How the role of ATM technology encourage financial efficiency on Madura villagers?

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Abstract
Nowadays, the necessity and utilization of Automatic Teller Machine (ATM) technologies increase in rural areas. Financial technology became a crucial thing and created efficiency in their activities. Some previous research uncovers technology that could create efficiency in the economy, including financial technology. This paper, interest in investigating and detect how ATM technology establishes financial efficiency on villagers. This research was conducted in rural communities on the island of Madura, Indonesia. This study uses SFA (Stochastic Frontier Analysis) model to estimate technical efficiency. This research found out that ATMs in rural communities on Madura Island produce highly financial efficiency. It proved that the villagers in Madura need ATM technology for carrying out their economic activities.

Keywords: Automatic Teller Machine, Financial efficiency, Stochastic Frontier Analysis, Villagers

JEL Classification: G21, G50, O33

INTRODUCTION

The development of financial technology in Indonesia in the latest decade grows very high. The rapid development of financial technology, one of them is automatic teller machine (ATM) technology. Central Bank of Indonesia was recorded the average number of ATM cardholders during 2019 at 9.3 billion users (according to the report of transaction tool use card).

The development using ATM technology has increased awareness from the Indonesian society to use ATM technology growing fast. The necessity for ATM as supporting economic activities is needed, mainly for the people that stay in the rural area. The rapid technology development, both direct and indirect, also affects the village community's mindset and habits. Formerly, they perform financial transactions by coming directly to the bank, but now they are given easy to perform financial transactions and the bank through atm. The ATM technologies were given to the villagers for ease and smoothness in economic activities.

Wulan (2017) figures out ATM holders, which positively and significantly impact the economy. Liaou et al. (2019) prove that there is the involvement of the internet against financial efficiency. Li et al. (2018) reveal an important role of technological innovations in the industrial sector. If it is associated with this discovery, this can be

concluded technological innovations in the financial sector will also create efficiency. Asongu et al. (2019) uncover the important role of information technology and communication to create financial efficiency. Besides building financial efficiency, financial technology also changes people's mindset, particularly of a village community (Prawirasasra, 2018). Internet used properly also helps to create financial efficiency (Botti et al., 2014). Another research found out financial efficiency also came from good governance and professional treatment of a financial institution (Yobe et al., 2020; Botti, 2014). Even Sufian (2004) revealed that good managerial and governance in financial institutions should produce efficiency.

The research's main focus is to identify and detect the role of ATM technology in financial efficiency for villagers in Madura. Whether with ATM technology give a significant impact on the smooth and convenient activities which Madura villagers do. Whether by financial technology, Madura villagers on their financial activities become more efficient. To prove that question then will be used the Stochastic Frontier Analysis (SFA) method.

LITERATURE REVIEW

Financial efficiency and technology

In these decades, technology became a crucial thing in over the world. Nearly all activities in this world using technology, especially to create efficiency and effectiveness. Technology gives simplicity and smoothness to human activities, primarily financial activities.

Nowadays, the role of technology in finance is very important. Using technology in financial activity would make it more efficient and effective. Saksonova (2017) verified that financial technology does not give satisfaction, comfort, fastness, and security in Latvia Country. That is because Latvia is developing countries and it does not ready through financial technology.

Wulan (2017) found out that financial technology developed in Indonesia, such as credit cards, ATM cards, and computer mainframe banks, has increased significantly. This result has a positive impact on the Indonesian economy. It provides a significant positive impact on the Indonesian economy. Another finding of this study is that Indonesian financial technology still needs technology maturity, resources, users, and regulations.

Different outcomes find that financial technology development negatively impacts the banking industry (Purnomo & Khalda, 2019). In addition to being a barrier to banking, financial technology should also be an opportunity for banks. Financial technology also has social impacts, such as changing the mindset of conventional financial institutions (Prawirasasra, 2018). Another result reveals the need for optimization by intervention regulation to maximize financial technology.

Previous research proved that technology could produce efficiency. The technology injects into the financial sector will build financial efficiency. Liaou et al. (2019) discovered there an impact of the internet on financial efficiency. The internet has a role in promoting regional financial resources and making advanced technology. Li et al. (2018) show innovation in technology which can produce efficiency in the industrial sector, mainly manufacturing.

Similarly, the role of technology in the financial system is very important to build financial efficiency. Information technology and communication positively impacted increasing information and financial transactions in 53 countries in Africa's Continent (Asongu et al., 2019). Their result also discovers that information technology and communication produce financial efficiency, particularly efficiency on financial intermediaries. Using the DEA-Malmquist model, Li and Wu (2016) prove large

fluctuations to financial encourage efficiency.

Financial efficiency is one of the determinants of economic stimulus. Healthy finances were demonstrated by the level of efficiency achieved. Efficiency is also used as a benchmark for the health of financial institutions. Besides technology having an important role in financial efficiency, good governance and professional management have also driven financial efficiency. The oldest financial institution like cooperative becomes more efficient than new cooperative (Yobe et al., 2020). A cooperative or financial institution with long experience tends to have good and professional management. Good governance becomes one of the key successes to create financial efficiency. Botti et al. (2014) suggest that good governance and proper usage of the internet create efficiency in financial reporting. Nourzad (2014) uncovers the development of financial intermediaries and equity markets to increase efficiency. Sufian's (2004) investigation shows a positive and significant relation to financial institutions' non-bank that is more efficient in a managerial manner.

Financial efficiency and rural area

In the modern era, the important role of finance becomes one of the main factors driving the economy at the rural level. The financial role also improves the welfare of villagers—nearly all of their activity depending on the financial sector. Generally, rural areas' people in developed countries are already aware of the financial technologies as a form of financial inclusion.

Nevertheless, in developing countries, financial technologies still lack the facilities and infrastructures that support financial inclusion, so difficult to create. The financial technologies in China, a high level of economic growth, is quite helpful for rural communities, primarily for farming credit (Turvey and Xiong, 2016). Their findings recording more than 2 % farm credit were distributed to the village. Financial products have a more efficient and effective tendency when is given to women (Arnold & Gammage, 2019). Financial products such as the economic empowerment and rescue of the financial institution have effective and efficient when managed by women, particularly in the village (Robert, 2015). Women have a tendency professional in planning and financial management than men, although the income earned is smaller (Tharp et al., 2019). Arestis (2006), using DEA analysis, represents financial deepening and financial development, which positively affects production efficiency.

Stochastic Frontier Analysis (SFA)

Efficiency becomes important in the financial industry. Some previous research finds out efficiency on financial wich comes from technology usage. To detect, identify, and analyze exit or not efficiency on financial uses, the Stochastic Frontier Analysis (SFA) approach measures efficiency value.

SFA is one of the method and analysis instruments to measure the level of efficiency. SFA method built based on regression model theory that Battese & Coelli found in 1992. SFA is linear programming used to measure the performance of an organization's efficiency by using the DMU (*Decision Making Unit*) (Eni et al., 2020). A Decision Making Unit (DMU) is an entity that uses inputs to produce outputs (Hassan, 2018). Another definition of SFA is a statistical analysis technique used to estimate the cost of production function in an economy by considering the inefficiency of companies. This definition and strengthened by Coelli (2005) explain that two types of functions can measure the efficiency with the SFA method, namely the production function and the cost function. The SFA model could be written the equation 1:

$$Q_i = \beta_0 + \beta_1 X_i + v_i - u_i \tag{1}$$

Description:

Q_i : dependent variable (output)

β_0 : constanta
β_1 : coefficient of the independent variable
X_i : independent variable (input)
v_i : normally residual or random factors that cannot be controlled
u_i : technical inefficiency or random factors that can be controlled

METHODS

We are using primary data which can collect directly from Madura villagers. The Sampling technique uses the random sample cluster method, which is randomly generated by area, without any special classification such as social strata, age, education, etc.

The number of samples was 200 respondents, consisting of 50 respondents of each regency in Madura Island (Sumenep, Pamekasan, Sampang, and Bangkalan). Data sources are directly obtained through interviews and refilling of the questionnaires.

The questionnaire question includes two parts: 1) The respondent's identity form of the name, gender, age, and occupation; 2) Instrument efficiency of ATM uses the form of ATM usage period, the use of ATM menu of pin chance, transfer, withdrawal, payment, inquiry. Two other questions are regarding security and the ease of respondents accessing ATM.

This study uses a parametric approach with Stochastic Frontier Analysis (SFA) to detect and analyze the financial efficiency. Estimation of Stochastic Frontier Analysis (SFA) models as in the following equations 3:

$$P_1 = \beta_1 q_1 + \beta_2 q_2 + \beta_3 q_3 + \beta_4 q_4 + \beta_5 q_5 + \beta_6 q_6 + \beta_7 q_7 + \ldots\ldots + \beta_n q_n + E_n \quad \ldots\ldots\ldots\ldots\ldots \quad (3)$$

Description:
P_1 = Log Time Period of use ATM
$q1$ = Log Pin Change
$q2$ = Log Transfer
$q3$ = Log Withdrawal
$q4$ = Log Payment
$q5$ = Log Inquiry
$q6$ = Log Security
$q7$ = Log Access
E_n = error term

Meanwhile, E_n is the *error term* of the function (Zuhroh, 2015). According to Rahaman (2016) E_n is described by Collin's theory which is *error terms* in the SFA model consists of two components as in the following equation 4:

$$E_n = V_t - U_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (4)$$

Description :
V_t = Random factors that cannot be controlled.
U_t = Random factors that can be controlled.

From the equation above, we get an error technical as an efficiency indicator. To measure the level of efficiency, this can be calculated using the value of U_t. U_t , which indicates the efficiency value of the production output. U_t is a level of technical efficiency that has a value between 0 and 1. To simplify the process of analysis, technical efficiency is categorized into three namely:
1. Low efficiency, with a technical efficiency less than 0.5;
2. Medium efficiency, with a limit of technical efficiency of 0.5 to 0.8
3. High efficiency, with a limit of technical efficiency of more than 0.8

RESULTS AND DISCUSSION

Profile of respondents

Various age from respondent's between 25 until 70 years old. The profile exposing respondents' gender consists of 104 (52,00%) males and 96 (48,00%) females. The majority of ATM user is male. It proved that the male role in the family still dominant in finance facilitation rather than female. Madura society is still patriarchal, where males provide and determine a treasury within households.

Based on employment status, 79.50% of respondents worked, and 20.50% were not working (were housewives). Specifically, homemakers became a job and devotion for a woman in the village. In Madura, especially thick with religious teachings, they still believe to be selfless housewives is an obligation that later creates prosperity for their family.

Of the total respondents who are working status, almost half (49.00%) are entrepreneurs. The rest are those who work as government employees, private employees, farmers, and others. It showed that the profession of the majority of villagers in Madura is an entrepreneur. This discovery opens up new information that there is a shift in profession from farmers to entrepreneurs in the village. The development of financial technology also has a significant impact on the change of occupations in the village. Refers to this finding concludes that the average Madura society is an entrepreneur as a majority profession.

Stochastic Frontier Analysis

The equation above is estimated and tested using the Stochastic Frontier Analysis approach. The first result provides a descriptive statistic that is shown in Table 1. Meanwhile, the result estimation of the SFA model uncovers in Table 1. The Stochastic Frontier equation can be rewritten as follows:

$$P_1 = 0.060 \, q_1 + 0.145 \, q_2 + 0.182 \, q_3 + 0.025 \, q_4 + 0.062 \, q_5 + 0.665 \, q_6 + 0.148 \, q_7 - 2.824 - 2.562 \ldots\ldots\ldots(5)$$

Based on the results of the SFA regression, all of the explanatory variables significant to the dependent variable. It is further strengthened by the probability value of Wald Chi-Square 0.000 less than the level of significant 5%. According to the revealed level table of transfer has a significant impact on the period of using ATM level. It is also evidenced by the probability value of z-statistic 0.078 less than 10% significant level. Each increase of 1% on transfer level will rise 0.145% of using ATM period. As well as the level of security has a significant effect on the period of use ATM level. The impact of the level of security is amplified by the probability value of z-statistic 0.000 less than 5% significant level. Rising of 1% on security level will rise 0.665% of Period of use ATM.

Table 1. The estimation of Stochastic Frontier Analysis (SFA)

Independent Variables	Coefficient	z-statistic	P > Z
Log Pin change (Q1)	0.060	0.98	0.329
Log Transfer (Q2)	0.145	1.76	0.078**
Log withdrawal (Q3)	0.182	2.26	0.024*
Log payment (Q4)	0.025	0.38	0.703
Log Inquiry (Q5)	0.062	0.76	0.449
Log Security (Q6)	0.665	7.27	0.000*
Log Access (Q7)	0.148	1.56	0.119
lnsig2v	-2.824	12.62	0.000*
lnsig2u	-2.562	8.90	0.000*
Wald chi^2 (7)	1369.74		
Prob > chi^2	0.000*		

*significant at the 5% level, **significant at the 10% level*

The level of withdrawal has an influence significantly on the period of use ATM. It is enhanced by the probability value of z-statistic 0.024 less than 5% significant level. One percent increase on withdrawal level will increase 0.182% of the period of use ATM level. This discovery reveals that transfers, withdrawals, and security are commonplace by users of ATM technology. Referring to the results of estimating can be concluded that the role of ATM technology as a tool of ease in conducting financial transactions has been proven

Efficiency analysis

The measurement of efficiency score is determined by several classifications (Andhyka, 2017). According to Junaedi (2016) about technical simultaneous efficiency analysis uses the stochastic frontier production function model. The efficiency index value of the analysis results can be categorized as efficient in using production inputs if the value is almost and close to 1. The categories used in research are highly efficient when they have a value of more than 0.90 if its value is between 0.70 to 0.89, which means quite efficient, while the value is smaller than 0.70, which means inefficient.

Table 2 finds out that the average value of the technical efficiency was 0.813. It shows that most users have quite efficient ATM technology that has been used and provided. Furthermore, most (78.00 percent) of ATM users have a technical efficiency value that is highly efficient (value = 0.999) and quite efficient (value = 0.750). Only 22.00 percent of them experienced inefficiency (values 0.499 and 0.249).

Table 3. The average and distribution of technical efficiency value

No	Value of technical efficiency	Description	% respondents
1	0.999	highly efficient	51.50
2	0.750	quite efficient	26.50
3	0.499	inefficient	17.50
4	0.249	inefficient	4.50
	Total		100.00
	Average technical efficiency value = 0.813		

From this evidence can conclude mostly Madura villagers get high efficiency from ATMs usage. ATM technology gives them ease and effectiveness to activity that is related to economic and financial. This result also reinforces that ATM technology significantly affects financial efficiency in rural areas (based on average technical efficiency number 0.813). These findings are supported by previous research, which reveals which the role of banking can create financial efficiency (Steward et al., 2017). The results in this study are in line with research Mishkin and Strahan (1999), which states that the development of financial technology reduces transaction costs and asymmetric information's, improves efficiency in the financial system, and changes the structure of the financial system

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

On average efficiency value of ATM usage, Madura villagers are quite efficient. More than half of ATM users get ease and efficiency from the use of ATM. It provides evidence that ATM technology benefits Madura villagers' financial activities, partially supporting their economy.

This study founds out almost all ATM menus which they often use in conducting financial transactions. The discovery shows that Madura, as an area with low economic growth and minimal social welfare, also requires financial technology to support financial effectiveness and efficiency.

Recommendations

Policymakers should build more ATM facilities, support financial modernization, and facilitate and facilitate rural and remote communities' activities. Theoretically, this research still requires further studies in various places to strengthen the evidence that rural communities need ATM technology. Other research also needs to be carried out to analyze the relationship between the characteristics of rural communities and the need for ATM services.

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