International Journal of Information System & Technology
Akreditasi No. 158/E/KPT/2021 | Vol. 6, No. 3, (2022), pp. 346-352

Criteria For Giving Car Loans to Consumers Using Sugeno's Fuzzy Concept

Rio Rahmat Yusran
Universitas Mohammad Natsir, West Sumatra, Indonesia
email: riorahmatyusran@gmail.com

Abstract

PT XYZ is a company engaged in car loans. This company sells various kinds of cars with credit payment systems. To ensure that the provision of credit is not bad, there are several criteria that are made by the company in accordance with the criteria that have been set. There are 4 criteria that are used as standards that must be met for consumers so that the car purchase system on credit is accepted. The 4 criteria include the capacity to pay off credit (Capacity), the ability of the customer's capital (Capital), the guarantee owned by the customer to bear credit risk (Collateral) and the customer's financial condition (Condition). The problem in this research is that there are often bad credit consumers who do not pay installments in accordance with the specified time. The purpose of this research is to help companies provide credit to consumers so that they are right on target. The settlement of this case uses Fuzzy Logic which is suitable to be implemented into a computerized system to take a decision. The method used in this study is the Sugeno method using the And operator and taking the MAX value. The final result of this study is in the acceptable range with a value of 196.33 . To see the other criteria, just input each x value into the existing system.

Keywords: *Car Loans, Criteria, Fuzzy Logic, Sugeno Method*

1. Introduction

Partial research design is a description of the relationship between variables, data collection, and data analysis, so that with a good design both researchers and interested parties have a clear picture of the relationship between variables in the research context and what a researcher wants to do in the context of research. carry out research [1]. Credit is a financial facility that allows a person or business entity to borrow money to buy a product and repay it within a predetermined period of time. The credit can be in the form of consumer credit or credit that is intended to develop its business. The distribution of funds in the form of credit to consumers carries the risk of not returning the funds that have been distributed. In order to minimize this risk, the company must conduct a proper credit analysis. The creditworthiness assessment is carried out to avoid losses to the company due to the non-return of the disbursed loans [2].

According to Research [3] In launching its business, PT.NSS has established a policy in providing credit, namely that prospective credit recipients must meet the Five C requirements, how is the customer's character (Character), the capacity to pay off credit (Capacity), the ability of capital owned by the customer of Capital, the guarantee that the customer has to pay off the loan. bear the credit risk (Collateral) and the customer's financial condition (Condition). However, the large number of credit applicant data makes it difficult for PT.NSS to analyze and decide on the right consumer to get credit. If an error occurs in the selection of prospective credit recipients, there will be consumer credit congestion which causes losses that can hamper the pace of company development.

Ismail (2013:94) states that there are 7 elements of credit, as follows: 1. Creditors, Creditors are parties who provide credit (loans) to other parties who get loans. 2. Debtor, Debtor is a party that needs funds, or a party that obtains a loan from another party. 3. Trust (Trust), the creditor is the belief in the party receiving the loan (the debtor) that the debtor will fulfill the obligation to repay the loan in accordance with a certain agreed

ISSN : 2580-7250

period of time. 4. Agreement, an agreement is a contract agreement or agreement made between a financial institution (creditor) and the borrower (debtor). 5. Risk, Risk is the possibility of loss that will arise from the distribution of credit. 6. Term, The term is the length of time required by the debtor to repay the loan to the creditor. 7. Remuneration, In return for funds distributed by creditors, the debtor will pay a certain amount of money in accordance with the agreement [4].

According to Research [5] The current system, the criteria that are used as a reference in making decisions on granting credit worthiness to credit consumers by the Credit Analyst section are the personality of the credit applicant, the ability to pay the credit applicant (salary slip), the number of dependents (family card), advances for credit applicants and guarantees applicant. This system has not worked well because there are still some consumers who have bad credit, such as late credit payments or credit payments that are not paid by consumers, causing a reduction in the profit of the leasing company. In an effort to assist Credit Analysts in appropriate consumer decision-making activitiescredit, it is necessary to have a computer-based decision support system model that can provide convenience in conducting analysis.

In the distribution of these loans, cooperatives actually have a fairly large risk, namely the existence of non-performing loans[6]. Procedures for granting credit are needed so that operational activities are more effective and efficient (Indrawan 2017).Meanwhile, according to the presentation [7]. Meanwhile, according to the presentation[8] At this time there are many types of credit offered to the public and to the business world. To obtain credit, customers must go through several procedures that have been set by each financial institution. Every credit given or offered certainly has a fundamental difference that must be passed by 2 customers. These differences can be seen in terms of the terms and conditions of each type of credit such as credit period, collateral provided, nominal amount of credit, use and so on. The elements contained in the credit:

1) Trust, namely the belief of the creditor that the achievements he has given, whether in money, goods or services, will actually be received back within a certain period of time in the future.
2) Time, which is a period that separates the awarding of achievements with contra-achievements that will be received in the future.
3) Degree of risk, which is a level of risk that will be faced as a result of the existence of a period of time that separates the award of achievement from the contra-achievement that will be received at a later date.
4) The achievement, or object of credit, is not only given in the form of money, but also in the form of money goods or services [9].

The use of the Fuzzy concept makes it easy for users to analyze the value, weight and level of the criteria used in the calculation and ranking process using the Simple Additive Weighting (SAW) method. The analysis of the calculation results obtained can be a recommendation for the decision makers [3].

2. Research Methodology

Partial research design is a description of the relationship between variables, data collection, and data analysis, so that with a good design both researchers and interested parties have a clear picture of the relationship between variables in the research context and what a researcher wants to do in the context of research. carry out research.

3. Results and Discussion

The Fuzzy discussion begins with data from processing using the Sugeno method to determine variables, then the formation of fuzzy sets, after the variables are set and the fuzzy sets have been formed, the next step is to enter data into the application.

a) Fufification

Table 1. Fuzzy Set Domain

Variables	Fuzzy Set Name	Domain
Ability	Very high	[80 100]
	Tall	[65 90]
	High enough	[0 70]
Down payment	Very large	[265 495]
	Currently	[135 265]
	Small	[90 205]
Work	Very good	[80 100]
	Good	[65 90]
	Not good	[0 70]
Guarantee	Good	[80 100]
	Quite good	[65 90]
	Not good	[0 70]
Decision	Received	[180 200]
	Considered	[160 185]
	Rejected	[0 160]

Form the calculation manually using Equation

1) Ability

$$\mu \text{ High enough} = \begin{cases} 1; & x \le 60 \\ (80-x)/(80-65) & 65 \le x \le 80 \\ 0; & x \ge 80 \end{cases}$$

$$\mu\text{Tall} = \begin{cases} 0; & x \le 60 atau\ x \ge 90 \\ (x-65)/(80-65); & 65 \le x \le 80 \\ (90-x)/(90-80); & 80 \le x \le 90 \end{cases}$$

$$\mu \text{ High enough} = \begin{cases} 0; & x \le 75 \\ (x-80)/(90-80) & 80 \le x \le 90 \\ 1; & x \ge 90 \end{cases}$$

2) Down payment

$$\mu\text{Small} = \begin{cases} 1; & x \le 135 \\ (205-x)/(205-135) & 135 \le x \le 205 \\ 0; & x \ge 205 \end{cases}$$

$$\mu\text{Currenty} = \begin{cases} 0; & x \le 135 atau\ x \ge 265 \\ (x-135)/(205-135); & 135 \le x \le 265 \\ (135-x)/(265-205); & 205 \le x \le 265 \end{cases}$$

$$\mu\text{Very Large} = \begin{cases} 0; & x \le 265 \\ (x-265)/(335-265); & 265 \le x \le 335 \\ 1; & x \ge 335 \end{cases}$$

3) Work

$$\mu \text{ Preetty Good} = \begin{cases} 1; & x \le 60 \\ (80-x)/(80-65) & 65 \le x \le 80 \\ 0; & x \ge 80 \end{cases}$$

$$\mu\text{Well} = \begin{cases} 0; & x \le 60 atau\ x \ge 85 \\ (x-65)/(80-65); & 65 \le x \le 80 \\ (90-x)/(90-80); & 80 \le x \le 90 \end{cases}$$

$$\mu\text{Very Good} = \begin{cases} 0; & x \le 75 \\ (x-80)/(90-80) & 80 \le x \le 90 \\ 1; & x \ge 90 \end{cases}$$

4) Guarantee

$$\mu\text{Not Good} = \begin{cases} 1; & x \le 60 \\ (80-x)/(80-65) & 65 \le x \le 80 \\ 0; & x \ge 80 \end{cases}$$

$$\mu\text{Quite Good} = \begin{cases} 0; & x \le 60 atau\ x \ge 85 \\ (x-65)/(80-65); & 65 \le x \le 80 \\ (90-x)/(90-80); & 80 \le x \le 90 \end{cases}$$

$$\mu\text{Verry Good} = \begin{cases} 0; & x \le 75 \\ (x-80)/(90-80) & 80 \le x \le 90 \\ 1; & x \ge 90 \end{cases}$$

IF x1 is A1 AND... OR xn is An THEN y is y = f (x,,,,,xn)

Where A1,..., An and B are linguistic values (or fuzzy set) and x1 is A1 which states that the value of the variable x1 is a member of the fuzzy set A1. The inference method used is clipping (alpha-cut) and when it is aggregated with other functions it will result in easy defuzzification.The rules used are based on interviews from the maximum rules that can be formed and the most selected by respondents to state the relationship between input and output. From the mapping, it can be seen that the maximum rules are as follows:

b) Machine Inference

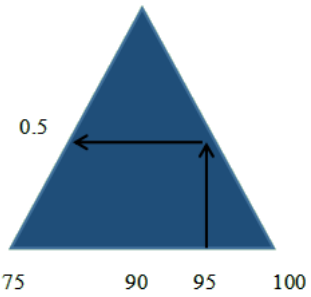
Table 2. Machine Inference

No Rule	Ability	Down payment	Work	Guarantee	Function Implication	Decision
Rule 1	Very high	Very large	Very good	Good	→	Received
Rule 2	Very high	Currently	Very good	Good	→	Received
Rule 3	Very high	Small	Good	Good	→	Received
Rule 4	Very high	Very large	Not good	Good	→	Received
Rule 5	Very high	Currently	Not good	Good	→	Received
Rule 6	Very high	Small	Not good	Good	→	Received
Rule 7	Very high	Very large	Good	Good	→	Received
Rule 8	Very high	Currently	Good	Good	→	Received
Rule 9	Very high	Small	Good	Good	→	Received
Rule 10	Very high	Very large	Very good	Quite good	→	Received
Rule 11	Very high	Currently	Very good	Quite good	→	Received

No Rule	Ability	Down payment	Work	Guarantee	Function Implication	Decision
Rule 12	Very high	Small	Very good	Quite good	→	Received
Rule 13	Very high	Very large	Good	Quite good	→	Received
Rule 14	Very high	Currently	Good	Quite good	→	Received
Rule 15	Very high	Small	Good	Quite good	→	Received
Rule 109	Very high	Very large	Very good	Good	→	Considered
Rule 110	Very high	Currently	Very good	Good	→	Considered
Rule 111	Very high	Small	Very good	Good	→	Considered
Rule 112	Very high	Very large	Not good	Good	→	Considered
Rule 113	Very high	Currently	Not good	Good	→	Considered
Rule 114	Very high	Small	Not good	Good	→	Considered
Rule 115	Very high	Very large	Not good	Good	→	Considered
Rule 116	Very high	Currently	Not good	Good	→	Considered
Rule 117	Very high	Small	Not good	Good	→	Considered
Rule 118	Very high	Very large	Very good	Quite good	→	Considered
Rule 119	Very high	Currently	Very good	Quite good	→	Considered
Rule 120	Very high	Small	Very good	Quite good	→	Considered
Rule 121	Very high	Very large	Not good	Quite good	→	Considered
Rule 122	Very high	Currently	Not good	Quite good	→	Considered
Rule 123	Very high	Small	Not good	Quite good	→	Considered
Rule 217	Very high	Very large	Very good	Good	→	Rejected
Rule 218	Very high	Currently	Very good	Good	→	Rejected
Rule 219	Very high	Small	Very good	Good	→	Rejected
Rule 220	Very high	Very large	Not good	Good	→	Rejected
Rule 221	Very high	Currently	Not good	Good	→	Rejected
Rule 222	Very high	Small	Not good	Good	→	Rejected
Rule 223	Very high	Very large	Not good	Good	→	Rejected

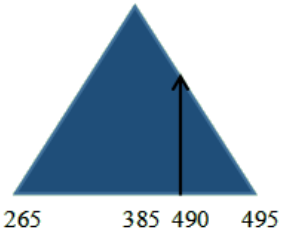
The form of manual down payment calculation is as follows:

1) It is known that the ability has a value of x 95, then the fuzzy membership value in each set is:



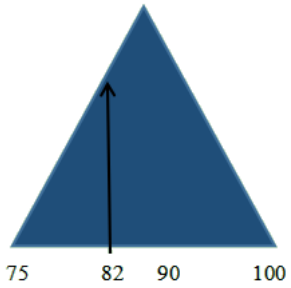
X = 95
= (c-x)/(c-b)
= (100-95)/(100-90)
=5/10
=0.5

2) It is known that advances have a value of x 82, then the value of fuzzy membership in each set is:



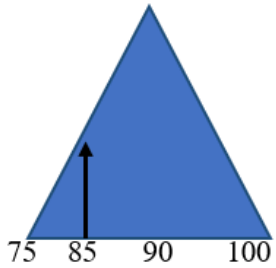
X = 490
= (c-x)/(c-b)
= (495-490)/(495-385)
=5/110
=0.504

3) It is known that the work has a value of x 82, then the fuzzy membership value in each set is:



X = 82
= (b-x)/(b-a)
= (90-82)/(90-75)
=8/15
=0.53

4) It is known that the guarantee has a value of x 85, then the fuzzy membership value in each set is:



X = 85
= (b-x)/(b-a)
= (90-85)/(90-75)
=5/15
=0.33

c) Application Function Implication

In the mamdani method, the application of the implication function uses the MAX function.

Rule 95 IF (Ability is VERY HIGH) and IF (Advance is VERY BIG) and IF (Work is VERY GOOD) and IF (Guarantee is GOOD) then (Credit decision is ACCEPTABLE)

α-predikat$_1$ = μ Ability is VERY HIGH μ Advance is VERY BIG ∩ Work is VERY GOOD ∩ μ Guarantee is GOOD

α-predikat$_1$ = MAX μ Ability is VERY HIGH [95] ∩ μ Advance is VERY BIG [390] ∩ μ Work is VERY GOOD [82] ∩ μ Guarantee is GOOD [85]

α-predikat$_1$ = = MAX (0.5; 0.5; 0.53; 0.33)

α-predikat$_1$ = = 0.53

d) Defuzzification

This stage is also known as the affirmation stage. The input of this assertion process is a fuzzy set obtained from the composition of fuzzy rules, while the resulting output is a number in the domain of the fuzzy set. The third step is to calculate the final result using a weighted average using the MOM (Mean Of Maximum) method, namely

Z* = (95x0,5) + 490x0,5) + (82x0,53) + (85x0,33)/ 0,5 + 0,504 + 0,53 + 0.33
Z* = 365,97/1,864
Z* = 196,33

Based on the results of the above equation, the defuzzification result = 196.33 is included in the accepted table range.

4. Conclusion

The measurement of the level of lending to consumers based on simulation data that has been processed can be concluded that for the assessment of the granting of car loans, there are 4 criteria, namely ability, down payment, work and guarantees and output consisting of accepted, considered and rejected. Final Defuzification results obtained a value of 196.33 which was in the acceptable range. Results from Fuzzy logic Giving car loans to consumers can be used as a reference to accept or reject the consumer who will apply for a car loan.

References

[1] M. . Endang, S.E., "Analisis Faktor-Faktor Penyebab Kredit Macet Sepeda Motor (Studi Kasus Pada Perusahaan Pembiayaan PT. Mega Finance Cabang Palembang)," *Jurnal Akuntansi Politeknik Sekayu (ACSY)*, vol. I, no. 1, pp. 24–31, 2014.

[2] R. Handriano and P. L. Budiati, "Analisis Pemberian Kredit Motor Pada PT Bfi Finance Indonesia Tbk Cabang Banjarmasin," *Dinamika Ekonomi - Jurnal Ekonomi dan Bisnis*, vol. 15, no. 1, pp. 99–115, 2022, doi: 10.53651/jdeb.v15i1.367.

[3] Y. P.K.Kelen and S. S. Manek, "Sistem Pendukung Keputusan Pemberian Kredit Sepeda Motor Menggunakan Metode Simple Additive Weighting (SAW) Pada PT. NSS Cabang Kefamenanu," *Jurnal Ilmiah Ilmu Komputer*, vol. 5, no. 2, pp. 1–7, 2019, doi: 10.35329/jiik.v5i2.96.

[4] R. Yuliansyah, "Analisis Sistem Akuntansi Pemberian Kredit Gadai dalam Mencegah terjadinya Kredit Macet terhadap UMKM pada PT. Pegadaian (Persero) Unit Pelayanan Syariah Cikijing," *Jurnal Akuntansi dan Manajemen*, vol. 15, no. 02, pp. 79–100, 2018, doi: 10.36406/jam.v15i02.178.

[5] S. Sarwindah, "Penunjang Keputusan Dalam Kelayakan Pemberian Kredit Motor Pada PT.Mandala Multifinance," *JATISI (Jurnal Teknik Informatika dan Sistem Informasi)*, vol. 7, no. 2, pp. 299–309, 2020, doi: 10.35957/jatisi.v7i2.389.

[6] B. G. Allo, "Prosedur Pemberian Kredit Dan Upaya Untuk Mengatasi Kredit Macet Pada Koperasi Kredit Swastiastu Singaraja," *Jurnal Akuntansi Profesi*, vol. 8, no. 2, p. 28, 2017, doi: 10.23887/jap.v8i2.21019.

[7] K. D. Indrawan, "Prosedur Pemberian Kredit Pada Kud Karma Bumi Amertha Kubutambahan," *Jurnal Akuntansi Profesi*, vol. 8, no. 2, p. 55, 2017, doi: 10.23887/jap.v8i2.21023.

[8] F. Muslim and Suharmiati, "Tinjauan Kelayakan Pemberian Kredit Motor Cabang Bogor," no. November 2015, 2019, doi: 10.13140/RG.2.2.14236.74883.

[9] E. Oktaputra, Alif Wahyu, Noersasongko, "Sistem Pendukung Keputusan Kelayakan Pemberian Kredit Motor Menggunakan Metode Simple Additive Weighting Pada Perusahaan Leasing Hd Finance," *Ilmu Komputer*, pp. 1–9, 2014.