

An empirical investigation of payment performance for consumer loans in Turkey

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Abstract

This paper explores the relationship between consumer credit clients' payment performance and some demographic and financial variables. Data to examine this relationship is obtained from the customer records of a private bank in Turkey. A logistic binary regression is used to evaluate the data. Financial variables rather than the demographic characteristics of clients have significant influence on customers' pay back performance. Thus, the longer the maturity time and the higher the interest rate, the higher the credit payment performance risks. Accordingly, banks and other financial institutions may minimize the credit payment performance risk by adjusting the financial instruments such as the interest rate and the maturity time.

Keywords: Credit, consumer, banks, payment performance risk, Turkey.

JEL classifications: G20, G21.

1. Introduction

In today's world, most individuals, firms, and countries get financial support through the assistance of the financial institutions. For that, the effective credit lending policies and the proper risk management become the key factors of success in the financial market (Smith, 1957). As one of the most important financial institutions, a bank has basically six functional responsibilities associated with its credit lending activities; (1) assessment of the customers' credit history, (2) making the credit granting decision (such

as a decision about to whom the credit will be given and for how long), (3) checking the loan payments and inform/ warn customers in case of payment performance or bad debt, (4) monitoring customer behavior and compiling management information, (5) bearing the risk of payment performance or bad debt, (6) financing the investment in debtor (Summer and Wilson, 2000).

The current study aims to explore the fourth credit lending activity; specifically it focuses on investigating the factors that may influence consumer loan/credit payment behavior. This is the first attempt to explore the credit payment situation in Turkey and hopefully will initiate further studies on credit lending to collect information for the financial institutions, particularly the banks. We expect that the information about the characteristics of the individuals that have not paid their loans/credits on time might help banks to evaluate alternative lending policies and to minimize the credit payment performance risks. Further, it might also contribute to constituting the credit- scoring models¹ for some consumer credit² types such as home loans, car loans, and individual support loans.

The contribution of the present paper to the current literature on payment performance risk for the consumer loans is important for three reasons. First, most of the previous studies have focused on the relationship between lenders' decision and the characteristics of the consumer *credit applicants* (e.g., Jappelli, 1990; Roszbach, 2004), however little attention has been paid to find out the relationship between payment performance of the consumer *credit clients* and their characteristics. It is, of course, important to investigate the effect of the characteristics of consumer credit applicants on the decision of the bank with respect to whether it accepts (then the *applicant* becomes the *client*) or rejects to give the credit. However, it is equally significant to obtain information about the relationship between the characteristics of the individuals that are already accepted for being granted a credit (credit clients) and whether they are paying back their loans on time or not i.e. their payment performances. To some extent, the second is kind of testing whether the decision of accepting/rejecting (or the credit decision-making criteria) the applicants' granting credit is the right one or not.

Second, different from the previous literature that mostly focus on the effect of demographic variables (such as age, gender, income, and education), we additionally determine the effects of some financial variables

¹ See Vojtek and Kocenda (2006) and Guillen and Artis (1992) for more information on credit scoring.

² For a detailed definition of consumer credit see Holthause (1952). There are many studies on the liquidity constraint problem that is the starting point of why consumers need credits (Hall and Mishkin, 1982; Hayashi, 1985; Mariger, 1987; Zeldes, 1989; Jappelli and Pagano, 1994; Jappelli and Fissel, 1990).

(such as principal, interest rate, maturity, credit category) on consumers' payment performances. We believe that financial variables might be the driving factor that eases on-time payments for a bank that operates in a very dynamic financial environment.

Lastly, as a reaction to an increasing competition and bankruptcies, banks all over the world are trying hard to improve the process of loan origination in corporate banking. Practitioners estimate that improvements in risk management can decrease credit losses by 20% to 40%. In fact, by ranking customers according to predicted payment performance probabilities, a bank might have a chance to minimize the expected payment performance or misclassification rate subject to some exogenous acceptance rule (Carling, Jacobson, and Roszbach, 1998). It is important to note that Turkish financial environment is not very stable in terms of credibility, interest rates, and currency rates. In fact, while in June 2001 Turkey has been announced as a risky country by S&P in terms of credibility, in January 2001 Turkey's credibility mark was B+. In addition, consumer credit is a new concept for Turkish financial market³ and insufficient credit granting mechanism and competition in Turkish credit market force banks to make credit-granting decision really fast, usually in a day. As a result, finding the ways of improving the credit risk management of the Turkish banks is a research area that needs to be explored more.

The following section gives a brief review of related previous research. Then, the conceptual model used in this study is presented followed by the explanations of the data, the methodology, and the statistical analysis. Finally, in the last section, conclusions and suggestions for further research are discussed.

2. Related literature

The previous literature on consumer credit can be classified in two: the studies on consumer credit *applicants* versus the studies on consumer credit *clients*. Most of the studies focus on scrutinizing and improving the rejection and acceptance criteria of credit lenders' decisions. Jappelli (1990), for example, investigated the credit market in United States in 1983. He found that most of the applicants were rejected⁴ because of their credit history, their age, or their income level. The amount of collateral, which is a property offered by borrowers to secure a loan in case of delinquency, was found to be another important factor affecting credit-granting decision. Among the less influential factors were time spent at current job, time spent at current address, job, type of work, family size, gender, and race.

³ See www.kkb.com.tr for more information about the Turkish financial market.

⁴ Rejected applicants are defined as individuals who have at least one rejected credit request.

Crook (1996) replicated Jappelli's study (1990) with 1989 data. Consistent with his results, he found that the probability of households being credit constrained was negatively related to family income, age, and saving of the household. However, unlike Jappelli, the education level of the head of the household was found to have a significant negative effect on credit constraint probability.

Jacobson and Roszbach (2003) built a statistical model in order to measure the risk of sample loan portfolio. They found that income did not affect credit-granting decision. In addition, while being male significantly decreased the probability of getting a loan/credit, being homeowner increased this chance.

Although, many studies have evaluated the lenders' decisions on granting loans to credit *applicants*, only two main studies investigated the relationship between the effect of the characteristics of credit *clients* on their payment performances (whether they pay back their loans on time or not). Sexton (1977), for example, analyzed the credit risk in United States for: (i) low-income families; (ii) high-income families. The aim of his study was to find out whether or not the variables associated with good credit risks among high-income families were similar to those for low-income families. The logistic binary regression was used to analyze the data collected from 4119 families' records, where the dependent variable was categorized as a good loan and a bad loan. The results indicated that married couples and homeowners had tendency to pay their loans on time (good loan). In addition, credit payment performance risk was found to decrease as income and age of the clients increased.

Carling, Jacobson, and Roszbach (1998) examined the Swedish consumer credit clients' payment performance. According to their study, married applicants had tendency to pay back their loans faster. A possible reason might be the existence of two wage earners in the Swedish families, which might lead to a stable flow of income. Alternatively, it could reflect the fact that married couples are simply more diligent. A negative relationship was found between income and credit payment performance risk. In addition, while the size of the credit limit was found to have no influence on payment performance, the loan size was found to delay repayment. Thus, accordingly, "bigger loans mean longer pay-back periods, but the amount of already outstanding loans does not affect duration".

The current study is the first attempt to investigate the effects of both the demographic characteristics of the customers and the financial variables on the payment performance of consumer credit clients of a bank in a developing country, Turkey. For this purpose, we used the data obtained from one of the biggest banks in the country that consists of financial and demographic information about 580 credit clients in Istanbul, who were granted a loan between 1999 and 2001.

3. The conceptual model

We constructed a conceptual model to explain the relationship between consumer credit clients' payment performance⁵ and loan type, interest rate, gender, age, marital status, income, principal, maturity, residential status and occupation. The equation of the model is as follows:

$$PP = \beta_0 + \beta_1 CT + \beta_2 IR + \beta_3 G + \beta_4 A + \beta_5 MS + \beta_6 I + \beta_7 P + \beta_8 M + \beta_9 RS + \beta_{10} O + \text{Error term} \quad (1)$$

PP= Payment performance (on time payment or late payment)

CT= Credit or loan type such as home loan, car loan, individual support loan.

IR= Interest rate

G= Gender of the credit client (male or female)

A= Age of the credit client

MS= Marital status of the client (single or married)

I= Income of the credit client

P= Principal

M= Maturity time of the loan

RS= Residential Status (renter/company's house or owner)

O= Occupation of the credit client (fixed income, non fixed-income, employed/housewife)

4. Hypotheses

The hypothesis for each independent variable to express our expectations about the relationship between each independent variable and the pay back performance i.e. whether the payment is on time or not, are explained below into two categories:

4.1. Hypotheses related with the characteristics of the credit

Hypothesis 1: Intuitively, the longer the maturity, the higher the risk for clients not paying their loans on time due to the difficulty of forecasting the financial well being of creditors over a long period of time.

Hypothesis 2: Intuitively, the higher the interest rate, the higher the installment size that the client has to pay back so the higher the risk for clients not paying their loans on time.

Hypothesis 3: Consistent with Carling et al. (1998), loan size (principal) affects repayment delay positively.

⁵ It is important to note that the dependent variable is a binary variable meaning that it has only two possible values for on time payment, 0, and late payment, 1. Further, "on time payment" is considered to be the situation when the loan is never repaid late, whereas "late payment" is the case when at least one installment is paid not on time or late.

4.2. Hypotheses related with demographic characteristics of the borrower:

Hypothesis 4: Older people have less credit payment performance risk (less tendency to pay their loans late) due to their precautionary motives (Sexton, 1977).

Hypothesis 5: According to Carling et al. (1998) and Sexton (1977), married clients have higher tendency to pay their installments on time.

Hypothesis 6: According to Carling et al. (1998) and Sexton (1977), income and clients' paying their loans on time are positively related to each other.

Hypothesis 7: Intuitively, fixed income earners tend to pay back their loans on time more than others do.

Hypothesis 8: According to Sexton (1977), homeowners have less credit payment performance risk (less tendency to repay their loans late) than non-homeowners do. One possible reason can be that their houses are considered as collateral, in case of not being able to repay their loan.

5. Data

Data used to explain the relationship between credit loan payments and some financial and demographic variables were obtained through consumer credit records of one of the biggest Turkish private banks. In order to preserve confidentiality, client's personal information and name of bank are not stated in this research. The dataset consists of 580 individuals from Istanbul who were granted a loan between the years 1999 and 2001 by a private bank. When monitored on January 15, 2001, the loans were either still paying regular installments, interest or had been amortized completely. Turkish Lira credits rather than the foreign currency credits were selected considering the high fluctuations of currency rates and commission-oriented credits. Our data contains credits which are repaid monthly with installments that are constant along the payback period.

6. Empirical results

Our dataset mostly contains on time paid loans (59 percent of the loans). Independent variables are grouped into two categories; demographic variables regarding the clients' characteristics such as age, income, marital status, residential status, occupation and gender; and financial variables regarding the credit characteristics such as principal, maturity, loan type and interest rate. In order to test the model that explains the relationship between consumer credit clients' payment performance and financial and demographic variables, we code the categorical variables in the model such as residential status, occupation, gender; payment performance, marital status, and loan type are presented in Table 1.

Table 1
Coding of the Categorical Variables

Client's Payment Performance	Late payment=1, On time payment=0
Client's Residential Status	Renter/Company's house=1, Owner=2
Client's Marital Status	Single=1, Married=2
Client's Gender	Male= 1, Female=2
Loan Type	Individual support loans=1, Car loans=2, Home loans=3
Client's Occupation	Fixed-income earner =1, non fixed-income earner=2, Unemployed/housewife=3

The descriptive statistics of the continuous variables are presented in Table 2. For demographic characteristics of the sample, the average age of the clients is 37.5 (minimum 19 and maximum 68). The average income⁶ is around 800 YTL (minimum 100 YTL and maximum 5000 YTL). Further, average principal is around 2600 YTL (minimum 100 YTL and maximum 44215 YTL) and average maturity is 15.485 months that varies from 5 to 60 months. With the effect of inconsistent political and economic environment, 64 percent of the loans are short-term credit; payback period is less than 12 months and 36 percent of the loans are categorized as long-term credits. The annual interest rate varies from 24 percent (2 percent monthly) to 108 percent (9 percent monthly), depending on the type of credit, maturity, and the loan size.

Table 2
Descriptive Statistics of Continuous Variables

	Number of observations	Minimum	Maximum	Mean	Standard Deviation
Income (monthly, YTL)	576	100	5000	798.883	810.88
Interest Rate (annually, in percentages)	580	24	106.8	46.2	14.16
Age	580	19	68	37.5	10.69
Maturity (months)	579	5	60	15.485	7.77
Principal (YTL)	580	100	44215	2557	4012.9

Notes: Monthly income is adjusted to the inflation rate. Maturity time is reported in terms of months. Annualized interest rate on the loans is reported. The highest 2 and the lowest 2 observations for income are treated as missing values regarding the box plot of the data. One observation on maturity is "1 month" which can be counterintuitive so is not included in the analysis.

For the frequencies of the categorical variables, 68 percent of the credit clients in the data are married (397 clients out of 580), 52 percent of

⁶ Inflation rate is taken into account for income variable.

them are homeowners (301 clients out of 580), and 69 percent of them (399 clients out of 580) are male. Most of the clients are fixed-income earners (64%). When we look at the gender and marital status variables in details, late payment ratio (number of people paid late divided by the total number of people) is higher for single women than single men (Table 3).

Table 3
Credit Payment Performance, Gender, and Marital Status

GENDER	PAYMENT*		MARITAL STATUS		Number of observations
			Single	Married	
Female	PAYMENT*	On-time	57	172	229
		Late	47	123	170
		Number of observations	104	295	399
Male	PAYMENT	On-time	52	61	113
		Late	33	35	68
		Number of observations	85	96	181

As for the frequencies of the categorical financial variables, the data in the current study mostly include individual support loans (491 out of 580); the rest of the data contains car loans (69 out of 580) and home loans (20 out of 580) (Table 4).

Table 4
Payment Performance and Loan Type

	Individual Support Loans	Car Loans	Home Loans
On time payment	291	38	13
Late payment	200	31	7
TOTAL	491	69	20

As our final statistical analysis, a logistic binary regression⁷ is used to determine the effect of financial and demographic variables on the payment performance of clients. The estimated change in the log of probability of “late payment” divided by probability of “on time payment” computed for every value of every factor variables except reference values. Last values of categorical factor variables kept constant when the others’ coefficients are calculated. It is important to note that, we examine the relationship between continuous variables by looking at the correlation matrix presented in the

⁷ A logistic binary regression is considered to be an adequate statistical method (Neter *et al.* 1990), since our dependent variable that is the payback performance of credit clients is a binary variable i.e. has a value of either 0 (on time payment) or 1 (late payment).

appendix. The results of the logistic binary regression are presented in Table 5.

Although R-square values are low, the model is worth exploring since Hosmer and Lemeshow goodness-of-fit test has a significance value that is higher than 0.05 indicating that there is sufficient evidence for the model fitting the data adequately. Also, it is a good fit according to the chi-square statistic, where p-value is lower than 0.05, which implies statistical evidence that at least one of the independent variables contributes in the model.

Table 5
Logistic Binary Regression Results (all variables are included) ^a

	Coefficient (B)	Wald	p-value
Constant	-3.282	12.023	0.001*
Loan		1.234	0.540
Loan type (1)	0.591	1.008	0.315
Loan type (2)	0.647	1.223	0.269
Interest rate	31.652	13.991	0.000*
Gender (1)	0.248	1.503	0.220
Marital Status (1)	0.322	2.383	0.123
Age	0.006	0.310	0.577
Income	0.000	0.003	0.957
Principal	0.000	0.926	0.336
Maturity	0.027	4.547	0.033*
Residential Status (1)	0.105	0.321	0.571
Occupation		0.106	0.949
Occupation (1)	0.110	0.096	0.757
Occupation (2)	0.065	0.038	0.845
<i>Cox&Snell R Square= 0.042</i>			
<i>Nagelkerke R square= 0.057</i>			
<i>Percentage of correct prediction= 60.7%</i>			
Goodness-of-Fit Tests^b			
<i>Chi-square=24.961, df=12, p-value=0.015</i>			
<i>Hosmer and Lemeshow chi-square=11.319,df=8, significance value=0.184</i>			

Dependent Variable: Credit clients' payment performance
(on-time payment=0 and late payment= 1)

^a The reference levels for the independent variables are as follows: home loans for loan type, female for gender, married for marital status, home-owners for residential status, and unemployed/housewife for occupation. Loan type is categorized as individual support loans (1), car loans (2), and home loans (3). Interest rate is reported annually, maturity and income are reported monthly. Marital status is categorized as single (1) and married (2). Gender is categorized as male (1), female (2). Residential status is categorized as renter/company's house (1) and owner (2). Occupation enters the model as fixed-income earners (1), non fixed-income earners (2), and unemployed/housewife (3).

^b The model adequately describes the data (Hosmer and Lemeshow statistic indicates a poor fit if the significance value is less than 0.05). Also, it is a good fit according to the chi-square statistic, where p-value is lower than 0.05.

* indicates significance level of 5 percent.

When we look at individual effect of each independent variable, most variables such as loan type, gender, occupation, income, residential status, and loan size are found statistically insignificant predictors of the client's payment performance. Interest rate and maturity both positively affect the credit payment performance risk, thus, the longer the maturity, the higher the interest, higher the risk for clients not paying their loans on time.

Table 6
Logistic Binary Regression Results (only demographic variables are included)^a

	Coefficient (B)	Wald	p-value
Constant	-1.295	4.832	0.028
Gender (1)	0.225	1.286	0.257
Marital Status (1)	0.303	2.205	0.138
Age	0.015	2.169	0.141
Income	0.000	0.032	0.858
Residential Status (1)	0.094	0.272	0.602
Occupation		0.288	0.866
Occupation (1)	0.124	0.126	0.722
Occupation (2)	0.019	0.003	0.955
<i>Cox&Snell R Square= 0.011</i>			
<i>Nagelkerke R square= 0.015</i>			
<i>Percentage of correct prediction=58.4%</i>			
Goodness-of-Fit Tests^b			
<i>Chi-square=6.430, df=7, p-value=0.491</i>			
<i>Hosmer and Lemeshow chi-square=10.943, df=8, significance value=0.205</i>			

Dependent Variable: Credit clients' payment performance (on-time payment=0 and late payment= 1)

^aThe reference levels for the independent variables are as follows: female for gender, married for marital status, home-owners for residential status, and unemployed/housewife for occupation. Income is reported monthly. Marital status is categorized as single (1) and married (2). Gender is categorized as male (1), female (2). Residential status is categorized as renter/company's house (1) and owner (2). Occupation enters the model as fixed-income earners (1), non fixed-income earners (2), and unemployed/housewife (3).

^bThe model is not a good fit according to p-value of chi-square (which is higher than 0.05), however seems to be fine according to the Hosmer and Lemeshow statistic (the model is a poor fit if the significance value is less than 0.05).

* indicates significance level of 5 percent.

In addition to the above regression analysis, we build a model that includes only demographic characteristics of the clients such as gender, age, marital status, occupation, residential status, and income in order to investigate the comparative effects of each on the clients' payment performances (Table 6). The results show that age (the probability of paying

late increases for older clients) and marital status (the probability of paying late increases for single clients) seem to have a potential significant impact on the loan payback performance.

Considering the fact that most banks are taking into account the demographic characteristics of loan applicants in determining what the maturity of the loan and the interest rate on the loan have to be, in order to overcome a potential problem caused by the endogenous variables in the model, we conducted two-stage least squares analysis (Table 7). As a result, maturity and interest rate remain to be the significant factors that positively influence the probability of payment performance risk.

Table 7
Two-stage Least Squares Analysis for the Payment Performance

	Unstandardized Beta	Standardized Beta	t-statistic	p-values
Constant	0.043		0.401	0.689
Maturity	0.006	0.096	2.087	0.037*
Principal	7.16E-006	0.058	1.232	0.218
Interest	7.482	0.179	4.129	0.000*
Loan Type	-0.026	-0.025	0.052	0.620

Multiple R= 0.184
R-square= 0.034
Adj. R-square = 0.027
Std Error of the Estimate = 0.486
F-statistic, df1, df2, p-value = 5.044, 4, 575, 0.001

Dependent Variable: Credit clients' payment performance
(on-time payment=0 and late payment= 1)

* indicates significance level of 5 percent.

7. Conclusions and suggestions for further research

A bank that lends money to consumers faces two types of risk: (i) risk of payment performance; (ii) risk of paying the loan earlier than the agreed time. The present study examines the risk of credit payment performance in terms of various financial and demographic variables and serves a useful function for creditworthiness. Our study is unique and important in many aspects. First, it examines the relationship between consumer credit clients' payment performance and their demographic characteristics whereas most previous research has been done on consumer credit applicants. In addition, we included financial variables additional to the demographic variables, while most of the previous studies done on clients' payment performance dwell upon only demographic variables. Second, our findings may enable banks and financial institutions to optimize their lending policies without

changing their market structure and potential clients. Third, although our results cannot be generalized for all the banks in Turkey, it is the first attempt to collect adequate information about how to decrease the credit payment performance risk in order to develop credit-scoring criteria and hopefully will stimulate further studies on investigating consumer credits in Turkey's banking system.

Our empirical results indicate that financial variables rather than the demographic characteristics of clients have a significant influence on customers' pay back performance. Thus, the longer the maturity time and the higher the interest rate, the higher the credit payment performance risks. This suggests bankers apply appropriate adjustments to financial variables in order to minimize credit payment performance risk.

For further research, it is suggested that the sample size could be increased and the coding for some categorical variables such as occupation could be classified in a different way during the data collection stage to ease the statistical analysis. It would be definitely better to include the education level of the clients in the data. In addition, payment performance could be measured as a continuous variable instead of a binary variable for a better investigation of the effects of the financial and demographic variables.

Appendix Correlation Matrix

	Interest rate	Age	Income	Principal
Interest Rate				
Age	0.131** (0.002)			
Income	0.048 (0.246)	0.337** (0.000)		
Principal	-0.080 (0.054)	0.181** (0.000)	0.562** (0.000)	
Maturity	-0.265** (0.000)	-0.033 (0.427)	-0.032 (0.445)	0.233** (0.000)

Note: Pearson correlation coefficients are reported. P-values are given in parentheses. * and ** indicate significant levels of 5 and 1 percent respectively.

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Özet

Türkiye’de tüketici kredisi borçlarının ödenmeme riski üzerine ampirik bir çalışma

Bu çalışmada tüketici kredisi almış müşterilerin kredi borçlarını geri ödeme performansları ile bazı demografik ve finansal değişkenler arasındaki ilişki araştırılmaktadır. Bu amaçla kullanılan veriler Türkiye’deki özel bankalardan biri tarafından tüketici kredisi almış müşteri raporlarından elde edilmiştir. Veri analizi için lojistik regresyon modeli kullanılmıştır. Kişilerin demografik özelliklerinden ziyade finansal değişkenlerin kredi borcu ödeme performansında etkili olduğu ortaya çıkmıştır. Vade ve faiz oranlarının artışı tüketici kredi borçlarının ödenme performansını olumsuz etkilemiştir. Buna göre müşterilerine kredi sağlayan bankalar ve diğer finansal kuruluşların vade ve faiz gibi finansal enstrümanlarda düzenleme yaparak risklerini minimuma indirmeleri mümkündür.

Anahtar kelimeler: Kredi, tüketici, bankalar, ödeme riski, Türkiye.

JEL kodları: G20, G21.