Analysis of Access to Financial Services on Poverty Alleviation with MARS Approach

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A R T I C L E   I N F O

A B S T R A C T

This study aimed to determine the barriers of public access to financial services and their effects on poverty alleviation. The sample used was 6 ASEAN countries (Indonesia, Singapore, Malaysia, Vietnam, Thailand, and the Philippines) from 2006 to 2015. The analytical method used was the MARS. MARS is one of the nonparametric regression methods as an alternative to the multiple linear regression method, which must fulfill parametric assumptions. The results of the study using MARS show that the model formed has a high coefficient of determination, and criteria of the test of the suitability of the model are met. In other words, multivariate adaptive regression spline (MARS) can explain well the variability of the independent variables on the dependent variable. The results of the hypothesis testing using the MARS method show that indicators of macroeconomic, social, bank characteristics, institutions, and regulations affect access to financial services (AFS) and AFS affect poverty alleviation. This finding shows that increasing AFS will affect poverty reduction, and to increase public AFS can be done by minimizing macroeconomic, regulatory, social, bank, and institutional constraints.

A B S T R A K

Penelitian ini bertujuan untuk mengetahui hambatan akses masyarakat terhadap jasa keuangan dan pengaruhnya terhadap pengentasan kemisikinan. Sampel yang digunakan adalah 6 negara Asean (Indonesia, Singapura, Malaysia, Vietnam, Thailand, dan Philipina) pada periode 2006 - 2015. Metode analisis yang digunakan adalah MARS. MARS adalah salah satu metode regresi non-parametrik sebagai alternatif metode regresi linier berganda yang harus memenuhi asumsi parametrik. Hasil penelitian menggunakan MARS menunjukan bahwa model yang terbentuk mempunyai koefisien determinasi yang tinggi dan kreteria uji kesesuaian model terpenuhi. Dengan kata lain, MARS mampu menjelaskan dengan baik variability variabel independent terhadap variabel dependent. Hasil uji hipotesis penelitian menggunakan metode MARS menunjukkan bahwa indikator hambatan makroekonomi, regulasi, sosial, karakterisitik bank, dan institusi mempengaruhi akses terhadap jasa keuangan dan Akses terhadap jasa keuangan berpengaruh terhadap pengentasan kemiskinan. Temuan ini menunjukkan bahwa meningkatnya akses jasa keuangan akan mempengaruhi penurunan angka kemiskinan dan untuk meningkatkan akses access to financial services dapat dilakukan dengan meminimalkan hambatan makroekonomi, regulasi, sosial, karakterisitik bank, dan institusi.

1. INTRODUCTION

Access to financial services has been recognized as one of the important factors supporting poverty alleviation efforts in many countries. A series of literature has proven that increasing people's AFS has a significant influence on poverty alleviation efforts. Increasing public participation in the use of financial services is an important issue on the policy agenda of several developing countries, including Indonesia, which has an underdeveloped banking and financial system and often only wants to serve high-income customers or large companies. This uneven distribution of financial services will hamper the growth and development of many small

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businesses and low-income families (Honohan, 2008; Mookerjee & Kalipioni, 2010).

Based on economic development theory, this reflects a gap in access to finance as a failure in the financial mechanism that will result in inequality of income and slow economic growth. With a good financial system, the poor and SMEs will be able to get out of their savings and income limitations. Thus, they can invest their income from their income in education and take the opportunity to improve their lives (Honohan, 2004).

Financial services are financial institution services, including credit/loan services, saving services, and payment services. With the existence of credit services or credit services from financial institutions for the poor and SMEs, the poor will get funds to start a business, or SMEs will be able to increase the scale of their business with funds obtained from these loans (Bittencourt, 2012). At the same time, savings services will provide a secure service to save income from the business they have done (Honohan 2004).

This study analyzes the barriers to accessing financial services and their influence in alleviating poverty with a sample of 6 ASEAN countries in 2006 - 2015. In analyzing the barriers to accessing the 6 ASEAN countries' financial services, it refers to previous research conducted by Rojas-Suarez (2007), which was later developed by Reinhart et al. (2009).

The barriers indicators used to consist of five categories. First, macroeconomic barriers to financial services are used to see the weak relationship of the macroeconomic environment concerning the population that can access the formal financial system explained by inflation volatility. Inflation volatility can inhibit access to financial services from two perspectives. It decreases people's purchasing power and creates uncertainty about the prices of goods and services. This causes the funds available for savings and investment to decrease (Nocetti & Smith, 2011). High inflation also causes lending rates to rise, making it difficult for people, especially low-income earners, to access credit (Katusiime, 2018). Second, socioeconomic barriers that see barriers from both sides of the supply-demand for financial services described by Social under-development (Rutherford, 1998). Third, inefficiencies are used to see the characteristics of the formal financial system's operation in financial services to households and companies, as explained by Bank Concentration. Bank concentration hurts the amount of credit supplied by banks (Park, 2008). Fourth, institutional deficiencies are used to see the legal quality and performance of a country's

government, as explained by Weak Law. The adaptability of the legal system largely determines barriers to access to finance (Beck et al., 2004). Fifth, the limitations of regulations in financial services that are explained by the Regulatory Obstacle. The government can facilitate access to financial services by improving infrastructure and regulations in the financial sector (Claessens, 2006).

In this research, the definition of access to financial services for low-income people is not measured by how much financial assets they have or how much they borrow credit to a financial institution. However, we see the obstacles that people experience in accessing financial services, including barriers to making credit, deposits, payment transactions, insurance, or other types of financial products (Rojaz-Suarez & Gonzales, 2010). This is now a debate of many economists because almost 10 percent of the adult population in various countries do not have transaction accounts, even though they are only in the form of savings, loans to formal institutions, or insurance.

2. THEORETICAL FRAMEWORK AND HYPOTHESES
Access to Financial Services and Its Determinants
To measure access to financial services (AFS) is closely related to the economic and social development agenda for two reasons. First, several theories and literature demonstrate the importance of a good financial system for the sustainability of economic development and poverty reduction (Beck et al. 2008; Demirguc-Kunt & Peria, 2007; Honohan 2004, Narayan & Narayan, 2013). Schumpeterian sees that the financial system will lead to growth because of the energy of creative destruction through the efficient allocation of resources to new entrants. Therefore, through widening access from external funds, such as credit, newcomers will be able to try and be free from losses that might increase due to their incapacity or limitations (Honohan, 2007). Second, access to financial services can facilitate public access to essential public goods, such as in terms of market-based economy (access to clean water, health services, or base education (Karlan & Morduch, 2010; Peachey, 2004).

In measuring financial stability and efficiency, access to financial services in such a large segment of the population is crucial for economic development. Access to finance is defined as the share of households or entities or companies that can utilize financial services that can impact welfare, which ultimately contributes to alleviating poverty, especially if access to financial services can stimulate

the public to obtain a higher education level (Karlan & Morduch, 2010).

Rojas-Suarez and Gonzales (2009) mention three indicators that can be used to measure access to financial services, namely, first, the ratio of financial depth is defined as a percentage of the number of deposits or loans per GDP. Second, the spread of the banking system, such as bank branches and ATMs. Third, the number of adult people who have accounts in banks. The second indicator is an important indicator but has limited information available. In contrast, for the third indicator, there is no information about the number of people who have accounts in several banks, which will cause misinformation in measuring financial access. Therefore, in this study, the financial access indicator is seen from the first indicator, namely financial depth (percentage of loans per GDP).

Poverty and Access to Financial Service
The cause of poverty and underdevelopment is the issue of accessibility. As a result of the limitations and lack of access, humans have limited choices to develop their welfare, except to carry out what they are forced to do, not what should be done. As a result, humans' potential to develop their lives is hampered (Inoue & Hamori, 2012; Neaime & Gaysset, 2018).

The poverty problems mentioned above are in line with what was stated by Nurske (1950) in his theory of the vicious cycle of poverty, which includes six elements, namely savings, capital, productivity, purchasing power, underdevelopment, and real income which is seen from two points of view, namely demand, and supply. From the perspective of demand, low real income causes low purchasing power, which causes low nutritional conditions, health, education, capital, and infrastructure, resulting in low productivity. Access to finance can reduce poverty and improve clean energy access (Xu et al., 2019).

From the perspective of supply, low real income causes low levels of savings. In other words, most (or all) income is spent on consumption. This situation results in a lack of venture capital, which leads to low productivity (Sehrawat & Giri, 2014).

Framework
This research stems from the importance of access to financial services to alleviate poverty in various countries, especially developing countries such as ASEAN 6, which were examined in this study. Before looking at the impact of financial access on poverty, this study looks at the obstacles that affect financial access in ASEAN 6. This is very important to look at first because of the high barriers to AFS in developing countries. The framework of thought and hypothesis of this study are as follows:
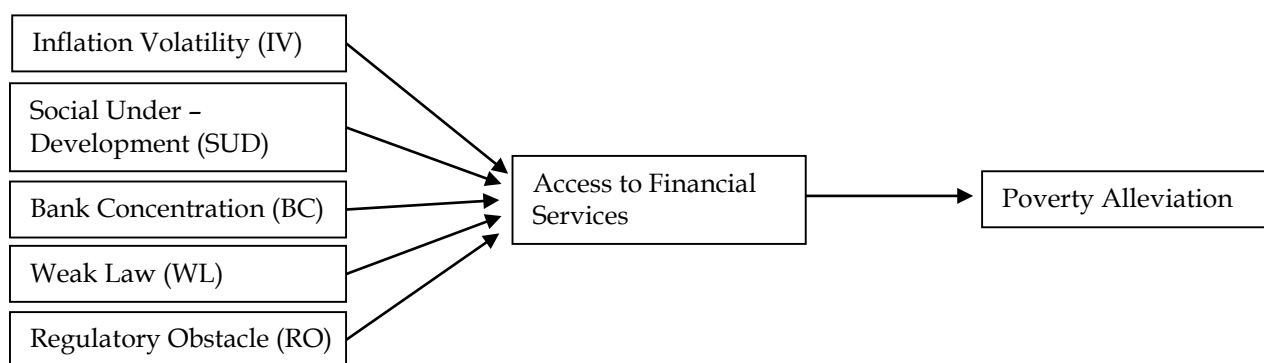

Figure 1. Framework

Research Hypothesis
Based on the background, literature review, and frame of mind that has been made, the research hypothesis can be written as follows:

H_1: Inflation volatility affect access to financial services

H_2: Social under-development affect to access to financial services

H_3: Bank concentration affect access to financial service

H_4: Weak law affect access to financial service

H_5: Regulatory obstacle affect access to financial service

H_6: Access to financial service affect poverty alleviation

3. RESEARCH METHOD

This research is a type of quantitative research, analyzing access to financial services to poverty alleviation and barriers to the public access to financial services in 6 ASEAN countries. The data used in this study is secondary data in the period of 2006-2015. The types of variables, symbols, proxies, and data sources are presented in Table 1.

Tabel 1. Variables Considered in the Empirical Analysis

Type	Symbol	Proxy	Source
Access to financial services	*Fin Access* (FA)	Privat Credit/GDP	World Bank, World Development Indicators
Macroeconomic Variables	*VolInf* (VI)	Deviation standard of the inflation rate	IFS - IMF
Social Variables	*Social Under Dev* (SUD)	1 minus value of Social Human Development Index	Human Development Report - UNDP
Banking Conditions	*BankCon* (BC)	Bank capital to assets ratio (%)	World Development Indicators(WDI)
Institutional Variables	*Weaklaw* (WL)	100 minus value of the Rule of Law	World Governance Indicators (WGI)
Regulatory Variables	*Regulatory Obst* (RO)	10 minus value of Legal Right Index	Doing Business
Poverty	*Poverty* (PV)	Value of Human Poverty Index	Human Development Report
GNI per Capita	*GNI per cap* (GPC)	GNI per capita	World Governance Indicators (WGI)
Population	*Population* (P)	Population rate	World Governance Indicators (WGI)
Inflation	*Inflation* (I)	*Inflation rate*	IFS - IMF

Source: Processed Data

The data analysis method in this study uses MARS. MARS is one of the nonparametric regressions that requires the classic assumption test as in multiple linear regression. The multivariate adaptive regression spline model is useful for overcoming high-dimensional data problems (Hastie et al., 2008). Besides, the multivariate adaptive regression spline model also produces accurate dependent variable predictions and produces a continuous model in knots based on the smallest generalized cross-validation (GCV) value (Friedman, 1991). The best multivariate adaptive regression spline model is obtained by combining the maximum number of base functions (BF), that is, 2x, 3x, and 4x the number of independent variables. The maximum number of interactions used in this study is 1, 2, and 3, considering if more than three will produce a very complex model. The minimum observation between knots is 1,2, and 3. The best model selection is obtained based on the smallest GCV value and the smallest mean square error (MSE) value (Friedman, 1991).

4. DATA ANALYSIS AND DISCUSSION

Descriptive analysis is the initial stage of data exploration carried out to get a general picture of the data used in a study. The following graph shows the phenomenon of access to financial services and the poverty index of 6 ASEAN countries (Indonesia, Malaysia, Philippines, Singapore, Thailand, Vietnam) for the period 2006 - 2015. Descriptive analysis in this study is illustrated in Figure 2 and Figure 3.

Figure 2. Access to Financial Services ASEAN-6

Figure 2 informs that access to financial services in ASEAN-6 shows that Singapore has the best access to financial services compared to 5 other ASEAN countries. A low poverty index can support good access to financial services in a country.

Figure 3 shows the value of the Singaporean poverty index having the smallest poverty index. Based on Figure 2 and Figure 3, it can be illustrated that the average life expectancy of the Singaporean community is better than that of the other 5 ASEAN countries.
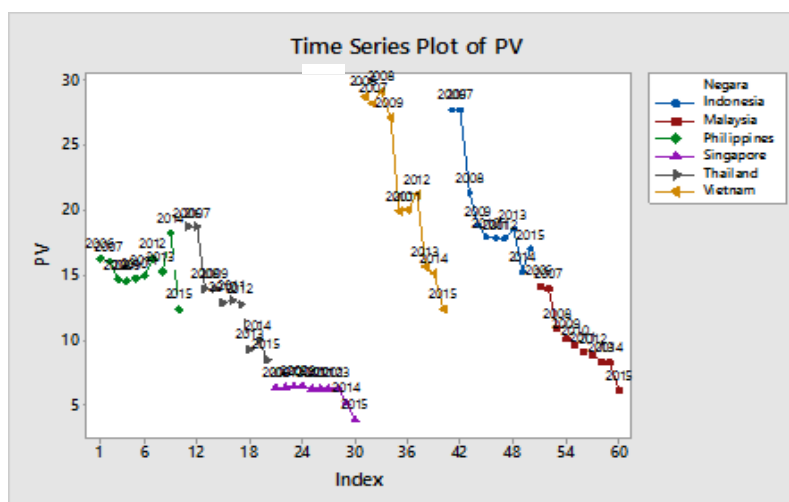
Figure 3. Poverty index of ASEAN-6

The next step of analysis that will be carried out in this study is to make a plot between the dependent variables with the five independent variables to find out whether there is a pattern of relationships between the dependent variables and the five independent variables. The Plot matrix that shows the pattern of the relationship of the five independent variables to the dependent variable is as follows:
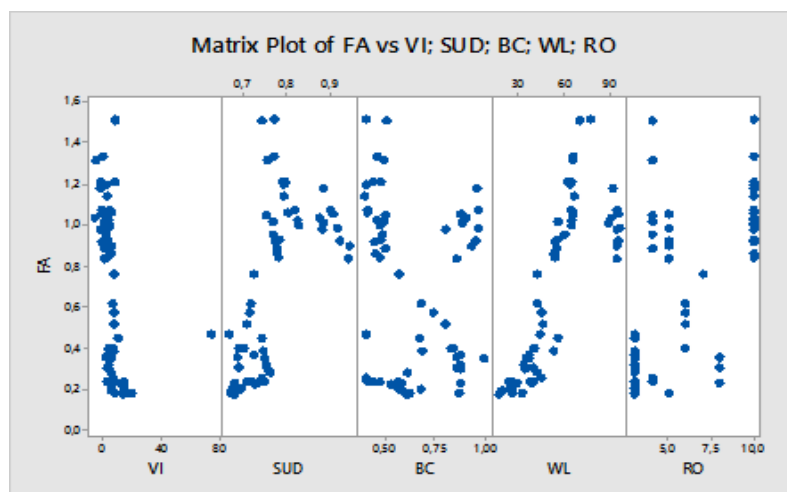
Figure 4. Matrix Plot Access to Financial Services

Figure 4 informs that the results of the Weak Law, Bank Concentration, Regulatory Obstacle, Social Under-Development, and Inflation Volatility variable plot on access to financial services do not form a certain pattern. One of the influence test methods that do not require a certain pattern on the relationship of independent variables to the dependent variable is the nonparametric regression analysis method. One of the nonparametric regressions used in this study is a multivariate adaptive regression spline (MARS).

Figure 5 informs that the results of the GNI per capita (GPC), Private Credit (PC), Inflation rate (I), and Population rate (P), access to financial services

(FA) plot against Poverty (PV) do not form patterns certain. One method of testing the effect that does not require a certain pattern on the relationship of independent variables to the dependent variable is the nonparametric regression analysis method. One of the nonparametric regressions used in this study is a multivariate adaptive regression spline (MARS). The unclear pattern of the relationship between the dependent and independent variables is the basis of using nonparametric regression to model the data. The non-metric regression approach used in this study is the Multivariate Adaptive Regression Spline (MARS), one of the accurate nonparametric models.
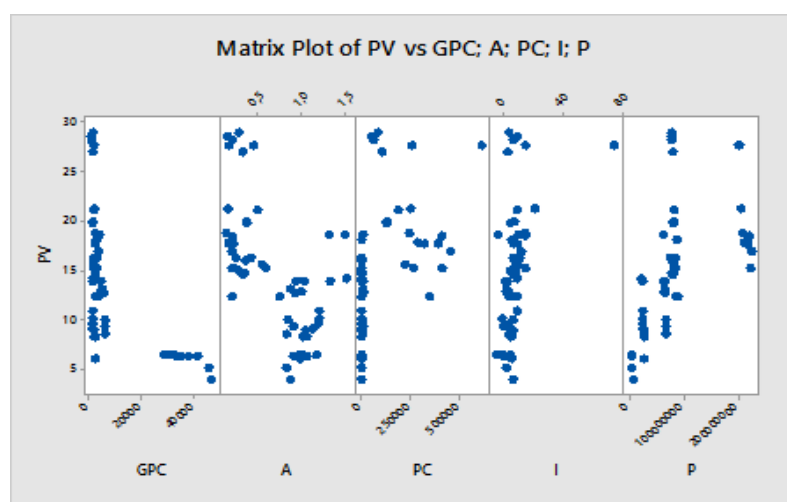
Figure 5. Matrix Plot Poverty index

The stage of forming the MARS model is done by a combination of the maximum number of Base Functions (BF), Minimum Observation (MO), and Maximum Interaction (MI) between knots to obtain an optimal model with minimum Generalized

Cross-Validation (GCV). According to Friedman (1991), who advocates choosing a maximum number of base functions by 2 to 4x the number of independent variables, the base functions (BF) used are 2x, 3x, and 4x the number of independent

variables. MI used in this study is 1, 2, and 3. Because if there are more than three interactions, it will lead to a very complex interpretation of the model. MO used is 0, 5, 10, 20, so that a minimum Generalized Cross-Validation value is obtained (Sutikno, 2008). Determine the best model of the combination of possible Base Functions (BF), Minimum Observation (MO), and Maximum Interaction (MI) values with minimum GCV (Generalized Cross-Validation) value criteria and parameter estimation. The criteria for selecting the best model are to compare the minimum GCV (Generalized Cross-Validation). If it has the same value, it can be seen by considering the smallest MSE (mean square error) value. The test result with the MARS method is presented in Table 2.

Table 2. BF, MO and MI Access to Financial Services

BF	MO	MI	GCV	MSE	BF	MO	MI	GCV	MSE	BF	MO	MI	GCV	MSE
	0	1	0,017	0,014		0	1	0,018	0,014		0	1	0,018	0,014
	5	1	0,017	0,014		5	1	0,018	0,014		5	1	0,018	0,014
	10	1	0,019	0,014		10	1	0,019	0,014		10	1	0,019	0,014
	20	1	0,048	0,034		20	1	0,057	0,034		20	1	0,069	0,034
	0	2	0,019	0,014		0	2	0,021	0,009		0	2	0,020	0,009
10	5	2	0,019	0,014	15	5	2	0,017	0,010	20	5	2	0,022	0,019
	10	2	0,022	0,014		10	2	0,021	0,013		10	2	0,022	0,013
	20	2	0,029	0,023		20	2	0,030	0,023		20	2	0,030	0,023
	0	3	0,019	0,014		0	3	0,021	0,008		0	3	0,018	0,011
	5	3	0,019	0,014		5	3	0,017	0,010		5	3	0,016	0,005
	10	3	0,012	0,014		10	3	0,022	0,010		10	3	0,024	0,016
	20	3	0,035	0,018		20	3	0,030	0,023		20	3	0,030	0,023

Source: Processed Data

Table 2 informs that testing the barriers to access to financial services with the MARS method obtained the best model with the smallest GVC value at a combination of BF = 20, Mo = 5, and Mi = 3 with MSE = 0.005 and GCV = 0.016. The MARS model obtained with the best combination is written as follows:

BF2 = max(0, 76.700 - WL);
BF6 = max(0, 6.000 - RO);
BF7 = max(0, SUD - 0.780);
BF9 = max(0, VI - 5.168);
BF12 = max(0, 0.689 - BC) * BF6;
BF13 = max(0, BC - 0.508);
BF15 = max(0, WL - 55.200) * BF13;
BF16 = max(0, 55.200 - WL) * BF13;
BF18 = max(0, 0.715 - SUD) * BF16;
BF19 = max(0, WL - 39.700) * BF12;

BF20 = max(0, 39.700 - WL) * BF12.   (1)

Y = 1.474 - 0.022 * BF2 - 0.070 * BF6 - 3.934 * BF7 + 0.006 * BF9 - 0.721 * BF12 - 2.098 * BF13 + 0.059 * BF15 + 0.104 * BF16 - 1.016 * BF18 + 0.044 * BF19 + 0.057 * BF20   (2)

FA = BF2 BF6 BF7 BF9 BF12 BF13 BF15 BF16 BF18 BF19 BF20;

The sustainability model test on the MARS method uses the F test. The MARS model can conclude fit / able to explain the variability of independent variables to the dependent variable if the F statistic > F table value or the P-value <alpha (0.05). The model conformity test results are presented in the ANOVA table as follows:

Table 3. ANOVA Analysis

	DF	SS	SSE	F-Stat
Regression	11	9,443	0,858455	
Residual	48	0,256	0,005333	161,265
Total	59	9,699		

Table 3 informs that the value of F-Stat = 161.265> F (0.05; 11; 48) = 1.99458. This shows that the MARS method can explain the variability of independent variables (Weak Law, Bank Concentration, Regulatory Obstacle, Social Under-Development, and Inflation Volatility) on the dependent variable (access to financial services).

The coefficient of determination on the best combination of MARS models is 96.8%. This shows that the influence of independent variables (Weak Law, Bank Concentration, Regulatory Obstacle, Social Under-Development, and Inflation Volatility) on the dependent variable (access to financial services) is 96.8% which means that there are other factors equal to 100% - 96.8% which are not included in the model.

Hypothesis testing or the significance of independent variables on the MARS method's dependent variable uses the highest negative GCV value (lowest GCV value). The GCV values of each independent variable on the dependent variables are presented in Table 4.

Table 4. Importance Variables

	Variable	Importance	-GCV
4	WL	100	0.112
3	BC	43.366	0.034
5	RO	37.231	0.03
2	SUD	30.562	0.025
1	VI	18.211	0.02

Table 4 shows that all independent variables are included in the importance table. This shows that Weak Law, Bank Concentration, Regulatory Obstacle, Social Under-Development, and Inflation Volatility affect access to financial services. The highest Weak Law value is 100, with a negative GCV value of 0.112. This shows that the variable that has the most influence on access to financial services is Weak Law.

Volatility Inflation and Access to Financial Services
The first hypothesis testing results indicate that inflation volatility affects access to financial services; this is indicated by the inclusion of inflation volumes in the importance table with a negative GCV value of 0.02 and an importance value of 18,211. It can be concluded that hypothesis 1 is accepted.

Macroeconomic instability will adversely affect financial development, financial depth, and financial access (Honohan, 2007; Nocetti & Smith, 2011; Katusiime, 2018; Reinhart et al., 2009). A significant example of the occurrence of macroeconomic imbalances that is at the time of financial crisis, which will sooner or later greatly affect the financial services. The problem of macroeconomic instability will affect the supply of credit and adversely affect the demand for financial services, which are usually quite severe and will only improve after the end of the crisis. The reason is that the public demand for its deposit and savings products in the formal financial system will greatly depend on the amount of trust from the public towards the power of the financial system. The economic and financial crisis in developing countries in the last three decades has resulted in significant losses to depositors, reflecting the real value of their well-being. Freezing deposits, interest rate ceilings, conversion of deposits from foreign currencies to local currencies using undervalued exchange rates, and hyperinflation, which in practice will destroy the value of savings in the financial system. Therefore, many developing countries in various parts of the world, have experience of considerable interest rate fluctuations, and some periods show a negative value. The magnitude of inflation volatility and the real interest rate is the best illustration of the adverse effects of macroeconomic instability concerning the demand for financial services.

Social Under-Development and Access to Financial Services
The second hypothesis testing results show that Social Under-Development influences access to financial services; this is indicated by the inclusion of Social Under-Development in the importance table with a negative GCV value of 0.025 and an importance value of 30.562. It can be concluded that hypothesis 2 is accepted.

Numerous studies show that the importance of socio-economic development will explain the degree of financial access. The low level of social indicators will reflect the relationship between low demand and supply for financial services. According to Claessens (2005), the marginalization of financial services for the community, such as access to credit, is normal due to

the marginalization of widening social conditions, such as in terms of education level type of work, training or expertise possessed.

The majority of ASEAN 6 countries have a correlation relationship between social development and centralized access to financial services, *cateris paribus*, which reflects the potential value of increasing access to the development of these countries. Although the causal relationship between social development and financial development is controversial, the consensus between the two variables is complementary. It requires great effort to improve a country's social indicators hand in hand to advance financial infrastructure, which will ultimately improve financial services (Rutherford, 1998).

Inequality of income is another social variable that has a relationship with the level of access to financial services. This argument explains that high economic inequality, for example, in the distribution of income, reflects the many segments of the population unable to meet the costs (monetary or otherwise) in utilizing formal financial system services (Claessens, 2005, 2006).

Bank Concentration and Access to Financial Services

The third hypothesis testing results show that Bank Concentration affects access to financial services; this is indicated by the inclusion of Bank Concentration in the importance table with a negative GCV value of 0.034 and an importance value of 43.366. It can be concluded that hypothesis 3 is accepted.

Bank concentration is an obstacle in obtaining financial access by individuals or entities or companies to carry out their operational performance (Park, 2008; Rojas-Suarez, 2007). The quality of customer service is low, requires a long time in conducting financial transactions. Individuals from all income segments felt limited information about financial services.

These constraints such as not fulfilling bank branches, ATMs, and POS (point of service) especially in small rural areas, the number of documents or requirements that must be met to have an account at a bank or other financial institution product accounts, including the minimum amount of balance that is must be fulfilled by the customer. Beck et al. (2004, 2008) have conducted a global survey of these barriers. Two problems stem from the unitary financial method of operation and the framework of the functioning of a financial institution. For example, private banks will not get profits if their bank branches operate in areas with low population

densities such as in small villages, because of the low demand from the public for financial products. Ultimately, banks cannot cover the fixed costs of the bank branches.

Inefficiency that occurs in a bank or other financial institution is caused by the difficulty of documents or requirements that must be met by prospective customers. These socioeconomic conditions and institutional demands make it increasingly difficult for customers to access financial services products. For example, many people do not have assets to meet the bank's requirements to get credit or informal workers who do not have a work contract or a fixed salary that cannot meet the requirements proposed by a bank. In the end, the high cost of having an account, including the minimum balance that must be met directly by the customer, will make them marginalized from a financial system.

In the end, the banking system's fragility will become a substantial obstacle to the sustainability of financial access. This weak position of banks and other financial institutions leaves them in no position to develop their operations and services for a large segment of the population. Because they will usually face great financial difficulties in the development process with great risks, but unfortunately, when there is a financial crisis, it will result in high risk with the existence of financial access behavior that decreases significantly, especially for people with low and middle incomes. Thus, indicators of solving financial problems become very important to ensure that increased financial access is on a sustainable basis.

Weak Law and Access to Financial Services

The results of the fourth hypothesis testing show that Weak Law influences access to financial services; this is indicated by the inclusion of Weak Law in the importance table with a negative GCV value of 0.112 and an importance value of 100. This can be concluded that hypothesis 4 is accepted.

This research uses indicators developed by Kaufmann et al. (2012) called Governance Indicators to measure a financial institution's quality. Previous research shows that the financial system will be more developed in a country that pays attention to the law, political stability, justice, and enforces the "rule of law" efficiently and pays attention to the rights of debtors and creditors (debtor incentives) to entrust their relations to banks and other financial institutions. Financial institutions also have an incentive to lend at an interest rate level that is friendlier to SMEs' ability and can last long. Financial institutions can seize collateral when credit fails and

compensate it based on the "rule in a bankruptcy" that has been made.

Regulatory Obstacle and Access to Financial Services

The fifth hypothesis testing results show that Regulatory Obstacle affects access to financial services; this is indicated by the inclusion of Regulatory Obstacle in the importance table with a negative GCV value of 0.03 and an importance value of 37.231. It can be concluded that hypothesis 4 is accepted.

The global financial crisis is a concern for the importance of adequate regulation of the financial system. Although the purpose of these regulations is good, some regulations also produce significant distortions that can threaten financial system stability. Therefore, inadequate regulation will prevent financial markets from developing, hinder the adoption of financial product security, and ultimately lead to a financial institution's operational inefficiencies and services (Claessens, 2006). The distortion of regulations between one country and another is indeed different and difficult to explain in general (Rojas-Suarez, 2010).

However, in developing countries such as ASEAN 6, there are important regulatory difficulties to be observed, namely estimating distortions from capital adequacy regulations, distortions of tax payments, such as taxes in transactions financial, interest loans, and other regulations.

The capital adequacy factor is certainly not the only reason that more government bonds lend to the private sector. However, the crowding-out effect of capital adequacy is a particular problem for the majority of SMEs. They do not have alternative sources of financing that are in sharp contrast to large companies. The taxation of financial transactions, or what is often referred to as Tax on Financial Transaction (TFT), is another example of a regulation that can significantly distort financial services. This tax is a bank liability, including the withdrawal of a savings account using a check, ATM, and debit card. This does not agree on the effects of the loss due to the tax, because there is no purpose to correct this in the financial system, but rather the purpose of the government to obtain revenue from it. The government imposes the tax as a fiscal authority that makes it collects the tax easily.

The Tax on Financial Transaction (TFT) has two negative consequences. First, TFT encourages financial disintermediation when the depositor (individual or company) tries to avoid paying taxes by making fewer transactions with banks and increasing the number of cash transactions. With the increasing costs of using bank services, TFT will cause access to financial services to decrease. Second, the imposition of this tax will burden entrepreneurs with relatively few resources. Because large entrepreneurs will be able to avoid TFT by conducting offshore transactions or derivative operations, but SMEs cannot do it (Rojas-Suarez, 2009).

In the end, this matter becomes important to study regulation. The first is what we call a usury law, which sets a maximum interest rate for bank loans to prevent banks from imposing high interest on debtors. Although regulations have good intentions and goals, many analysts argue that regulation is counterproductive. Because regulations hamper access to credit for some SMEs, arguing that they are riskier than large companies, so the interest rates on loans charged to them are also higher than the interest rates that have been set. The same thing also applies to regulations regarding excessive money laundering, which will also hamper financial access for SMEs and individuals in developing countries.

The next test to see whether access to financial services affects Poverty alleviation with the indicator used is the Value of Human Poverty Index. In testing the effect of access to financial services on Poverty alleviation, four control variables are used, namely GNI per Capita (GPC), Private Credit (PC), Inflation rate (I), and Population rate (P). The best model with the smallest GCV is found in the BF combination = 10, Mi = 2 and Mo = 0 and Mo = 5 with GCV = 4.401 and MSE = 2.833. The results of the BF, Mi, and Mo combination are presented in Table 5.

Table 5. BF, MO and MI Poverty

BF	MO	MI	GCV	MSE	BF	MO	MI	GCV	MSE	BF	MO	MI	GCV	MSE
	0	1	7,260	4,551		0	1	6,958	4,060		0	1	5,583	2,968
	5	1	7,260	4,551		5	1	6,958	4,060		5	1	5,583	2,968
10	10	1	6,210	3,892	15	10	1	5,833	3,403	20	10	1	5,833	3,403
	20	1	26,766	18,791		20	1	31,736	18,791		20	1	36,398	26,148
	0	2	4,401	2,833		0	2	4,635	2,659		0	2	4,733	1,946
	5	2	4,401	2,833		5	2	4,801	2,658		5	2	5,063	2,628

10	2	6,984	4,252	10	2	7,192	2,351	10	2	7,592	3,187
20	2	20,013	13,397	20	2	5,843	4,307	20	2	5,906	4,307
0	3	5,190	3,244	0	3	4,495	2,579	0	3	5,360	3,397
5	3	5,171	3,232	5	3	4,520	2,879	5	3	5,360	3,397
10	3	6,984	4,252	10	3	7,192	2,351	10	3	6,800	2,855
20	3	20,013	13,397	20	3	5,843	4,307	20	3	5,906	4,307

Source. Processed Data

Table 5 informs us that testing the access to financial services against Poverty alleviation with the MARS method, obtained the best model with the smallest GVC value combination of Mo = 0 and Mo = 5, BF = 10, Mi = 2 with MSE = 2,833 and GCV = 4.401. The MARS model obtained with the best combination is written as follows

$BF2 = \max(0, 1.073 - A);$
$BF4 = \max(0, 2750.000 - GPC) * BF2;$
$BF6 = \max(0, .887182E+08 - P);$
$BF7 = \max(0, I - 8.179);$
$BF9 = \max(0, A - 0.760);$ (3)

$Y = 10.784 + 6.044 * BF2 + 0.011 * BF4 - .109722E-0.6 * BF6 + 0.133 * BF7 + 15.661 * BF9;$ (4)

$PV = BF2\ BF4\ BF6\ BF7\ BF9;$

The sustainability model test on the MARS method uses the F test. The MARS model can conclude fit / able to explain the variability of independent variables to the dependent variable if the F-Stat > F table value or the P-value <alpha (0.05). The model conformity test results are presented in the ANOVA table as follows:

Table 6. ANOVA Analysis

	DF	SS	SSE	F-Stat
Regresi	5	2333,76	466,752	
Residual	54	152,97	2,832778	164,768
Total	59	2486,73		

Table 6 informs that the value of F-Stat = 164.768> F (0.05; 5; 54) = 2.38607. This shows that the MARS method can explain the variability of access to financial services to poverty alleviation.

The coefficient of determination on the best combination of MARS models is 93.3%. This shows that the influence of access to financial services with four control variables namely, GNI per Capita (GPC), Private Credit (PC), Inflation rate (I), and Population rate (P) on poverty alleviation is 93.3%, which means there is another factor of 100% - 96.8% which is not included in the model.

Hypothesis testing or the significance of independent variables on the MARS method's dependent variable uses the highest negative GCV value (the lowest GCV value). The GCV values of each independent variable on the dependent variables are as follows:

Table 7. Hypotheses Testing

Variable		Importance	-GCV
2	FA	100	20.592
1	GPC	94.168	18.759
5	P	59.868	10.204
4	I	30.170	5.928
2	PC	0.000	4.401

Table 7 informs that access to financial services affects poverty alleviation with an importance value of 100% and a negative GCV value of 20,592.

Access to financial services against poverty alleviation

The results of the sixth hypothesis test show that access to financial services affects poverty alleviation. This is shown by the inclusion of access to financial services in the importance table with a negative GCV

value of 20,592 and an importance value of 100. This can be concluded that hypothesis 6 is accepted.

Access to financial services on poverty in ASEAN 6 countries is significant, which means that better access to financial services in a country's society will affect the decreasing poverty rate and vice versa. With the public having good access to financial services to a financial institution, it enables them to get the financial institution products they want. As it is easy for the community to get credit services (loans), this will enable the community to increase further the economies of scale, which will ultimately increase welfare and be lifted from the poverty line (Inoue & Hamori, 2012).

5. CONCLUSION, IMPLICATION, SUGGES-TION, AND LIMITATIONS

Access to financial services is influenced by five obstacles categorized as a macroeconomic, social, bank, institutional and regulatory constraints. Access to financial services has an impact on reducing poverty. This explains that it is very important to increase access to public financial services to banks and other financial institutions as an alternative solution in poverty alleviation. So that in the future, it is essential for the government as a policy-making authority to increase public participation in financial access that can stimulate a reduction in the amount of poverty and minimize these obstacles in order to increase access to public financial services to banks and other financial institutions.

This study only analyzes access to financial services and poverty alleviation until 2015. The economic crisis in 2018 and the COVID 19 pandemic in 2020 could harm access to financial services and poverty alleviation. Therefore, further research needs to extend the study period to cover these periods.

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