

Identifying the Macroeconomic Factors Influencing Credit Card Usage in Turkey by Using MARS Method

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The aim of this study is to define the macroeconomic factors that have an impact on credit card usage in Turkey. Within this scope, quarterly data for the period between 01/2005 and 02/2016 were used in this study. Moreover, MARS (Multivariate Adaptive Regression Splines) method was taken into the consideration in order to achieve this objective. As a result of the analysis, it was determined that there is negative relationship between credit card usage and unemployment rate. Another result of this study is that people in Turkey use more credit cards in case of high interest rate. While considering these issues, it was understood that Turkish government should focus on these variables in order to increase the credit card usage.

Keywords: credit card, Turkey, banking, MARS

Introduction

Credit card is described as the payment instrument that gives opportunity to the consumers to buy some goods or services without using cash (Roberts & Jones, 2001). Credit card was firstly developed by Hotel Credit Letter in 1894 in USA. This credit card could only be used in tourism sector (Karaca & Yayar, 2012). On the other hand, Setur was the first company which produced the credit card in Turkey in 1968. The name of this credit card was Dinners Club Card and its volume was very low (Altan & Göktürk, 2007). However, nowadays, credit cards are becoming more popular in Turkey. According to the reports of Interbank Card Center in Turkey, credit cards usage has grown so rapidly that the number of credit cards reached from 10,045,643 in 1999 to 57,809,641 in 2016 August in Turkey. Besides growing in credit card number, payment amount by using credit card also increased to TL 54,083,000,000 (17,502,588,997 USD) in 2016 August in Turkey. Additionally, 88% of this amount consists of shopping and 12% belongs to the cash withdrawal.

Using credit card has many advantages for the consumers. Firstly, consumers can obtain cash money within the limit of the credit card. Another advantage of the credit card is that consumers can purchase a good or service by using credit card despite the fact that they do not have enough money at that moment (Chakravorti, 2003). Moreover, card holders can enjoy from the benefit of purchasing something by paying installment. In

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addition to these aspects, credit card has also many advantages to the economy of the country. First of all, because credit card increases the consumption in the country, it helps economic growth of this country to go up. Furthermore, using credit card in buying and selling decreases unrecorded sales. Owing to this situation, tax revenue of the government will increase (Ludvigson, 1999).

Due to the aspects emphasized above, credit card usage plays a very significant role to improve the economies of the countries. Therefore, many governments take actions in order to encourage consumers to use credit cards in their expenditures. Thus, it can be said that academic studies related to credit cards are very important. Within this context, the main purpose of this study is to define the macroeconomic factors that have an impact on credit card usage in Turkey. In order to achieve this objective, Multivariate Adaptive Regression Splines (MARS) method was used. As a result of this analysis, it will be possible to make recommendation to increase the usage of credit card in Turkey. Additionally, it can be said that this study will make an important contribution to the literature by helping to analyze this issue with a new and original method.

Literature Review

In the literature, there are many studies that analyzed the relationship between credit card usage and macroeconomic variables. Bellotti and Crook (2013) built a model for credit card stress testing including behavioral and macroeconomic data. They used interest rate, unemployment rate, production index, FTSE 100 index, earnings, retail sales, house prices, consumer confidence, and retail price index (RPI) as macroeconomics variables. Moreover, Gross and Souleles (2001) also analyzed credit card usage to understand whether liquidity constraints and interest rates are effective on consumer behavior. They found that interest rate has strong effects for this situation. Furthermore, Agarwal and Liu (2003) showed that unemployment rate significantly affects credit card delinquency. Ekici and Dunn (2010) identified negative relationship between credit card debt and consumption rate. Telyukova (2009) analyzed liquidity, saving, and consumer debt to evaluate the role of liquidity. In addition to this situation, Stauffer (2003) demonstrated that credit card usage increases credit demand. Another conclusion of this study is that interest rate encourages credit card users. Canner and Lueckett (1992) and Demirci and Akben Selçuk (2016) also determined that interest rate is an important factor in credit card choice. Differently from these studies, Ausubel (1991), Steidle (1994), and Akin, Aysan, Kara, and Yildiran (2010) defined that interest rate does not have any affect to increase credit card usage. While considering these studies, it was understood that in the most of the studies in the literature, regression model was used to achieve the objective. Owing to this situation, it can be said that there is a need for a study in which a new and original model is used.

MARS Method

Multivariate Adaptive Regression Splines (MARS) method was developed by Jerome Friedman in 1991. This method is used to understand the relationship between dependent and independent variables. The equation of MARS method is shown below.

$$Y = B_0 + \sum_{n=1}^K a_n B_n(X_t) + \varepsilon$$

In the equation above, “Y” shows dependent variable whereas “X” refers to the independent variable. Moreover, “B₀” is the constant term and “a_n” explains the coefficient of the basis function. Additionally, “K”

demonstrates the number of basis functions while “ ε ” refers to error term of the equation. MARS method has some advantages in comparison with other regression methods. Firstly, it is possible to use a lot of variables in the analysis of this method because there is no multicollinearity problem. Also, it provides meaningful result since independent variables may take several coefficients for different conditions.

While making analysis in MARS method, there are two different analyses. First of all, system creates different models by using basis functions that refer to the potential functions created by using different combinations of the independent variable. This system goes on until achieving the most complex model. After that, system eliminates some basis functions which are unnecessary. As a result of this process, the best model can be obtained (Friedman, 1991).

Analysis Results

In this analysis, credit card usage amount was used as a dependent variable. It was provided from Interbank Card Center of Turkey. Furthermore, we also used five different macroeconomic explanatory variables in this study. Increase in USD/TL currency exchange rate shows the volatility in the market. Therefore, when there is an increase in this rate, credit card usage is expected to decrease. Moreover, higher GDP growth increases the life quality of people in the country, so it is expected to increase credit card usage. When there is a high inflation expectation, people prefer to consume at the moment. Thus, it is expected to raise credit card usage. Also, in case of higher interest rate, people opt for using credit card instead of taking loan. The main reason is that people will not pay any interest if they pay their total credit card debt. Finally, when people become unemployed they decrease the usage of credit card. In analysis process, firstly, MARS program created 10 different models which were detailed on Table 1.

Table 1

Results of All Models

Basis functions	Total variables	GCV	GCV R^2 -square
10	3	0.000142	0.162
9	3	0.000112	0.341
8	3	0.000091	0.462
7	3	0.000076	0.552
6	3	0.000065	0.617
5	3	0.000066	0.608
4**	2	0.000063	0.627
3	2	0.000073	0.568
2	2	0.000079	0.530
1	1	0.000096	0.435

The model at the bottom of Table 1 is called as starting model. The system added all possible basis functions to this model until achieving the most complex model. After that, this system eliminated some basis functions that are unnecessary to achieve the best model. It has four basis functions, two different explanatory variables, lowest GCV (error) value, and highest GCV R^2 value. The details of the best model were given in Table 2.

As it can be seen from Table 2, p values of all basis functions are less than 0.05 which shows that all these functions are statistically significant at 5% level. In addition to this situation, the value of F test explains that the model is also statistically significant. Furthermore, the value of adjusted R -square gives information that

independent variables can explain 75.8% of the dependent variable. The details of the basis functions were detailed on Table 3.

Table 2

Results of the Best Model

Variables	Coefficient	<i>p</i> values
Constant term	93,482	0.000
Basis function 1	-34,459	0.000
Basis function 3	-12,848	0.000
Basis function 5	33,686	0.000
Basis function 9	16,723	0.000

Note. *F* Test: 36.289 [0.00] Adj *R*²: 0.758.

Table 3

Explanation of Basis Functions

Basis functions (BF)	Explanation	Coefficient
Basis function 1	max (0, Interest rate – 11.32)	-34,459
Basis function 3	max (0, Unemployment rate – 10.27)	-12,848
Basis function 5	max (0, Interest rate – 17.31)	+33,686
Basis function 9	max (0, Interest rate – 9.18)	+16,723

According to the results of the analysis, it was defined that two different macroeconomic independent variables affect credit card usage in Turkey. Interest rate is the first significant variable that was stated in basis functions 1, 5 and 9. The sum of the coefficients (-34,459+33,686+16,723) of these basis functions is positive. This situation shows that there is direct relationship between interest rate and credit card usage. In other words, when there is an increase in interest rate, the usage of credit cards goes up as well. The main reason behind this situation is that in case of higher interest rate, people prefer to use credit cards instead of getting loans because there is no interest payment when people pay all debt amount of the credit card on time. Canner and Lockett (1992) and Demirci and Akben Selçuk (2016) also reached the similar results in their studies. Additionally, it was also identified that there is an inverse relationship between unemployment rate and the usage of the credit card owing to the negative coefficient (-12,848). This aspect explains that when people become unemployed, they decline the usage of the credit cards. Agarwal and Liu (2003) also emphasized this situation in their study.

Recommendations and Conclusions

In this study, it was aimed to define the macroeconomic variables that have an effect on the credit card usage in Turkey. Within this scope, quarterly data for the periods between 01/2005 and 02/2016 were analyzed in this study. Furthermore, an analysis by using MARS method was made in order to achieve this objective. According to the results of the analysis, it was concluded that interest rate and unemployment rate affect credit card usage in Turkey. First of all, it was determined that higher interest rate increases the usage of the credit card. The main reason for this issue is that Turkish people prefer to use credit cards instead of taking loan from the banks in case of high interest rate since they do not have to pay interest when they pay total debt amount of the credit card. In addition to this aspect, it was also identified that there is a negative relationship between unemployment rate and credit card usage in Turkey. The reason for this result is that when people lose their jobs, they minimize their consumption due to the financial problems. Owing to this situation, the usage of

credit card also declines in this process. While taking into the consideration of these issues, it can be said that Turkish government should mainly focus on interest rate and unemployment rate in order to develop a policy related to the usage of the credit cards. For instance, it may try to decrease unemployment rate if they want to increase the credit card usage. Another example is that if the credit card usage is aimed to decrease, interest rate may be decreased in order to make the usage of the loans more attractive to the people.

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