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Submission date: 04-Nov-2022 04:34AM (UTC+0800)

Submission ID: 1943757387

File name: Purmiyati_Artikel_Tambahan101_Technical_efficiency_analysis.pdf (654.31K)

Word count: 10426

Character count: 56828



Technical efficiency analysis: Management factor as determinants of saving and credit cooperatives' health

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ARTICLE INFO

JEL classification:

D13
D24
G51

Keywords:

Efficiency
Data envelopment analysis
Logistic regression
Savings and credits cooperatives
Tobit regression

ABSTRACT

The main purpose of this study is to analyze the technical efficiency of Saving and Credit Cooperatives (SACCOs) and the impact for SACCOs' health using primary data obtained from a survey of 178 respondents of SACCOs in East Java, Indonesia. The three stages of the analysis used are Data Envelopment Analysis (DEA), Tobit Regression and Logistic Regression. Based on the results of the analysis using the DEA method, it is concluded that the average performance that can be achieved by SACCOs with existing technology is 65 % of the maximum potential yield. There are 61.3 % of SACCOs which are declared technically inefficient. The factors that influence the level of technical efficiency of Saving and Credit Cooperatives are interest, loan term, manager's age, and type of business. Furthermore, the factors that affect the health of the cooperative based on logistics analysis are the variable frequency of management meetings, age of the cooperative, fixed deposits and average loan. This study supports the SACCOs in becoming more efficient and healthy with the influence of external policy (from government) and internal policy (from SACCOs).

1. Introduction

Economic development comprises the activities carried out by a country to develop economic prosperity and the standard of living of its people (Deville et al., 2007; Todaro & Smith, 2009). One way to improve welfare is to provide financial inclusion facilities for entrepreneurs, especially micro, small and medium enterprises (Allen et al., 2016; Kabakova & Plaksenkov, 2018; World Bank, 2018). This is in line with Lal (2018) which states that financial inclusion through cooperatives is proven to have a direct and significant effect on poverty alleviation. In developing countries, the role of cooperatives is very important in embracing the economic activities of people with low income and helping them to improve their standard of living (Thomas & Faruq, 2017). Participation in becoming a member of a cooperative is proven to increase household income (Ma & Abdulai, 2016) and can effectively reduce poverty in rural areas (Verhofstadt & Maertens, 2014).

The International Cooperatives Alliance defines a cooperative as a people-centered enterprise owned, controlled and run by and for their members to realize their common economic, social, and cultural needs and aspirations. A cooperatives' is a joint business entity that operates in the economic sector and is democratic in nature (Kabugu, 2014). Governance is carried out from members, by members and for members

(Fauzi & Marwansyah, 2018). The main values of cooperation are dependent on equality, freedom, and mutual assistance which are based on the premise that fighting together by working together can achieve better results than fighting alone (Campbell et al., 2017). A cooperative is also defined as a form of cooperation in the economic sector; this cooperation is due to the similar needs of the participants.

The most flexible type of cooperative business is Savings and Credit Cooperatives (SACCOs), which are mini banks, meaning that SACCOs act as financial intermediaries, namely collecting member deposits and providing credit to members (Chuku & Ndanshau, 2016). Unlike bank customers, cooperative members act as both borrowers and lenders, providing both demand and supply of funds (Tumwine et al., 2015). Members are required to save regularly and then they are encouraged to borrow for the productive purpose of accumulated savings (Semaw Henock, 2018). SACCOs provide credit services to their members in order to help develop their businesses and increase their income (Thomas & Faruq, 2017). According to Grashuis (2019), this credit can be used to increase the production capacity of members who have businesses so that it is hoped that their productivity will improve and hence increasing household income. In addition, the loans that SACCOs provides to members typically have low interest rates and less 'tight' payments so as not to burden members (Da Silva et al., 2017; Mmari &

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<https://doi.org/10.1016/j.jcom.2022.100186>

Received 14 January 2022; Received in revised form 15 September 2022; Accepted 20 September 2022

Available online 1 November 2022

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Thinyane, 2019). Ezekiel (2014) found that cooperative activities increase income opportunities, economic growth, market opportunities, and job creation especially among low-income households thereby increasing sustainable development in the area.

With an increase in the income of cooperative members, it can reduce the poverty rate that occurs in the community (Wanyama, 2015; Sentime, 2019; Afolabi & Ganiyu, 2021). Meanwhile, the poverty of cooperative members is mostly structural poverty. According to Sukesu (2015), structural poverty is poverty caused by factors or variables beyond individual control. So that poverty can be reduced, it is necessary to have institutions/organizations that become a forum for the community to reduce poverty.

Cooperatives in East Java have a very strategic role in contributing to Gross Domestic Regional Bruto in East Java and are able to strengthen the nation's economy. The contribution of cooperatives and MSMEs to Gross Domestic Regional Product in East Java in 2021 was Rp 1.418.94 trillion or around 57.81 %. The contribution of cooperatives in East Java to the national growth of cooperatives was recorded at 32 %. From a number of assessments, the cooperative sector in East Java is ranked first and has a major role in supporting the people's economy when compared to 33 other provinces; this is because cooperatives in other provinces only have an average contribution of 15 %. According to the Department of Cooperatives and SMEs East Java, the biggest problem experienced by cooperatives in East Java is in terms of capital.

One source capital of SACCOs is obtained from members. SACCOs play an important role in improving the saving habits of the poor, even with very small nominal values that were previously underestimated by banks. The accumulated savings of these members will be rewarded according to their total savings, so that members will increasingly try to increase their savings to obtain greater rewards (Zikalala, 2016). Kwai and Urassa (2015) explains that the habit of saving has a significant impact in reducing poverty, because the habit of saving can make it easier for individuals to accumulate capital to invest and to generate returns.

This research is essential because Savings and Credit Cooperatives play an important role in helping Micro, Small and Medium Enterprises (MSMEs) who have difficulty accessing sources of capital from banks due to difficult requirements (Oktaria & Sari, 2021). Through cooperatives, MSMEs can obtain capital on easier terms so they can develop their businesses (Thomas & Faruq, 2017). To continue to assist and carry out the duties of cooperatives according to the law, it is necessary to evaluate the efficiency of cooperatives (Hasan et al., 2018). According to Yusuf (2016), if the efficiency of cooperatives is improving, cooperatives can develop and reach the wider community and MSMEs so that they can help alleviate poverty. Although the benefits provided by joining as a member in a cooperative have been proven, in some cases these benefits cannot be felt by the members. This can be caused by external factors such as education level, gender, age, and risk perception of members (Kumar et al., 2015). However, it can also be caused by internal factors of the cooperative itself because it does not convey opportunities that can be used by members to improve their quality of life when joining a cooperative (Tumwine et al., 2015). Therefore, it is necessary to analyze the factors that affect the efficiency of cooperatives in East Java so that cooperatives can continue to improve themselves. In addition, in an effort to support the law on the health of cooperatives, it is necessary to conduct research on the factors that affect the health of cooperatives. According to Ani et al. (2021), assessment of cooperative health is a way for governments to evaluate cooperatives. Previous research has discussed many factors that affect the health of cooperatives from a financial perspective (Ariansyah & Nurmala, 2019; Bhakti et al., 2018; Putr et al., 2019) but in this study the focus is on analyzing the health of cooperatives from the perspective of cooperative institutions. To help reduce poverty, cooperatives must improve the performance of cooperatives in the production process to achieve efficiency (Hasan et al., 2018). Through improving performance, cooperatives can maximize services to their members and can help

alleviate poverty (Yusuf, 2016). Based on the description above, the researcher wishes to determine the level of technical efficiency of Savings and Credit Cooperatives in East Java, the factors that affect the technical efficiency of Savings and Credit Cooperatives, and the determinants of the institutional health of Savings and Credit Cooperatives in East Java.

2. Literature review

2.1. Production theory

The production function is an equation that describes the amount of input used to produce a certain output; in other words the output is a function of the input (Nicholson & Snyder, 2010). The inputs used in the production process are capital, labor, raw materials and other variables that support an activity in production. Various combinations of factors of production to produce the same level of production are depicted in Isoquant curves. An isoquant is a line that connects the points of the optimum combination of a number of inputs and other inputs so as to produce a certain level of output. In addition, the combination of production factors that can be obtained using a certain number of costs is described in the isocost curve. One way for companies to reduce expenses is to save on production costs. Optimum production conditions are those where a company can choose the lowest combination of input costs to produce an output. To minimize the cost of production in producing a certain amount of output, the unit of economic activity must choose a combination of inputs with the minimum cost (least cost combination). This combination occurs when the isocost line is tangent to the isoquant curve or equal to the producer's equilibrium curve (Pindyck, 2008).

2.2. The concept of production efficiency

In general, efficiency can be interpreted in the concept of achieving results with optimal use of resources. Adiwaman (2006), explained that "Efficient is doing the things right" which means doing things the correct way to obtain optimal results. In economic theory, there are two general concepts of efficiency: the first in terms of economic concepts and the second is the concept of production. Efficiency viewed from the economic concept has a wider reach from a macro perspective, while efficiency from a production point of view is viewed from a micro perspective.

Farrell (1957) and Coelli et al. (1998) divide efficiency into three, namely technical efficiency, allocative efficiency, and economic efficiency. Technical Efficiency (TE) is the company's ability to obtain maximum output by combining the use of inputs with existing cost. Allocative Efficiency (AE) is the company's ability to use expenditure in an optimal proportion with a certain price and production technology. The efficiency of the two combinations will be called Economic Efficiency (EE) or total efficiency.

2.3. Relationship between production functions and efficiency

Data Envelopment Analysis (DEA) is a non-parametric approach (Rout et al., 2019) that measures the efficiency of several work units produced by producers which is manifested in a Decision-Making Unit (DMU). DMU is a unit (set) of operations (work units) that will perform technical efficiency calculations. The DEA method avoids the distribution assumption of inefficiency and does not require a function specification for the production frontier, so it can use multiple inputs and outputs, and can identify the best combination of each DMU (Coelli et al., 1998).

DEA was first developed by Farrell (1957), there are two models in the relationship between input and output, a constant rate of return (Constant Return to Scale) and variable return (Variable Return to Scale). The DEA Constant Return to Scale (CRS) model assumes that the

rate of return of the economic unit of work will operate constantly, where a change in input will produce the same change in output. This model has the assumption that the economic work unit operates at an optimal value, so it does not affect the efficiency of the production value (Cooper et al., 2006). DEA Model Variable Return to Scale (VRS), when all economic work units are measured, will have a distribution over all outputs where each economic work unit is considered to work in various rates of return. The model assumes that the production value can affect the efficiency and productivity achieved. One of the factors that influence VRS technology is that it allows production scale to affect efficiency.

According to Hasan et al. (2018), in comparison with other approaches, the DEA is a superior method to measure productivity. It is not only able to recognize the input or output of the DMUs using as a reference to discover the sources of inefficiency (Omar et al., 2006), but it also considers all inputs or outputs, differences in technology, capacity, competition, and demographics to measure efficiency. It then compares the level of efficiency of a DMU with the best-practice (efficiency) frontier among the investigated DMUs.

2.4. Savings and credit cooperatives (SACCOs)

Cooperative is an association of people voluntarily to meet common economic, social and cultural needs and aspirations through jointly owned and democratically controlled enterprises (International Labour Organization Recommendations No. 193). International Cooperative Alliance explained that cooperatives, as enterprises based on values and principles, put fairness and equality first, allowing people to create sustainable enterprises that generate long-term jobs and prosperity. A Saving and Credit Cooperative (SACCOs) is a cooperative whose members consist of people who have a direct interest in savings and credits. One of the goals of a savings and credit cooperative is to make it easier for its members to obtain loans with low interest rates (Da Silva et al., 2017; Thomas & Faruq, 2017; Mmari & Lebitso, 2019). The main activity of savings and credit cooperatives is to provide credits to their members. However, it cannot be denied that the provision of loans is filled with uncertainty and always contains risks that must be faced.

2.5. Cooperative health

Cooperative health assessment is the result of a quantitative assessment of various aspects that affect the condition of a cooperative, namely, capital, quality of productive assets, management, efficiency, independence and growth, liquidity and identity of cooperatives. Cooperative health assessment is regulated in the Regulation of the Minister of Cooperatives and Small and Medium Enterprises of the Republic of Indonesia Number 15/Per/ M.KUKM/IX/2015 concerning Savings and credits by Cooperatives Article 31. In implementing the regulation for cooperative, explained which aspects of the cooperative health assessment, namely in the Regulation of the Deputy for Supervision of the Ministry of Cooperatives and Small and Medium Enterprises of the Republic of Indonesia Number 06/Per/Dep.6/IV/2016 concerning Guidelines for Health Assessment of Savings and credits Cooperatives (SACCOs) and Cooperative Savings and credits Units (USP). The purpose of the cooperative health assessment is the realization of a healthy management of the SACCOs and USP of the Cooperative in accordance with statutory regulations.

The scope of the cooperative's health assessment is capital, productive asset quality, management, efficiency, liquidity, independence and growth, and the identity of the cooperative. The results of the cooperative health assessment (x) were categorized into four groups, namely healthy ($80.00 \leq x < 100$), quite healthy ($66.00 \leq x < 80.00$), under supervision ($51.00 \leq x < 66$), and under special supervision ($0 < x < 51.00$). This study did not use these four categories but employed two categories to facilitate justification, namely that a cooperative is said to be healthy if it has a score of ≤ 80 and is said to be less healthy if it has a

score of < 80 .

2.6. Previous research

Analysis of the efficiency of savings and credit cooperatives has been carried out extensively in previous studies. However, most studies only focus on their efficiency without any deeper analysis. An analysis of cooperative efficiency using Data Envelopment Analysis with output oriented found that 40 % of cooperatives are efficient with the Variable Return to Scale assumption and 21 % efficient with the Constant Return to Scale assumption (Xaba et al., 2018). The study also found that the size of the cooperative is more important than the location of the cooperative. Smaller cooperatives in the Italian northern region show greater inefficiency (Forleo et al., 2018). Furthermore, technical efficiency analysis and profitability analysis were carried out on cooperatives in Mpumalangan, South Africa. The analysis found that not all cooperatives achieved technical efficiency and only 10 % were profit-efficient. The conclusion states that not all technically efficient cooperatives are profitably efficient, therefore management needs to re-evaluate cooperative activities in order to achieve technically efficient and profitable cooperatives (Xaba et al., 2018).

The efficiency of savings and credit cooperatives on eleven savings and credit cooperatives in Jakarta found that only four cooperatives were efficient and the rest still required improvement (Sudarmadji & Sendarti, 2019). Kaswanto (2018) conducted research on the Village Unit Cooperative in Madiun, Indonesia in several stages. Firstly, the efficiency of the cooperatives being studied is still low, so that adjustments to the input and output are needed to make it efficient. Secondly, Kaswanto (2018) analyzed the factors that influence the efficiency level of the cooperatives. It was found that the age of the head of management, the education of the chief supervisor, and the experience of the manager have a significant effect on the efficiency level of the KUD. Furthermore, the factors that affect the residual income of the cooperative's business are the number of members and the amount of business volume. Syamni and Abd Majid (2016) found that if cooperatives desire to be consistently efficient, they need to provide sufficient additional input both from their own capital and from external capital to produce better output so that cooperatives can be consistent in efficiency. The factors that have a positive significant effect on cooperative efficiency are size and the number of service points (Martínez-Campillo & Fernández-Santos, 2017). Another study suggests that the factors which have a significant effect on cooperatives' efficiency are the number of members, percentage of female members, age, size, deposit to loan ratio, operational self-sufficiency, average deposit per balance per depositor, gross loan portfolio, income, return on assets, and gross loan portfolio to total assets (Duguma & Han, 2020). It is also mentioned that although capital, employees, business volume, and management system are very important in running a cooperative, cooperative members are the most important asset in cooperatives (Zeuli & Cropp, 2004).

Research by Nur Imamah (2019) on efficiency in Sharia SACCOs Tamzis Bina Utama in the three years 2015, 2016 and 2017, showed that the efficiency was around 0.8. The model used was the CCR assumption of CRS (Constant Return to Scale) with the input variables, namely savings, operating expenses, and capital, while the output was financing. Ramadhani et al. (2020) conducted the same research regarding the efficiency of five Baitul Maal Wa Tamwil (Sharia Cooperatives) with input variables, namely, operational-financing costs, salary costs and fixed assets. Meanwhile, the output variable consisted of liquid assets, total financing and revenue sharing. The results showed that of the five BMTs, there are still those that have not reached 100 % efficiency, so it is still necessary to improve their performance.

In other research, Othman et al. (2014) conducted an analysis of the efficiency of cooperatives and their determinants in Malaysia. The results of the analysis of 56 cooperatives were that only 19.6 % of cooperatives achieved efficiency. Then for the results of the factors that

affect efficiency with tobit regression, it was found that the variables of turnover, profit and capital of cooperatives had a significant effect on the technical efficiency of cooperatives. Similar research was conducted by Krasachat and Chimkul (2009) on the efficiency of agricultural cooperatives in Thailand. The average technical efficiency obtained was 0.725. The findings of Marwa and Aziakpono (2016) are that savings and credit cooperatives in Tanzania are technically inefficient and suggest reducing waste and utilizing inputs more efficiently to increase efficiency. Duguma & Han (2018) showed that among the deposits mobilization variables, the ratio of savings to loans, the ratio of savings to total assets, the volume of deposits, and the current demand ratio have a significant direct effect on financial sustainability. Furthermore, another study by Daniel (2017), based on data analysis, stated that savings and credit cooperative societies' governance plays a major role in improving key performance such as growth, savings, income, loans, and dividend rates. A similar study states that the variables of asset return, operational efficiency, debt equity ratio, donations, and savings mobilization have a statistically significant effect in determining SACCO's financial self-sufficiency. Financial self-sufficiency, size, debt equity ratio and donations are statistically significant predictor variables in determining SACCO's outreach performance (Henock, 2019).

Cooperatives that perform well also require good management. Employees who have the appropriate education and skills are an important factor. To engage employees who meet the standards, recruitment and selection must be carried out professionally. The cooperatives aim to obtain competent resources so that they can survive and thrive in the current era. In addition, it is necessary to instill the values and principles of cooperatives to management and in carrying out cooperative activities. To be able to achieve the values and principles of cooperatives, the cooperative movement needs to develop and attract more managers who share their own attitudes and values of cooperatives and who wish to inform their vision for cooperative business with those values (Davis, 2004). This theory is proven by the research of Shakir et al. (2020) which states that by correlation analysis and linear regression, it is found that there is a significant positive relationship between the human capital of cooperative board members and cooperative performance.

3. Methods

This study has three stages of analysis: first, measuring the efficiency level of SACCOS in East Java using the Data Envelopment Analysis (DEA) analysis tool; the second is analyzing the determinants of SACCOS efficiency in East Java using the Tobit, and finally analyzing the determinants of cooperative health by using Logistic Regression. The reason for the use of Tobit regression is the independent variable using censored variable. Logistics Regression is a statistical analysis method to describe the relationship between the dependent variable which has two or more categories with one or more independent variables on a categorical or continuous scale. This study aimed to determine the relationship between the independent variable and the dependent variable, namely the category of healthy and unhealthy cooperatives. In general, the three formulations have a relation in each other. Value of technical efficiency from DEA analysis using for Tobit regression as dependent variable and using for Logistics Regression as independent variable.

3.1. Population and sample

The population in this study were 5660 savings and credit cooperatives at provincial scale and city/regency scale in East Java (Cooperatives and Small Medium Enterprise Office, 2020). The sampling method used was purposive sampling with the Slovin formula, that is:

$$n = \frac{N}{1 + Ne^2}$$

here:

n = Sample size.

N = Population size.

e= Desired critical value (percentage of tolerance from the inaccuracy due to population sampling error).

Based on the formula above with population 5660 and using critical value (e) of 10 %, the minimum number of samples needed is 98. Due to limited research time, the locations surveyed were 14 out of 38 cities and regencies in East Java Province with 178 respondents. The 14 regions were chosen because they represent the entire number of cooperatives in East Java Province. Data was obtained through in-depth interviews with Savings and Credit Cooperatives at provincial scale and city/regency scale in East Java from September to November 2020.

3.2. Data envelopment analysis

DEA is a data-oriented approach to assess the achievement of an entity called the Decision Making Unit (DMU) using mathematical programming techniques. Technical efficiency measurements using DEA can be made based on input or output oriented measurements. In this study, DEA is used to measure the performance or efficiency of the 178 SACCOs (conventional and sharia). The variables used in the Data Envelopment Analysis are presented in Table 1.

3.3. Tobit regression

The Tobit regression model is used to determine the relationship between the independent variable and the dependent variable. Tobit regression has a dependent variable in the form of censored data (Tobin, 1958). This study uses Tobit regression to determine the factors that affect the efficiency of Savings and Credit Cooperatives (conventional and sharia) in East Java Province.

3.4. Logistic regression

Logistic regression is a method used to model categorical dependent variables (nominal/ordinal in scale) based on one or more independent variables which can be categorical or continuous (interval/ratio scale) (Hosmer & Lemeshow, 2000). In this study logistic regression is used to determine the determinants of the health of Savings and Credit Cooperatives.

Table 1
Research Variables to Calculate Efficiency with Data Envelopment Analysis.

Variable	Definition	Unit
Output:		
SHU	The remainder of the cooperative's operating results from cooperative's income obtained in one financial year minus costs, depreciation and other obligations including taxes in the relevant financial year	Rupiah
Input:		
Capital	Total Capital of the Cooperative	Rupiah
Operating costs	Cooperative operational costs include employee salaries, building rental costs, electricity costs, administrative costs, and other costs that support cooperative operations	Rupiah
Number of Employees	Total Employment	Person
Business Volume	The amount of loans disbursed (products from cooperatives which will later provide interest benefits for cooperatives)	Rupiah
Number of Members	Number of Cooperative Members	Person

4. Results and discussion

4.1. Data envelopment analysis

Data on cooperatives in other countries exist but this study only focuses on case studies in East Java, Indonesia, because East Java is the province that has the highest number of cooperatives in Indonesia (Indonesia Central Bureau of Statistic Indonesia, 2021). The data obtained in this study were from 178 respondents from a random sample of Saving and Credit Cooperatives (SACCOs) in East Java. The data envelopment analysis method used was based on the orientation of the input. This is based on the fact that Saving and Credit Cooperatives is an organization whose saving and credit activities are limited to its members, where consumers will only increase if there are additional members of the cooperative. Thus, the assumption used is that the output obtained by the Saving and Credit Cooperatives is considered to be given. On the other hand, the input used by the Saving and Credits Cooperatives is adjustable. (Tables 2 and 3).

Saving and Credit Cooperatives is a cooperative whose members consist of people with a direct interest in saving and credit (Chuku & Ndanshau, 2016). One of the goals of Saving and Credit Cooperatives is to make it easier for its members to obtain loans with low interest rates (Da Silva et al., 2017; Thomas & Faruq, 2017; Mmari & Lebiso, 2019). The main activity of Saving and Credit Cooperatives is to provide loans to their members based on trust. However, it cannot be denied that the provision of loans is filled with uncertainty and always carries risks that must be faced. The calculation of the efficiency of the cooperative is required as a control function in the performance of saving and credit activities (Sudarmadji & Sendarti, 2019). Results of statistical computation efficiency savings and credit activities by savings and credit cooperatives in East Java are presented in Table 4.

The results of the DEA SACCOs calculation in East Java show that the average technical efficiency with the assumption of VRS (TE DEA - VRS) is 0.65 with an efficiency range of 0.02–1. This efficiency value shows that the average performance that can be achieved by SACCOs with existing technology is 65 % of the maximum potential yield. The average gap between the performance of the best SACCOs and other SACCOs is around 35 %. Thus the performance achievement of the SACCOs in East Java could still be increased by 35 % to achieve its maximum potential yield. Meanwhile, based on the CRS assumption, savings and credit cooperatives in East Java only show an average performance of 42 %, so that performance still needs to be increased by 58 % to achieve maximum results.

The distribution of SACCOs' technical efficiency in East Java is divided into nine classes as presented in Fig. 1 which shows the distribution of technical efficiency based on the assumption of input-oriented VRS. Savings and Credit Cooperatives that were declared 100 % efficient (TE = 1) were 38.7 % of the total respondents or as many as 69 cooperatives. There are 61.3 % Savings and Credit Cooperatives that are declared not technically efficient. There are as many as 45 % of cooperatives that have an efficiency range between 0.02 and 0.61 while

Table 2
Variables for Tobit regression analysis.

Code	Variable	Definition
Y	Cooperative Technical Efficiency	Cooperative efficiency obtained from the DEA analysis
X ₁	Cooperative assets	Asset owned by the cooperative (Rupiah)
X ₂	Loan interest	Cooperative loan repayments (%)
X ₃	Loan term	Loan repayment period (Years)
X ₄	Manager's Age	Cooperative Manager Age (Years)
X ₅	Gender Manager	Gender Cooperative manager
X ₆	Employee age	Cooperative employee age (years)
X ₇	Type of Member's Business	Type of cooperative member business 0: SMEs and employees 1: Employees

Table 3
Variables for Logistic regression analysis.

Code	Variable	Definition
Y	Cooperative Health	A cooperative is healthy if it has a cooperative health value of more than 80, and less healthy if it has a value less than 80
X ₁	Have a Manager	Manager's ownership in the cooperative 0: No manager 1: There is a manager
X ₂	Management meeting frequency	The number of meetings held by the board
X ₃	Cooperative technical efficiency	Cooperative efficiency obtained from the DEA analysis
X ₄	Cooperative NPL	Non Performance Loan (%)
X ₅	Cooperative age	Age of cooperative (years)
X ₆	Principal saving	Total principal savings of cooperatives (Rupiah)
X ₇	Mandatory savings	Total mandatory savings of cooperatives (Rupiah)
X ₈	Loan average	Cooperative member average loan (IDR)

Table 4
Technical efficiency of savings and loan cooperatives in East Java.

	N	Mean	Min	Max	Standard Deviation
TE DEA - VRS	178	0.65	0.02	1	0.34
TE DEA - CRS	178	0.42	0.001	1	0.33

only 16.3 % of cooperatives have an efficiency range between 0.62 and 0.99. This shows that most of the Savings and Credit Cooperatives in East Java are not technically efficient.

As many as 61.3 % of savings and credit cooperatives in East Java still need to improve their performance in order to achieve their maximum potential yield. Based on the results of the DEA analysis with the input orientation assumption, it is found that Savings and Credit Cooperatives in East Java can increase efficiency by minimizing input costs, namely internal and external capital, operational costs, and the number of workers. Table 5 shows that operational costs are a type of input that needs to be minimized more than other inputs. Operational costs need to be minimized by 62 %, while internal and external capital inputs need to be minimized by 46 % in order to reach a cooperative efficiency point. In addition, the number of workers also need to be reduced by as much as 42 % because in this case the employment of less productive employees can hinder the performance of the cooperative. So it can be said that to increase efficiency in savings and loan cooperatives it is necessary to reduce waste and optimally utilize inputs (Marwa & Aziakpono, 2016).

4.2. Tobit regression

The next analysis is to determine the factors that affect the efficiency of Savings and Credit Cooperatives in provinces and districts/cities in East Java. The method used is Tobit regression because the Y variable is ranges from 0 to 1. The results of the analysis that have been carried out using the variables in Table 2 can be seen as follows.

Based on Table 6, it can be seen that from the simultaneous test, the Likelihood Ratio value is 74.78 with a probability of 0.000. This means that simultaneously at least one independent variable has an effect on the dependent variable with a significance level of $\alpha = 0.1$. Furthermore, by partial test, there are four significant variables at $\alpha = 0.1$ from a total of seven independent variables. The significant variables were interest (0.052), loan term (0.000), manager's age (0.029), and type of business (0.008).

The loan interest has a significant negative effect on efficiency, which means that if the interest/service of the cooperative is lower, it will increase the efficiency of the cooperative by 0.12 units, and vice versa if the interest/services increases, the efficiency of the cooperative will decrease by 0.12 units. High interest rates reduce the demand for

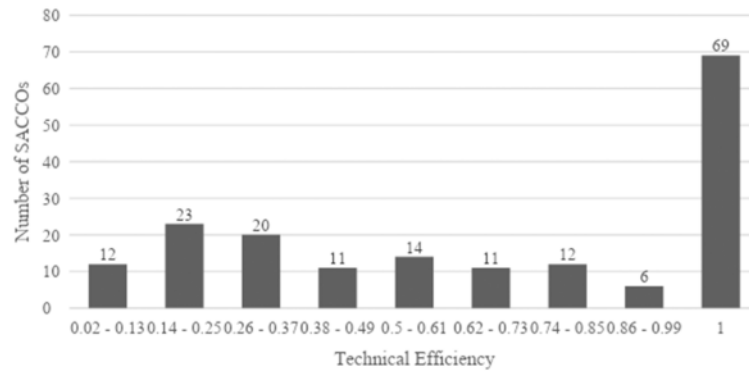


Fig. 1. Distribution of technical efficiency saving and credit cooperatives in East Java, Indonesia.

Table 5
Actual Inputs and target inputs average of savings and loans cooperatives in East Java.

	TOTAL		
	Actual	Targeted	Input Target (%)
Capital	5,779,383,691	3,129,549,916	-46
Operational cost	1243,157,879	466,460,258	-62
Number of members	2282	1523	-33
Number of employees	24	14	-42

Source: Data analysis.

Table 6
Tobit regression analysis results.

Variable		Dy/dx	Standard Error	Z-Statistics	Prob
Constant	C	1.264	0.318	3.98	0.000
Asset	X1	5.45e-07	7.40e-07	0.74	0.463
Interest / Services	X2	-0.12	0.063	-1.96	0.052
Loan Term	X3	-0.04	0.006	-6.46	0.000
Manager's Age	X4	0.01	0.005	2.21	0.029
Manager gender	X5	-0.04	0.079	-0.47	0.639
Employee Age	X6	-0.003	0.007	-0.48	0.636
Type of business	X7	-0.21	0.079	-0.269	0.008
LR				74.78	0.000
Log Likelihood				-65.935	
Pseudo R2	0.3619				

* Significant at $\alpha = 10\%$.

Source: Data analysis.

working capital financing in cooperatives (Mutomimah, 2014; Oluwasanya et al., 2020). High loan interest/services will cause people to choose other cooperatives that have lower loan interest rates because they will ease the loan burden. This is in accordance with research conducted by Hanjisi and Simba (2016) which states that the increase in interest rates on short-term and long-term loans has reduced organizational performance in the cooperative sector. This is different from deposit interest which has a positive performance for the organization. The loan term variable has a significant negative effect on the efficiency of the cooperative, which means that if the loan term is shorter or decreases, the efficiency of the cooperative will increase by 0.04 units and vice versa. This result is in line with the research of Kinasih (2018)

which states that the loan repayment period (loan term) has a significant negative effect. The shorter repayment period will reduce the chance of bad credit. It should be noted that cooperatives have short repayment periods, especially cooperatives with members who have jobs in agriculture and livestock. They borrow before the growing season and return it after the harvest (Ganc, 2020).

The next variable is age of the manager, which has a significant positive effect on the technical efficiency of the cooperative. If the cooperative has a manager who is ageing, it will increase the efficiency of the cooperative by 0.01 units, but on the contrary if the age of the employee is younger then the efficiency of the cooperative will be higher. However, in this research employee age is not significant to Saving and Credit Cooperative efficiency. This is in accordance with the results of research conducted by Kaswanto et al. (2018) which states that the age of managers has a positive effect on the efficiency of cooperatives. The older manager has greater experience so that the ability to manage cooperatives is better. Managers must have the ability and experience to instill the principles and values of cooperatives to ensure that cooperatives survive in their business (Davis, 2004; Shakir et al., 2020; Yitayaw, 2021).

The last is the type of business variable, which has a significant negative effect on the technical efficiency of the cooperative. This means that if the cooperative members' businesses are MSMEs and employees, the efficiency of the cooperative will increase by 0.21 units, whereas if the cooperative members are employees, the cooperative efficiency will decrease. Based on the results of the survey in this study, if the member is the owner of the MSMEs, it will use the loan for production activities so that it becomes productive credit. These results are also in accordance with research conducted by Grashuis (2019). Meanwhile, if the cooperative members are employees, the use of credit is for consumptive credit.

The asset variable does not have a significant effect on the technical efficiency of savings and credit cooperatives. This is in line with Mawarati (2016) where assets have no influence on technical efficiency because in most cooperatives the assets owned are the cooperative building itself, where the building is not functioning as an active asset. Even though it is used as an operational building, the income earned from the building is not from renting the building costs but from cooperative operations. There is no additional income from the building, for example, such as from renting it as a meeting place, but operational costs continue to be incurred. The bigger the building, the greater the operational costs. The next variable that does not have a significant relationship to the efficiency of savings and loan cooperatives is the gender of the manager, because all countries in the world emphasize gender equality in all fields, including cooperatives. This is in accordance with the steps that have been implemented by the Spanish government regarding the equality law (Organic Act 3/2007, of 22 March) which

guarantees equal treatment and opportunities for women and men in every sphere of life (Hernández-Nicolás et al., 2019; Meliá-Martí et al., 2020).

4.3. Logistic regression

The next analysis stage in this study is to determine the factors that affect the health of Savings and Credit Cooperatives using logistic regression. Cooperative health assessments have been carried out by the Cooperative Office beforehand so that data analysis of factors that affect the health of Savings and Credit Cooperatives can be carried out immediately. Following are the results of the logistic regression analysis of the factors that affect the health of the cooperative.

Based on the Table 7, it can be seen simultaneously that the chi square probability value is $0.000 < \alpha$ (10 %), which means that at least one independent variable has an effect on the dependent variable, namely the health of the cooperative. Furthermore, in the partial test with $\alpha = 10\%$, four of the eight variables have a significant effect on the health of Savings and Credit Cooperatives. The significant independent variables are the frequency of management meetings (0.088), age of the cooperative (0.036), fixed deposits (0.01), and the average loan (0.099).

The variable of management meeting frequency has a significant positive effect on the health of the cooperative, which means that more frequent management meetings will increase the health of the cooperative by 1.027 units and vice versa. Cooperative members have the highest authority and have the right to appoint and dismiss administrators and supervisors (Maria et al., 2019). Administrators and supervisors are required to account for their work in the management meeting, so that holding management meeting is one of the important things in opening access to transparency that leads to improving the health of cooperatives.

The age of the cooperative has a significant negative effect on the health of the cooperative, which means that the younger the cooperative is, the health of the cooperative will increase by 0.968 units. This is not in line with research conducted by Fanasch and Frick (2018); young cooperatives can improve cooperative performance because young cooperatives reduce or avoid moral hazards and adverse selection and have better management. The fixed deposits variable has a significant positive effect on the health of the cooperative, meaning that the greater the fixed deposits, the health of the cooperative will increase by 1.007 units, and vice versa, in line with the research of Suskaniah et al. (2015). The fixed deposits of cooperatives include their own capital from cooperatives, as in the research of Winarko (2014) which states that cooperative's own capital can increase the cooperative income. According to Sitio and Tamba (2001), the higher the participation of the members,

the more benefits the members will receive. The participation of members here can be in the form of fixed deposits that are paid up and become their own capital for the cooperative. The next variable, namely the average loan has a significant positive effect on the health of the cooperative, which means that the greater the average loan, the more the health of the cooperative is increased by 1.058 units. This reflects the research of Ayuk and I Made (2013) and Kefi (2019), namely the amount of loans affects the SHU of the cooperative. The remainder of the business results is one that is used in calculating the cooperative health assessment indicators (Ministry of Cooperatives and MSMEs).

Variables that do not have a significant relationship to the health of cooperatives are manager, efficiency, cooperative NPL, principal saving and mandatory saving. Manager does not have a significant relationship with the health of cooperatives because governance is carried out from members, by members and for members (Fauzi & Marwansyah, 2018), meaning that cooperatives are joint ventures that are managed together, so the presence or absence of a manager has no effect.

5. Conclusions and suggestions

In this study using three analytical tools, the first using DEA to measure the level of institutional efficiency of cooperatives, the results obtained are the average performance that can be achieved by savings and loan cooperatives in East Java with existing technology is 65 % of the maximum potential return. There are 61.3 % of savings and loan cooperatives that are declared technically inefficient. This shows that most of the savings and loan cooperatives in East Java are not yet technically efficient. Furthermore, the analytical tool used, namely Tobit, is used to analyze the factors that influence the level of technical efficiency of savings and loan cooperative institutions in East Java, including interest, loan term, age of management, and type of business, while the interest variable, type of business and time period loans are negatively related to the level of technical efficiency of savings and loan cooperative institutions in East Java. The level of technical efficiency of the business status of MSMEs members is higher than the status of employee members. This happens because cooperatives with MSMEs members use the credit they obtain for additional working. capital and increase business income. Meanwhile, cooperatives with employee members use the credit they receive for consumption. The variables of assets, manager's gender and the average age of employees do not have a significant effect on SACCO's technical efficiency. In addition, the selection of the board should be a major concern for SACCO because managers who have the skills and instill the principles and values of the cooperative will be able to lead the cooperative to achieve its vision and mission. The Logistic Regression, which is used to analyze the factors that affect the health of cooperatives. The result is that the variable frequency of management meetings, fixed savings, and average loans have a positive effect on the health of cooperatives, while the age of the cooperatives has a negative effect on the health of cooperatives. Meanwhile, the management variables, technical efficiency, NPL, and mandatory savings have no significant effect on the health of the cooperative.

Cooperatives in East Java have not yet produced financial reports that can be accessed by the public, either directly or through the website. Thus, scientific studies on cooperatives cannot be carried out in depth by university researchers because of limited data. This study may only be concentrated in government circles which tend to be less skilled in producing in-depth analysis using various econometric methods. Therefore, the government needs to immediately formulate a policy so that cooperatives provide clear and responsible information about financial reports and other matters related to Savings and Loans Cooperatives. Thus, cooperative studies can be carried out comprehensively and research results can be applied more broadly.

In addition, the government needs to provide a more in-depth evaluation of cooperatives so that better organizational management can be formed. The evaluation of cooperatives can be continued in the form of

Table 7
Logistic regression analysis results.

Variable	C	Odds Ratio	Standard Error	Wald	Prob
Constant	-0.812	0.444	0.538	2.279	0.131
Manager	-0.285	0.752	0.368	0.603	0.438
Management Meeting Frequency	0.027	1.027	0.016	2.907	0.088
Efficiency	0.614	1.847	0.526	1.363	0.243
NPL	-0.003	0.997	0.027	0.017	0.897
Cooperative Age	-0.032	0.968	0.015	4.404	0.036
Principal saving	0.007	1.007	0.003	6.609	0.010
Mandatory saving	0.000	1.000	0.000	0.547	0.460
Average Loan	0.056	1.058	0.034	2.729	0.099
Chi Square	41.325				0.000

* Significant at $\alpha = 10\%$.

Source: Data analysis.

revitalization of cooperatives that have been declared unfit for operation, so as to minimize costs for cooperatives that are not feasible but are still operating. Suggestions for further research are to analyze the efficiency of cooperative institutions and their determinants with broader case studies, for example between developing countries.

Funding

This research has been approved and funded by Ministry of Research and Technology of the Republic of Indonesia, decree number 992/UN3.14/PT/2020 and agreement/contract number 648/UN3.14/PT/2020.

Conflict of interest

This research was conducted and approved by the four authors to be published without any conflict of interest. On behalf of all authors, the corresponding author states that there is no conflict of interest.

Data availability

Data is primary data obtained through interviews conducted by the research team. The data is available upon request because it contains confidential information.

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