent variable, respondent's paying habit, was coded as 1 if respondents' answer was "always pay debt as scheduled" and 0 if "sometimes got behind or missed payments". Among the 4299 observations, 1,584 were deleted because the response was "inappropriate". The study was based on the remaining 2,715 households. The descriptive statistics reported in sample description were weighted to represent the population of the United States.

Independent Variables

The independent variables were classified into five categories: demographics, economics, attitudinal, financial management, and debt burden variables. The demographic variables consisted of: education, gender, age, job tenure, race, marital status, homeownership, family size, and number of children in the household. Economic variables included family's annual income and if the respondents were regularly paid or not. Debt burden variables included the ratio of *monthly debt payment to income,* the ratio of *liquid assets to total debt*, the ratio of *total debt to total assets,* and net worth. Attitudinal variables included respondents' general attitude toward credit as measured by their answer to the question, " In general, do you think it is a good idea or a bad idea for people to buy things on the installment plan?" A positive attitude was defined if the response was "a good idea". A neutral attitude was defined if the answer was "good in some ways and bad in some ways" and a negative attitude was defined if the answer was "a bad idea". Two variables were selected to measure respondents' financial management: (a) "In planning your saving and spending, which of the time periods listed on this page is most important to you?" and (b) "Do you usually have a good idea of what your next year's income will be?". See Table 1 for the coding of variables.

A correlation analysis showed that family size was highly correlated with both the number of children in the household and the marital status of the household head. Therefore, family size was dropped from the model. In addition, the gender and marital status of the household head were highly correlated and the gender variable was dropped. For households with married couples, the male was always defined as the household head.

First, t-tests and chi-square tests were conducted for all continuous and categorical variables respectively to give a preliminary analysis of the data. Then, a multivariate logistic regression analysis was used in this study to further explore the relationship between consumers' repayment patterns and a set of socioeconomic, attitudinal, and financial management factors simultaneously. "Logit analysis considers the influence of a number of explanatory variables simultaneously, and generates mathematical coefficients that reflect the separate impact of each given variable, holding the values of the other variables constant" (Canner and Luckett, 1990).

Sample Description

About 75.4% reported that they always paid their debt as scheduled while 24.6% reported that they missed some payments or paid their debt late in the past few years. On average, household heads were 44.4 years old and had completed 13.35 years of education. There was less than one child per household. The average job tenure was 7.6 years. About 8.6% of households had a yearly income above $100,000. Seventy nine percent of the households were headed by white people and 62.8% of household heads were married. Sixty seven percent of households were homeowners. Only 4.2% of household heads were regularly paid, which is smaller than expected. About one-third of household heads held a negative, neutral, or a positive attitude toward credit, respectively. Seventy-two percent of household heads were usually able to predict next year's income. The median net worth for all households was $67,595. The average for the *total debt/total assets* ratio was 0.45 while the median was 0.33. The average for the *liquid assets/total debt* ratio was 665.04 while the median was 0.05. The large gap between the mean and median of those financial figures reflects the unevenly distributed wealth in the sample.

Results of Preliminary Tests

Before doing the logistic regression analysis, the sample was divided into two groups, respondents with good and poor paying habits. T-tests and Chi-square tests were conducted for continuous and categorical variables, respectively, to examine if the variable selection and classification are successful. On-time payers had a longer job tenure, smaller number of children in the household, larger amount of net worth, larger *liquid assets/total debt* ratio,

and smaller *total debt/total assets* ratio. Chi-square analysis revealed that the two groups significantly differed in their age, education level, race, marital status, homeownership, income, whether regularly paid, plan for saving and spending, and the ability to predict next year's income.

Table 1. Coding of Variables for Logistic Regression Model.

Variables	Coding Scheme	
Dependent Variable		
Debt payment pattern	1=always pay debt as scheduled	0=otherwise
Independent Variables		
Demographic Variables		
Age		
< 35 years	1=yes	0=otherwise
35 - 44 years	1=yes	0=otherwise
45 - 54 years	1=yes	0=otherwise
> 54 (reference)		
Education level		
below high school	1=yes	0=otherwise
high school diploma	1=yes	0=otherwise
some college	1=yes	0=otherwise
bachelor degree	1=yes	0=otherwise
graduate school (reference)		
Race	1=white	0=otherwise
Marital status	1=married	0=otherwise
Number of children	continuous	
Homeownership	1=home owner	0=otherwise
Job tenure	continuous	
Economic Variables		
Income		
< $ 25000	1=yes	0=otherwise
$25000 - $50000	1=yes	0=otherwise
$50000 - $75000	1=yes	0=otherwise
$75000 - $100000	1=yes	0=otherwise
>$100000 (reference)		
Regular pay	1=paid regularly	0=otherwise
Attitudinal Variables		
General attitude toward credit		
positive attitude	1=yes	0=otherwise
neutural	1=yes	0=otherwise
negative (reference)		
Money Management		
Plan for saving & spending		
next few months	1=yes	0=otherwise
next year	1=yes	0=otherwise
next few years	1=yes	0=otherwise
next 5 - 10 years	1=yes	0=otherwise
longer than 10 years (reference)		
Usually predict next year's income	1=can predict	0=otherwise
Debt Burden		
Net worth	continuous	
Liquid assets/total debt	continuous	
Total debt/total assets	continuous	

Results of Logistic Regression

As the dependent variable, "respondents' paying habit", is coded as a dummy variable, it is appropriate to use the multivariate logistic regression for the analysis. The results are presented in Table 2.

The findings of the logistic regression can be summarized as follows. When controlling all the other variables, compared with households headed by someone 55 and over, households headed by people younger than 35, 35 to 44, and 45 to 54 are 34.5%, 35.3% and 36.3%, respectively, less likely to pay their debt on time. Households headed by white people are 69.7% more likely to pay their debt on time when compared with non-white households. Households headed by married people are 61.4% more likely to pay their debt on time in comparison to households headed by a non-married person. When the number of children in the household increases by 1, the probability of paying debt on time will decrease by 21.7%. Compared with renters, households owning their houses are 84.9% more likely to pay their debt on time. Compared with households with more than $100,000 yearly income, households with a yearly income less than $25,000, $25,000 to $50,000, $50,000 to $75,000, and $75,000 to $100,000 are 77.5% , 74.6%, 68.3% and 65%, respectively, less likely to pay their debt on time. Long-term planning had an important effect on paying debts on time although there was not a linear effect between planning and the amount of time specified. When compared to households planning for saving and spending for 10 years, all

other groups were less likely to pay on time. When the *total debt to total assets* ratio of a household increases by 1, the probability of paying debt on time will decrease by 21.9%. In addition, it is also worth mentioning that the variable measuring if respondents' ability to predict next year's income was almost significant with a P-Value of 0.0526. With a lower confidence level, households who can usually predict next year's income are 26.2% more likely to pay their debt on time.

Table 2. Results of Logistic Regression. (N=2715).

Variables	Parameter Estimate	P-Value		Odds Ratio
Age1(<35)	-0.4230	0.0296	*	0.655
Age2(35-44)	-0.4361	0.0268	*	0.647
Age3(45-54)	-0.4514	0.0154	*	0.637
Reference (>54))				
Edu1 (below high school)	-0.1333	0.5781		0.875
Edu2 (high school diploma)	-0.1093	0.5796		0.896
Edu3 (some college)	-0.0615	0.7560		0.940
Edu4 (bachelor degree)	0.2322	0.2678		1.261
Reference (graduate school)				
White	0.5286	0.0001	***	1.697
Marital Status	0.4789	0.0002	**	1.614
No. of Children	-0.2451	0.0001	***	0.783
Homeowner	0.6148	0.0001	***	1.849
Job Tenure	0.0044	0.5269		0.996
Income1(<$25,000)	-1.4934	0.0001	***	0.225
Income2($25,000-$50,000)	-1.3721	0.0001	***	0.254
Income3($50,000-$75,000)	-1.1487	0.0001	***	0.317
Income4($75,000-$100,000)	-1.0488	0.0006	**	0.350
Reference (>$100,000)				
Pay Regularly	0.3705	0.1554		1.448
Credatt1 (positive attitude)	0.1486	0.2860		1.160
Credatt2 (neutural attitude)	0.0146	0.9153		1.015
Reference (negative attitude)				
SavingPlan1(next frew months)	-0.6297	0.0022	*	0.533
SavingPlan2(next year)	-0.4515	0.0289	*	0.637
SavingPlan3(next few years)	-0.5835	0.0048	*	0.558
SavingPlan4(next 5-10 years)	-0.0454	0.8097		0.956
Reference (longer than 10 years)				
Predict Income	0.2328	0.0526		1.262
Net worth	0.0000	0.2542		1.000
LiquidAssets/Debt	0.0000	0.3652		1.000
Debt/Assets	-0.2468	0.0069	*	0.781
Intercept	2.2473			

* P<0.05   ** P<0.01   *** P<0.001

Discussion and Conclusions

Consistent with the hypotheses, households headed by people who were younger, had a lower annual income, nonwhite, unmarried, have more children, renters, short-term planners, had a larger *total debt/total assets* ratio were more likely to have debt payment difficulties. However, several hypotheses were not supported by the findings. Respondents' attitude toward credit, education level, job tenure, whether people were paid regularly or not, net worth, and *liquid assets to total debt* ratio were not significant in this study. It is not surprising to find that consumers' attitude toward credit was not significant as this variable was not significant in the chi-square test. The attitudinal variables in studies using the SCF data have not been significant. They were reported significant only in the studies done by Lea, Webley and Walker (1995) and Livingstone and Lunt (1992), where self-developed scales were used to measure consumers' attitude toward credit. Therefore, it can be argued that the reliability and validity of the scale measuring respondents' credit attitude in the SCF is in question and one should be cautious in drawing a conclusion about this variable. Further analysis is needed to examine the reliability and validity of this scale.

Among all the variables measuring respondents' debt burdens, *the total debt/total assets* ratio turned out to be the best predictor in this study. However, respondents' *monthly debt payment to monthly income* ratio was not included in this study due to the relatively large amount of missing data. Although it has been recommended as a good predictor theoretically, it was not significant in the study done by Canner and Luckett (1990), where the 1983 SCF data was used. The way they calculated the *debt payment to income* ratio was not disclosed in their paper. Therefore, it is hard to say whether the non-significance is due to calculation errors or some other reasons. It may be useful to reexamine this model with other data sets. Canner and Luckett (1990) found that liquid assets/total debt was significant, a variable that was not in the current study. In addition, the only significant variable in this study

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that measured respondents' debt burden, the *total debt/total assets* ratio, was not included in Canner and Luckett's model. Therefore, it was hard to compare the results of their research with the current study.

Implications

The findings of this study provide some implications for credit issuers. First, this study has given empirical evidence about which factors can significantly influence consumers' paying habit. Consumers' age, household income, race, marital status, number of children in the households, homeownership, the length of time planning for saving and spending, the ability to predict next year's income, and the total debt/total assets of households were the most important factors according to this study. Therefore, creditors can improve the predicting power of the model used in their credit scoring systems by deleting some irrelevant factors and adding some more important factors. In addition, according to the significance level of each factor, creditors can adjust the weight given to each factor in their credit scoring system. A well-designed scoring system will obviously make credit evaluation more efficient, reliable, and accurate. It will ultimately help reduce credit risk and at the same time increase profit by being able to select the best customers. However, consumers' paying habit is a very complicated issue. Besides the factors studied in the current studies, Lea, Webley and Walker (1995) have shown that some psychological factors can also influence consumers' paying habit. However, for creditors, some information, such as consumers' planning for saving and spending, ability to predict next year's income, and consumers' psychological characteristics, are not readily available and they are difficult to measure and collect. Therefore, there is still some gap between empirical studies and the practices in the real life.

Limitations

The sample size in this study was 2,715. Therefore, one should be cautious to generalize the conclusions drawn from this study to the general population. The variables selected in the model are restricted by the information provided by the data set. Although some previous studies have revealed that psychological factors were also important determinants of consumers' repayment patterns, the information was not available in the data set. Also, race of household heads is an important factor in predicting consumers' paying habit. A simple comparison between white people and all other minority groups is not enough. It would be helpful if the SCF could oversample minority households in the future so that more valuable information about minority groups can be available to researchers. Moreover, consumers' residence tenure is widely used in credit scoring systems as an important factor to predict consumers' credit risk and previous studies have found it has a significant influence on consumers' paying patterns. However, this information is not available in the SCF data. Because of all the limitations mentioned above, future study is needed to reexamine the findings of this study by including more explanatory variables.

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Endnotes

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