# ASEAN-5 Economic Analysis Based on Financial Inclusion and Financial Technology

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**Abstract**

This research aims to find leading economic indicators in each ASEAN-5 country based on financial inclusion and FinTech. Five ASEAN developing countries, Indonesia, the Philippines, Vietnam, Malaysia, and Thailand, were used as observations from 2009 to 2019. The analysis method of this study used the ARDL Panel approach. The results obtained from the ARDL Panel model are: (1) Leading economic fundamental indicators of unemployment rates in Indonesia, the Philippines, Vietnam, Malaysia, and Thailand are through the variable number of bank branches, savings, and e-money (2) Leading indicators of economic fundamentals Inflation rates in Indonesia, the Philippines, Vietnam, and Malaysia are through savings and e-money variables (3) Thailand is the chosen country because the three observation variables, namely the number of bank branch offices, savings, and e-money, can become leading indicators of economic fundamentals for controlling inflation rates.

**Keywords:** Economic Fundamentals; Financial Inclusion; Financial Technology.

## INTRODUCTION

Indonesia is a country with the largest economy in the Southeast Asia (ASEAN) region. According to World Bank data, the Indonesian economy, as measured by the Gross Domestic Product (GDP) at current prices, amounted to USD 1,042.17 billion or the equivalent of Rp.14,837 trillion in 2018. The large population and vast territory are advantages and challenges for Indonesia's development and economy. Several international institutions even predict Indonesia will become the world's fifth-largest economy in the next few years (Kusnandar, 2019).

However, Indonesia's economy in the third quarter of 2019 grew lower than in the fourth quarter of 2018. According to Bank Indonesia data, Indonesia's economic growth in Q3-2019 was 5% while Q4-2018 was 5.2%. The slowdown in economic growth was triggered by ongoing global uncertainties, such as escalating trade war tensions between the United States and China, Brexit uncertainty, protests in Hong Kong, and demonstrations in Latin America, which impacted weakening sentiment, thereby holding back business and investment activity (Indonesia, 2019).

GDP trends in Indonesia, Malaysia, and Thailand tend to fluctuate. In 2015, there was a simultaneous decrease in GDP in these three countries, and this was due to the not-yet-strong world economic growth, which was marked by the continuing decline in world commodity prices, as well as the uncertainty in financial markets that remained high. In Cambodia, Lao PDR, Myanmar, the Philippines, and Vietnam, the GDP trend tends to be stable and increasing. This increase was driven by the industrial and construction sectors, which grew quite well, investment, government spending, and household consumption.

The slowdown in GDP growth was also felt in several ASEAN-8 countries in 2015 and 2016 due to external and domestic challenges. External challenges such as lower-than-expected world economic growth, uncertainty in global financial markets triggered by forecasts of an increase in the Fed's interest rate, fears of Greek fiscal negotiations, and exacerbated by the devaluation of the Yuan ultimately impacted trade and financial channels (Indonesia, 2016).

In Indonesia, the domestic challenges are due to the economic structure, which still relies on commodities, the high content of imports in export products, and the shallow domestic financial market. It all reduces the confidence of economic actors and puts pressure on the Rupiah

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exchange rate. Likewise, inflationary pressure in several ASEAN countries weakened in 2019. In the Philippines, inflation fell significantly from 5.2% in 2018 to 2.48% in 2019. The weakening of rice prices triggered this decline due to the government implementing trade liberalization policies, including eliminating quantitative import restrictions. Meanwhile, Vietnam, Malaysia, Lao PDR, and Thailand were observed to be more moderate.
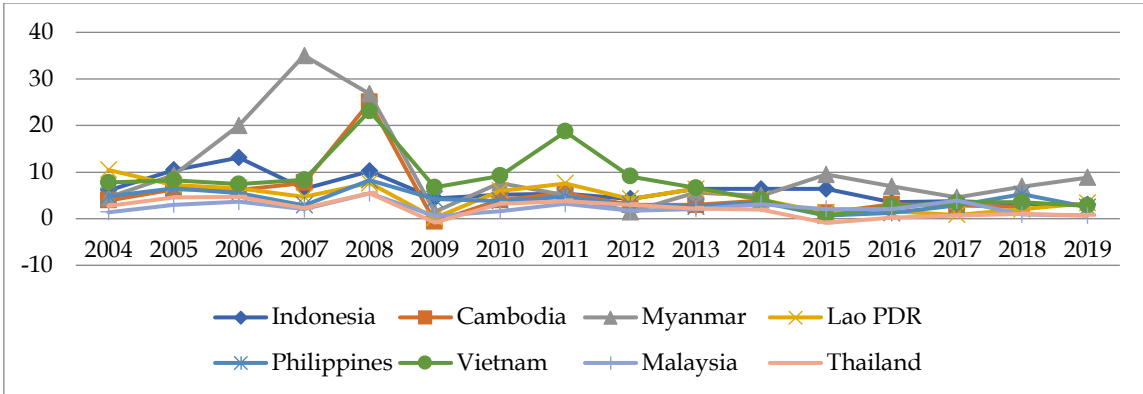


Source: World Bank Data

**Figure 1.** CPI Inflation Rate of ASEAN-8 Countries 2004 – 2019 (%)

A significant increase in inflation in 2019 occurred in Myanmar, which was 2% — increased from 6.8% in 2018 to 8.8% in 2019. This high inflation occurred due to the increase in electricity rates implemented by the Myanmar government in July 2019. Another cause was increased food prices, driven by fluctuating exchange rates (Times, 2020).

When viewed from the perspective of the unemployment rate in ASEAN, economic fundamentals have been relatively low from 2005 to 2019. However, they tend to fluctuate in line with fluctuations in the economy. In 2019, the lowest number occurred in Thailand (1.0%) and Vietnam (2.2%), followed by Singapore (3.1%) and Malaysia (3.3%). Indonesia had a stable unemployment rate of 5.3% in 2018 and 2019, while Brunei Darussalam recorded the highest unemployment rate at 6.8% (Secretariat, 2020).
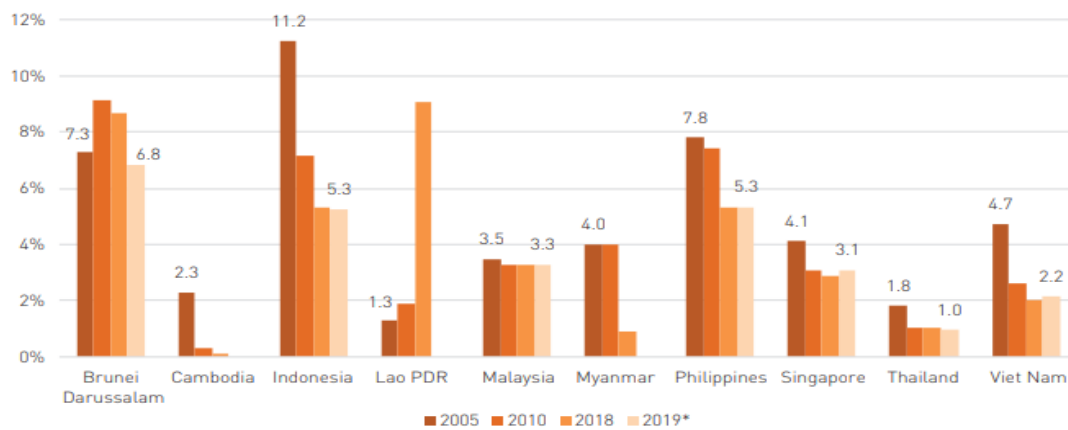


Source: ASEAN Key Figures, 2020

**Figure 2.** Unemployment Rate of ASEAN Countries (%)

The global economic slowdown continued in 2019. The International Monetary Fund (IMF) voiced the urgency to strengthen economic fundamentals increase resilience, and inclusiveness to encourage global economic growth (Indonesia, 2019). A World Bank report states that although the world economy is experiencing a downturn, extreme poverty continues to decrease. Improvements to eradicate extreme poverty are driven more by the East Asia and Pacific region, especially China, Indonesia, and India.

Poverty is a development problem faced in every region of the world. Reducing the world's poor population is one of the global agreements stated in the Millennium Development Goals, which must be achieved significantly by 2015, followed by the Sustainable Development Goals as a joint development ambition until 2030. Agenda The new sustainable development plan was created to answer the demands of world leadership in tackling poverty, inequality, and climate change in the form of real action.

**Table 1.** The proportion of the population Below the National Poverty Line in ASEAN (%), 1990 – 2015

| Country | 1990 | 1995 | 2000 | 2005 | 2010 | 2015 |
|---------|------|------|------|------|------|------|
| Indonesia | 15 | 18 | 19 | 16 | 13 | 11 |
| Cambodia | 39 | 36 | 36 | 33 | 21 | 14 |
| Lao PDR | 49 | 43 | 36 | 30 | 24 | 17 |
| Philippines | 34 | 32 | 26 | 26 | 24 | 22 |
| Vietnam | 72 | 58 | 29 | 16 | 14 | 7 |
| Malaysia | 17 | 9 | 9 | 6 | 4 | 1 |
| Thailand | 34 | 17 | 21 | 10 | 17 | 14 |
| ASEAN | 31 | 27 | 25 | 18 | 15 | 14 |

Source: ASEAN Secretariat

Overall, the proportion of the population below the poverty line in ASEAN has declined over 25 years (1990 to 2015). However, if we look at each country, there are fluctuations, such as in Indonesia and Thailand. Table 1. above shows that Indonesia experienced an increase in the population below the poverty line from 1990 to 2000, but from 2000 to 2015, the proportion tended to decrease. Meanwhile, Thailand experienced an increase in the proportion in 2000 and 2010.
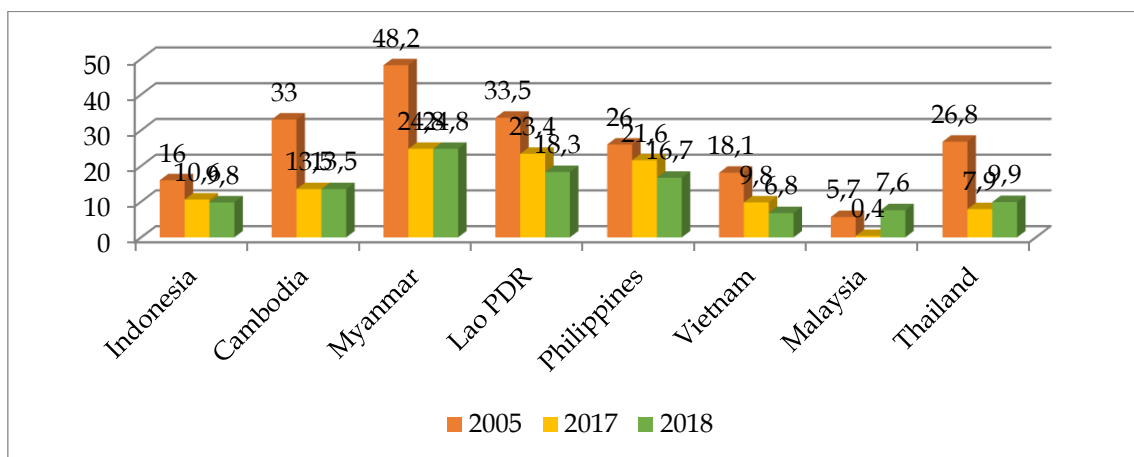


Source: ASEAN Key Figures

**Figure 3.** Population Living Below the National Poverty Line (%) in ASEAN-8

ASEAN Key Figure notes Myanmar as the country with the highest poverty reduction rate, from 48.2% in 2005 to 24.8% in 2017, or a decrease of 23.4%, but in 2018 there was no reduction in poverty from 2017. Reduction Cambodia and Thailand also experienced significant decreases of 19.5% and 18.9% in 2017, but in 2018, poverty in Thailand increased again (9.9%). Indonesia and the Philippines experienced a not-so-significant decrease. It was recorded that Indonesia only fell by 5.4% from 16% in 2005 to 10.6% in 2017. Likewise, the Philippines only fell by 4.4% from 26% in 2005 to 21.6% in 2017, but This decline in poverty continued in 2018. In contrast to Malaysia, the poverty rate had almost reached 0% in 2017, namely 0.4%, down by 5.3% from 5.7% in 2005, but in 2018 there was a significant increase to 7.2% (Secretariat, 2020).

From the phenomena that have been explained, fluctuations in the economy and poverty levels in Indonesia and ASEAN countries are challenging for the ASEAN economy. Various external and internal causal factors indicate the instability of the economy and financial sector. Levine revealed that four roles of the financial sector benefit the economy, namely reducing risk, mobilizing savings, reducing transaction and information costs, and encouraging specialization (Levine, 2004). The financial sector can create capital accumulation and technological innovation through these four roles, increasing economic growth. In addition, the financial sector can also provide borrowers with various financial instruments of high quality and low risk. It can increase investment and ultimately accelerate economic growth (Fabya, 2011).

Digitalization and automation are also seen as critical influences on the future labor market. FinTech (financial technology) is expected to significantly impact the financial sector by leveraging some of the latest innovations such as Artificial Intelligence, Robotics, Biometric applications, Blockchain, or platforms for Peer-to-Peer lending. FinTech also describes technologically enabled financial innovations that result in new business models, applications, processes, products, or services with associated material effects on financial markets and institutions and the provision of financial services ((EFTA), 2018).

Statements at international forums such as the G-20 (most recently in 2016 in Hangzhou) that financial inclusion is one of the factors for reducing poverty and increasing prosperity. It is characterized by the existence of policies in many developing countries, such as establishing financial inclusion units at the Central Bank and Ministry of Finance and specific financial inclusion targets.

The G-20 financial inclusion indicators were developed to assess the state of financial inclusion and digital financial services to support countries in achieving their financial inclusion goals. Around two-thirds of regulatory and supervisory institutions are now charged with increasing financial inclusion at the country level alone. Around 50 countries have set formal targets and goals for financial inclusion in recent years, including ASEAN countries. Therefore, financial inclusion and FinTech (financial technology) affect economic fundamentals and poverty levels.

In Indonesia, an inclusive financial policy is a form of deepening services aimed at the lower classes to take advantage of formal financial products and services such as safe means of saving money, transfers, savings, loans, and insurance. In order to increase financial inclusion in Indonesia, it was selected comprehensively by compiling a national strategy that was jointly developed between Bank Indonesia, the vice president's office (National Team for the Acceleration of Poverty Reduction/TNP2K) and the Ministry of Finance, which is called the National Strategy for Inclusive Finance (Indonesia, 2019).

This inclusive financial strategy is expected to encourage economic growth, accelerate poverty reduction, and reduce social inequalities in society, ultimately improving people's welfare.In Malaysia, the vision of the financial inclusion framework is to create an inclusive financial system that best serves all members of society, especially the underserved, to have access

to and use quality and affordable essential financial services to meet their needs towards greater shared prosperity (Malaysia, 2019).

In Thailand, they were utilizing Financial Technology (FinTech) to increase financial inclusion. Laid out five policy measures to help harness the full potential of FinTech in supporting financial inclusion in Thailand: 1) lift barriers for companies seeking to enter the financial sector, 2) encourage collaboration between traditional banks and FinTech companies, 3) improve coordination between regulators e.g. regarding squares regulatory sands, 4) fostering public-private and private-private collaboration, and 5) supporting initiatives such as incubators and early-stage funding platforms, as well as providing matching funds to help FinTech companies take off in Thailand (Bank, 2019).

Myanmar's Financial Inclusion Roadmap 2014 – 2020 outlines the vision of increasing financial inclusion in Myanmar. It is based on the diagnostic results in the MAP (Making Access Possible) Myanmar Financial Inclusion Synthesis Record and MAP (Making Access Possible): Myanmar Country Diagnostic Report, 2014. The MAP diagnostic and programming framework supports expanding access to, or consolidation of provision, financial services for individuals and micro and small enterprises ((MAP), 2014)

The State of Vietnam is making significant efforts to develop and implement the National Financial Inclusion Strategy. It is one of the critical tasks assigned to the State Bank of Vietnam (SBV) to lead in 2019. Financial inclusion is essential not only for socio-economic development but also for the nation's sustainable growth. Therefore, SBV has decided on Baking Vietnam 2019 as "Financial inclusion in a cashless moving economy" to serve the interests of the competent authorities and international and domestic institutions and ensure compliance with current directives and policies from the banking sector (Vietnam, 2019).

Formal financial inclusion in Cambodia ranks higher than Laos, Myanmar, and Pakistan, mainly because of the other formal sector (Microfinance). The total number of depositors and borrowers has increased markedly over the last decade (Cambodia, 2017). Financial services have also expanded their reach to village communities that previously did not have bank accounts (unbanked). Bank branch offices, other financial institutions, and ATMs have also increased recently.

The use of financial technology can stimulate financial inclusion. Examples of using FinTech in everyday life include payments via electronic money digital wallets such as GoPay, OVO, Funds, iSaku, and others. The use of FinTech to stimulate financial inclusion clearly illustrates the positive feedback between finance and the economy. Suppose people in developing countries get new access to financial services through FinTech. In that case, they will get opportunities to develop businesses such as e-commerce and e-learning, which are currently hampered by limited access to payment services. In this way, FinTech is expected to contribute to economic development (Nakaso, 2016).

Additionally, FinTechs can reduce transaction costs for third-party financing through peer-to-peer investing and lending. Therefore, FinTech can make it easier and cheaper for small businesses to get credit. It can positively affect innovation and economic growth, especially for MSMEs. Data from (djkn.kemenkeu.go.id, 2020) states that in 2018, the number of MSME actors was 64.2 million, or 99.9% of the number of business actors in Indonesia. Very many micro-entrepreneurs dominate MSMEs. Of course, this is a potential for a solid national economic base because the number of MSMEs, especially micro businesses, is enormous, thus absorbing a more outstanding workforce.

However, of the 64 million existing MSMEs, only 13% use digital platforms for their business (liputan6.com, 2020). During the COVID-19 pandemic throughout 2020, 30% of MSMEs stopped their business. Of course, in these conditions, fintech's presence can be a solution and

not to be feared. MSMEs can use digitization to run their business, such as by touching e-commerce platforms or working with transportation application companies Gojek and Grab.

The World Bank stated that there is a vast untapped potential for the digital economy to grow further and faster in ASEAN. Of course, this cannot be separated from each country's government's role in providing systems or services that support digital economic growth. The development of financial technology through digital payments is the primary driver of financial inclusion. Payments are usually a gateway into the use of financial services by those who were previously excluded. Digital payment channels can empower those who do not have access to banking services to access other formal financial services (Group, 2019).

Several previous studies found that there is an influence of financial inclusion and FinTech on economic fundamentals and poverty (Babajide, Adegboye, & Omankhanlen, 2015) (Mwaitete & George, 2018) (Mwinzi, 2014) (Iqbal & Sami, 2017) (Hariharan & Marktanner, 2012) (Hussaini & Chibuzo, 2018) (Park & Mercado, Jr., 2015) (Bakari, et al., 2019) (Zia & Prasetyo, 2018) (Okoro, Obiekwe, & Okoro, 2020) (Zakaria, Risalat, & Fida, 2015), however, there are also findings from previous research which state that financial inclusion does not affect economic fundamentals and poverty (Ductor, 2015) (Ayensu, 2017).

This gap in previous research ultimately raises the question of current conditions, especially in ASEAN countries. A presentation by the World Bank for the ASEAN working group on financial inclusion in Kuala Lumpur in 2016 provided an illustration that between 2011 and 2014, ASEAN had achieved substantial improvements in financial inclusion. However, 264 million adults aged 15 years and over, or around 59% in ASEAN, are unbanked, which means they still need a bank account.

The trend of households in ASEAN is that cash is still the primary means of conducting financial transactions. The use of debit and credit cards is relatively lower across ASEAN when compared to the rest of the world. This is because most adults with accounts at financial institutions still prefer to carry out and complete financial transactions in cash.

The World Bank, in one of its publications in 2018, emphasized that the higher the level of financial inclusion in society, it will enable them to make the right decisions regarding managing their finances, using financial products and services, supporting the development of the financial sector, and more broadly encouraging economic growth. A study by another World Bank also confirmed that increasing financial inclusion by 1% could encourage GDP per capita growth of 0.03% (Bank, 2018).

## LITERATURE REVIEW
### Financial Inclusion/Exclusion

In the 1980s, the retail financial market grew, and more people could access various financial products. It was reported that about a quarter of households had access to credit facilities in the early 1970s, which increased to seven out of ten in the two-decade period (Berthoud & Kempson, 1992). There are two main reasons for this development: deregulation of the financial services sector and developments in the application of information technology for risk assessment (Kempson & Whyley, 1999).

Many people have benefited from this development, especially those who enjoy a stable income. On the other hand, there are minority groups who do not even have the most basic financial products, such as checking accounts or insurance. There is also increasing concern that this group is the most underserved market in society and has limited participation in financial services, adding to the more general problem of social exclusion (Kempson & Whyley, 1999).

Because it is both a financial and a social issue, financial exclusion has emerged as a significant concern in the US and Europe (Zhijun, 2007).

The World Bank has distinguished between those who are financially served, formally included, and financially excluded, as shown in Figure 4 following (Group, 2006).
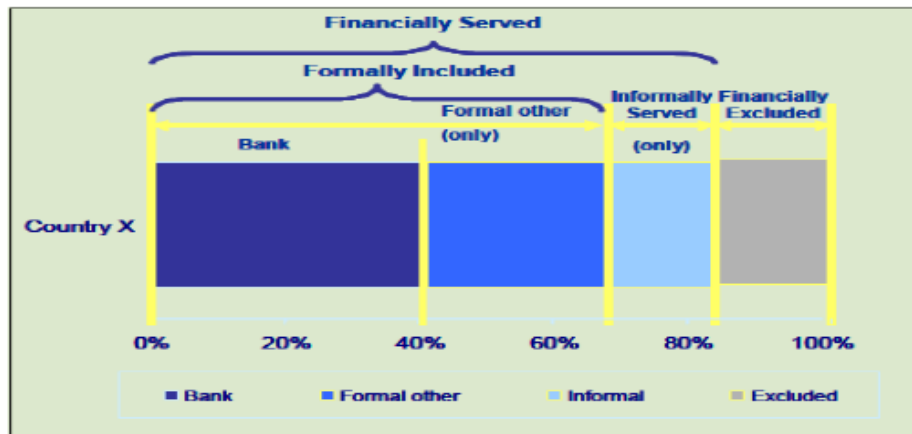


Source: World Bank, 2006

**Figure 4.** Financial Access Diagram: From Formal to Informal Providers

Formally served are those with access to financial services from banks and other formal providers (such as all other legal entities licensed to provide financial services). Financially served includes those who are formally served and those who use informal providers (i.e., other organized financial service providers who are not registered financial intermediaries and are not subject to any oversight). Conversely, the term financially excluded describes individuals with no access at all (Group, 2006).

The Consultative Group to Assist the Poor – Global Partnership for Financial Inclusion (CGAP-GPFI) defines financial inclusion as a "State in which all working-age adults have effective access to credit, savings, payments, and insurance from formal service providers. Effective access involves convenient and responsible service delivery, at a cost affordable to the customer and sustainable for the provider, with the result that financially excluded customers use formal financial services rather than existing informal options" (CGAP-GPFI, 2011). -- A country where all working-age adults have practical access to credit, savings, payments, and insurance from formal providers. Adequate access involves providing services that are convenient and responsible, cost-effective for customers, and sustainable for providers, with the result that financially excluded customers use formal financial services over existing informal options.

The Financial Action Task Force (FATF) defines financial inclusion as "involves providing access to an adequate range of safe, convenient and affordable financial services to disadvantaged and other vulnerable groups, including low income, rural and undocumented persons, who have been underserved or excluded from the formal financial sector" (FATF, 2011). -- Financial inclusion includes providing access to a wide range of safe, convenient, and affordable financial services to other vulnerable and disadvantaged groups, including low-income, rural, and undocumented people who have been underserved or excluded from the formal financial sector.

**Financial Innovation**

The existence of Communication and Information Technology (ICT) is an essential component for creating innovations in financial products so that it can attract the interest of people with low incomes in accessing financial services (Suidarma, 2019). Ultimately, financial innovation can increase economic growth (Mwinzi, 2014).

ICT to several studies can significantly contribute to economic growth (Andrianaivo & Kpodar, 2011), is beneficial for long-term economic growth processes (Makun & Jayaraman, 2020) (Pradhan, Arvin, Nair, Bennett, & Bahmani, 2016), able to reduce poverty (Schmied & Marr, 2016) (Bakari, et al., 2019), and has a significant impact on the economic performance and success of individual firms in particular, when combined with investment in skills, organizational change, and innovation (OECD, 2004).

Several empirical studies have also found a causal relationship between ICT and economic growth (Beil, Ford, & Jackson, 2005) (Lee, Levendis, & Gutierrez, 2011) (Pradhan, Bele, & Pandey, 2013) (Shiu & Lam, 2008).

## RESEARCH METHOD
### Data

This research was conducted in 5 ASEAN countries (Malaysia, Thailand, Indonesia, Vietnam, Philippines). This research focuses on analyzing the ARDL panel model of financial inclusion and financial technology for the economy in each of the ASEAN-5 countries. The data used in this research is secondary data obtained from the World Bank and processed using Eviews 10 from 2009 to 2019.

### Analysis Method

This research uses panel data, namely by using data over time and data between regions or countries. The ARDL panel is used to obtain estimation results for each individual characteristic separately by assuming the existence of cointegration in the long-term lag of each variable. ARDL Panel Testing with the equation formula:

$$PE_{it} = \alpha + \beta 1 INF_{it} + \beta 2 ATM_{it} + \beta 3 TB_{it} + \beta 4 KRD_{it} + \beta 5 PMJM_{it} + e$$

The following is the ARDL panel equation formula based on country:

$$UNEMP_{it-p} = \alpha + \beta_1 KACAB_{it-p} + \beta_2 TAB_{it-p} + \beta_3 KREDIT_{it-p} + \beta_4 ATM_{it-p} + \beta_5 EMONEY_{it-p} + \beta_6 CELL_{it-p} + \varepsilon_1$$

$$INF_{it-p} = \alpha + \beta_1 KACAB_{it-p} + \beta_2 TAB_{it-p} + \beta_3 KREDIT_{it-p} + \beta_4 ATM_{it-p} + \beta_5 EMONEY_{it-p} + \beta_6 CELL_{it-p} + \varepsilon_2$$

$$PDB_{it-p} = \alpha + \beta_1 KACAB_{it-p} + \beta_2 TAB_{it-p} + \beta_3 KREDIT_{it-p} + \beta_4 ATM_{it-p} + \beta_5 EMONEY_{it-p} + \beta_6 CELL_{it-p} + \varepsilon 3$$

Information:
| | |
|---|---|
| UNEMP | = Unemployment Rate (% of labor force) |
| INF | = CPI Inflation (%) |
| GDP | = Gross Domestic Product (Billion USD) |
| KACAB | = Commercial bank branch offices (per 100,000 adults) (%) |
| TAB | = Net national savings (Billion USD) |
| CREDIT | = Domestic credit provided by the financial sector (% of GDP) |
| ATM | = Number of ATMs (per 100,000 adults) (%) |

| EMONEY | = e-money transactions |
|---|---|
| CELL | = Cell Phone Subscriptions (per 100 people) (%) |
| α | = Constant |
| β | = Regression coefficient |
| i | = Number of observations (8 Countries) |
| t | = Amount of time (11 years, 2009 – 2019) |
| p | = Optimal lag length |
| ε | = Error term |

**ARDL Panel Criteria:** The accepted ARDL Panel model is a model that has a cointegrated lag where the central assumption is that the coefficient value in the short-run equation has a negative slope with a significant level of 5%.

## RESULTS AND DISCUSSIONS

### Test Unit Root

Before carrying out the ARDL Panel test, the assumption must be fulfilled: all observation variables are free from unit root problems. The unit root test used for the researcher's panel data is the Augmented Dickey-Fuller (ADF) Fisher Unit Root Test. The unit root test results for all observation variables are shown in the following table:

**Table 2.** Unit Root Test Results

| Variable | Statistic ADF Fisher Chi-Square | Prob. | Result |
|---|---|---|---|
| UNEMP | 24.4076 | 0.0066 | Stationary on Level |
| INF | 29.2018 | 0.0012 | Stationary at 1st difference |
| PDB | 21.8982 | 0.0156 | Stationary on the 2nd difference |
| KACAB | 26.2666 | 0.0031 | Stationary on Level |
| TAB | 23.0696 | 0.0105 | Stationary at 1st difference |
| KREDIT | 8.94136 | 0.5377 | Not Stationary at Level/1st/2nd |
| ATM | 36.7488 | 0.0001 | Stationary on the 2nd difference |
| EMONEY | 17.9114 | 0.0465 | Stationary at 1st difference |
| CELL | 18.6706 | 0.0447 | Stationary on the 2nd difference |

Source: Data processing, 2023

The ADF Fisher Unit Root Test results show that the UNEMP and KACAB variables are stationary at Level, INF, TAB, and EMONEY at the first difference, GDP, ATM, and CELL at the second difference. Meanwhile, the CREDIT variable is not stationary at the level, first, or second difference. The assumptions that must be met are stationary variables at the level of the first difference. If the variable is stationary at the second difference or not stationary, then the ARDL Panel test cannot be performed. So that the GDP, CREDIT, ATM, and CELL variables are degraded from the equation model.

### ARDL Panel Model Results, UNEMP = KACAB, TAB, and EMONEY

The ARDL Panel model was tested using UNEMP as a fundamental economic variable, KACAB and TAB as financial inclusion variables, and EMONEY as a FinTech variable. The results of the ARDL Panel model are shown in the following table:

**Table 3.** ARDL Panel Model Results (UNEMP)

| Variable | Coefficient | t-Statistic | Prob. |
|---|---|---|---|
| Long Run Equation | | | |
| KACAB | -0.136071 | -10.22484 | 0.0000 |
| TAB | -0.002830 | -2.679499 | 0.0124 |
| EMONEY | 2.51E-09 | 1.768808 | 0.0882 |
| Short Run Equation | | | |
| COINTEQ01 | -0.913898 | -3.524563 | 0.0015 |
| D(KACAB) | 0.195021 | 0.791220 | 0.4357 |
| D(TAB) | -0.007009 | -0.552797 | 0.5850 |
| D(EMONEY) | 8.48E-06 | 1.021201 | 0.3162 |
| C | 3.764030 | 2.638777 | 0.0136 |

Source: Data processing, 2023

The output shows that the KACAB and TAB variables significantly affect UNEMP in the long run. In the short term, the coefficient value (COINTEQ01) has a negative slope of -0.9138 with a p-value of 0.0015, which means it is significant at $\alpha$ = 5%. So, the ARDL Panel model is accepted. Therefore, panel testing was carried out by country with the following results:

**Table 4.** Indonesian ARDL Panel Output

| Variable | Coefficient | t-Statistik | Prob. |
|---|---|---|---|
| COINTEQ01 | -1.259167 | -47.93976 | 0.0000 |
| D(KACAB) | 0.113674 | 151.3878 | 0.0000 |
| D(TAB) | 0.001334 | 200.5989 | 0.0000 |
| D(EMONEY) | -6.29E-09 | -3.01E+08 | 0.0000 |
| C | 8.833902 | 5.739892 | 0.0105 |

Source: Data processing, 2023

The ARDL Panel results for Indonesia show that all independent variables (KACAB, TAB, and EMONEY) significantly affect UNEMP with a p-value of less than 0.05.

**Table 5.** Philippines ARDL Panel Output

| Variable | Coefficient | t-Statistik | Prob. |
|---|---|---|---|
| COINTEQ01 | -0.168969 | -6.814289 | 0.0065 |
| D(KACAB) | 1.056055 | 6.157682 | 0.0086 |
| D(TAB) | 0.014762 | 120.1224 | 0.0000 |
| D(EMONEY) | -4.49E-07 | -32339.56 | 0.0000 |
| C | 0.377811 | 0.666722 | 0.5526 |

Source: Data processing, 2023

The ARDL Panel results above show that all variables, KACAB, TAB, and EMONEY, also significantly affect UNEMP in the Philippines with a p-value less than 0.05.

**Table 6.** Vietnam ARDL Panel Output

| Variable | Coefficient | t-Statistik | Prob. |
|---|---|---|---|
| COINTEQ01 | -0.677084 | -34.60788 | 0.0001 |
| D(KACAB) | 0.347332 | 25.97709 | 0.0001 |
| D(TAB) | -0.056771 | -653.2227 | 0.0000 |
| D(EMONEY) | -2.71E-06 | -584183.2 | 0.0000 |
| C | 1.909933 | 20.19322 | 0.0003 |

Source: Data processing, 2023

The ARDL Panel results above show that all independent variables (KACAB, TAB, and EMONEY) significantly affect UNEMP in Vietnam, with a p-value smaller than 0.05.

**Table 7.** Malaysia ARDL Panel Output

| Variable | Coefficient | t-Statistik | Prob. |
|---|---|---|---|
| COINTEQ01 | -0.778312 | -13.21233 | 0.0009 |
| D(KACAB) | -0.201855 | -3.453290 | 0.0408 |
| D(TAB) | 0.001643 | 22.88529 | 0.0002 |
| D(EMONEY) | 4.14E-05 | 2580.335 | 0.0000 |
| C | 3.659831 | 2.658712 | 0.0764 |

Source: Data processing, 2023

The results of the ARDL Panel for Malaysia above show that the variables KACAB, TAB, and EMONEY have a significant effect on UNEMP with a p-value of less than 0.05.

**Table 8.** Thailand ARDL Panel Output

| Variable | Coefficient | t-Statistik | Prob. |
|---|---|---|---|
| COINTEQ01 | -1.685956 | -42.14452 | 0.0000 |
| D(KACAB) | -0.340100 | -86.09365 | 0.0000 |
| D(TAB) | 0.003985 | 996.3857 | 0.0000 |
| D(EMONEY) | 4.17E-06 | 3482593. | 0.0000 |
| C | 4.038671 | 8.774619 | 0.0031 |

Source: Data processing, 2023

The results of the Thai ARDL Panel show that the variables KACAB, TAB, and EMONEY also have a significant effect on UNEMP, with a p-value of less than 0.05.

**Panel Model Results ARDL, INF = KACAB, TAB, and EMONEY**
The ARDL Panel model tested uses INF as a fundamental economic variable, KACAB and TAB as financial inclusion variables, and EMONEY as a FinTech variable. The results of the ARDL Panel model are shown in the following table:

**Table 9.** ARDL Panel Model Results (INF)

| Variable | Coefficient | t-Statistic | Prob. |
|---|---|---|---|
| **Long Run Equation** | | | |
| KACAB | -1.684907 | -6.037805 | 0.0000 |
| TAB | 0.048881 | 4.060791 | 0.0004 |
| EMONEY | 5.52E-09 | 0.077892 | 0.9385 |
| **Short Run Equation** | | | |
| COINTEQ01 | -0.969288 | -2.711375 | 0.0115 |
| D(KACAB) | 1.663722 | 1.345474 | 0.1897 |
| D(TAB) | -0.066105 | -1.042612 | 0.3064 |
| D(EMONEY) | 0.000760 | 0.969276 | 0.3410 |
| C | 17.91389 | 2.884447 | 0.0076 |

Source: Data processing, 2023

The output in Table 5.13 shows that the variables KACAB and TAB significantly influence INF in the long term. In the short term, the coefficient value (COINTEQ01) has a negative slope of -0.9692 with a p-value of 0.0115, which means it is significant at $\alpha = 5\%$. So, the ARDL Panel model is accepted. Therefore, panel testing was carried out by country with the following results:

**Table 10.** Indonesian ARDL Panel Output

| Variable | Coefficient | t-Statistik | Prob. |
|---|---|---|---|
| COINTEQ01 | -0.232195 | -22.16475 | 0.0002 |
| D(KACAB) | -0.008956 | -0.336043 | 0.7590 |
| D(TAB) | -0.056185 | -79.67778 | 0.0000 |
| D(EMONEY) | -1.12E-08 | -7432563. | 0.0000 |
| C | 6.766410 | 0.829522 | 0.4676 |

Source: Data processing, 2023

The ARDL Panel results for Indonesia show that TAB and EMONEY significantly affect INF with a p-value less than 0.05. Meanwhile, the KACAB variable has no significant effect on INF in Indonesia, with a p-value greater than 0.05.

**Table 11.** Philippines ARDL Panel Output

| Variable | Coefficient | t-Statistik | Prob. |
|---|---|---|---|
| COINTEQ01 | -1.100143 | -16.17148 | 0.0005 |
| D(KACAB) | -1.882814 | -0.183041 | 0.8664 |
| D(TAB) | 0.064903 | 7.803202 | 0.0044 |
| D(EMONEY) | 5.32E-05 | 96603.29 | 0.0000 |
| C | 14.12250 | 0.776919 | 0.4938 |

Source: Data processing, 2023

The ARDL Panel results above show that TAB and EMONEY significantly affect INF with a p-value less than 0.05. Meanwhile, the KACAB variable has no significant effect on INF in the Philippines, with a p-value greater than 0.05.

**Table 12.** Vietnam ARDL Panel Output

| Variable | Coefficient | t-Statistik | Prob. |
|---|---|---|---|
| COINTEQ01 | -0.420725 | -10.11887 | 0.0021 |
| D(KACAB) | 1.389070 | 0.166586 | 0.8783 |
| D(TAB) | -0.275505 | -4.674728 | 0.0185 |
| D(EMONEY) | -0.000144 | -68004.48 | 0.0000 |
| C | 11.40122 | 1.093457 | 0.3541 |

Source: Data processing, 2023

The ARDL Panel results above show that TAB and EMONEY significantly affect INF with a p-value less than 0.05. Meanwhile, the KACAB variable has no significant effect on INF in Vietnam, with a p-value greater than 0.05.

**Table 13.** Malaysia ARDL Panel Output

| Variable | Coefficient | t-Statistik | Prob. |
|---|---|---|---|
| COINTEQ01 | -2.263570 | -5.480320 | 0.0119 |
| D(KACAB) | 4.548097 | 0.790443 | 0.4870 |
| D(TAB) | -0.123918 | -14.98268 | 0.0006 |
| D(EMONEY) | 0.003892 | 3829.981 | 0.0000 |
| C | 42.06108 | 0.222856 | 0.8380 |

Source: Data processing, 2023

The results of the ARDL Panel for Malaysia above show that the variables TAB and EMONEY have a significant effect on INF, with a p-value of less than 0.05. Meanwhile, the KACAB variable has no significant effect on INF in Malaysia, with a p-value greater than 0.05.

**Table 14.** Thailand ARDL Panel Output

| Variable | Coefficient | t-Statistik | Prob. |
|---|---|---|---|
| COINTEQ01 | -0.829805 | -44.14856 | 0.0000 |
| D(KACAB) | 4.273214 | 14.73496 | 0.0007 |
| D(TAB) | 0.060179 | 63.62591 | 0.0000 |
| D(EMONEY) | -2.55E-06 | -27112.88 | 0.0000 |
| C | 15.21824 | 2.780117 | 0.0690 |

Source: Data processing, 2023

The results of the ARDL Panel for Thailand show that all independent variables, namely KACAB, TAB, and EMONEY have a significant effect on INF with a p-value of less than 0.05.

**Discussion**

This analysis was carried out to find leading indicators of economic fundamentals for the unemployment rate in ASEAN-5. The ARDL Panel results for economic fundamentals of the unemployment rate show the leading indicators in each observation country. Based on the summary of the results of the ARDL Panel model with UNEMP as the dependent variable, it can be analyzed as follows:

**Table 15.** Summary of Results of the ARDL Panel Model (UNEMP)

| Variable | Indonesia | Philippines | Vietnam | Malaysia | Thailand | Short Run | Long Run |
|---|---|---|---|---|---|---|---|
| KACAB | 1 | 1 | 1 | 1 | 1 | 0 | 1 |
| TAB | 1 | 1 | 1 | 1 | 1 | 0 | 1 |
| EMONEY | 1 | 1 | 1 | 1 | 1 | 0 | 0 |

Source: Data processing, 2023

Based on the summary of the ARDL Panel results above, the summary for long-term stability in ASEAN-5 countries is:
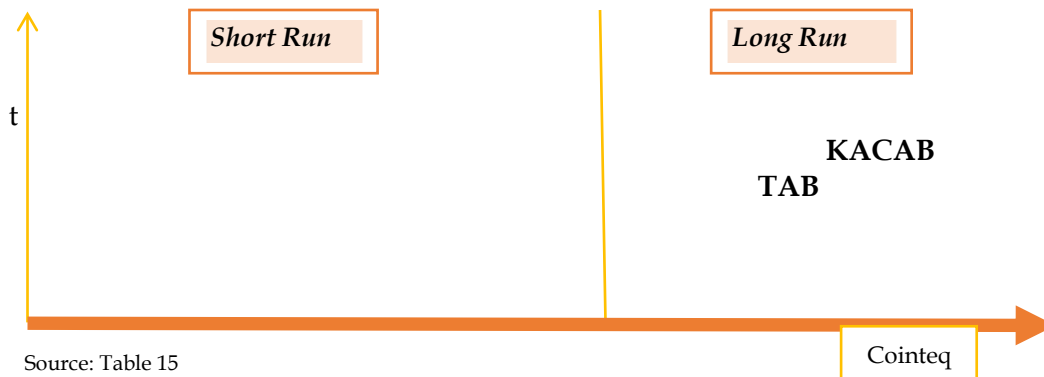


**Figure 5.** Summary ARDL Panel Model

It can be seen that for long-term stability, KACAB and TAB significantly influence UNEMP in ASEAN-5 countries, while EMONEY does not. For short-term stability, there are no variables that significantly influence UNEMP. The results for each ASEAN-5 country show that the effectiveness of financial inclusion and FinTech in determining the leading indicators of economic fundamentals of unemployment levels shows that the three observed variables, namely

KACAB, TAB, and EMONEY can become leading indicators of economic fundamentals of unemployment levels in both Indonesia and the Philippines, Vietnam, Malaysia, and Thailand. Financial inclusion and FinTech are necessary for strengthening economic fundamentals and reducing unemployment rates in the five ASEAN countries.

The most significant contribution to reducing unemployment in Indonesia is EMONEY, with a negative and significant coefficient at $\alpha$ = 5%. It proves the statement by The Institute for Development of Economics and Finance (INDEF) that the development of FinTech has increased labor absorption, ultimately reducing the unemployment rate (Adhinegara, Huda, & Adha, 2018). Because the presence of FinTech will open up new job opportunities for people who can scale up more quickly, cost-effectively, and efficiently (FSB, 2017). Similar to Indonesia, in the Philippines, similar results were also found. The most enormous contribution to reducing unemployment in the Philippines is FinTech (variable EMONEY). Therefore, the government can implement FinTech developments and establish policies to reduce unemployment.

The most significant contribution to reducing the unemployment rate in Vietnam was TAB, followed by EMONEY. These findings confirm that financial inclusion and FinTech can be leading indicators of reducing unemployment in Vietnam. It is also supported by research results (Bande-Ramudo, Fernandez-Grela, & Riveiro-Garcia, 2014), which explain that when savings increase, unemployment will increase (because consumption decreases). However, using savings for investment will reduce the unemployment rate in the medium term.

The most significant contribution to reducing unemployment rates for Malaysia and Thailand comes from the financial inclusion variable, namely KACAB. Even though technology is developing rapidly in developing countries, many people still prefer to go directly to financial institutions such as banks to make transactions both for cash deposits and opening new accounts. In addition, people also come to the bank to apply for business capital loans. So, as more and more new bank branches are opened, labor absorption will expand, ultimately reducing the unemployment rate. This finding is confirmed by (Mehry, Ashraf, & Marwa, 2021) (Sykes, Elder, Gurbuzer, & Principi, 2016) that financial inclusion significantly negatively impacts unemployment rates in developing countries.

**Analysis of the Effectiveness of Financial Inclusion and Financial Technology in Determining Leading Economic Fundamental Indicators (INF) in ASEAN-5**

This analysis was conducted to find leading indicators of economic fundamentals for the inflation rate in ASEAN-5. The ARDL Panel results for the economic fundamentals of the inflation rate show the leading indicator of the inflation rate in each observed country. Based on the summary of the results of the ARDL Panel model with INF as the dependent variable, it can be analyzed as follows:

**Table 16.** Summary of ARDL Panel Model Results (INF)

| Variabel | Indonesia | Philippines | Vietnam | Malaysia | Thailand | Short Run | Long Run |
|---|---|---|---|---|---|---|---|
| KACAB | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| TAB | 1 | 1 | 1 | 1 | 1 | 0 | 1 |
| EMONEY | 1 | 1 | 1 | 1 | 1 | 0 | 0 |

Based on the summary of the results of the ARDL Panel above, the summary for long-term stability in ASEAN-5 countries is:
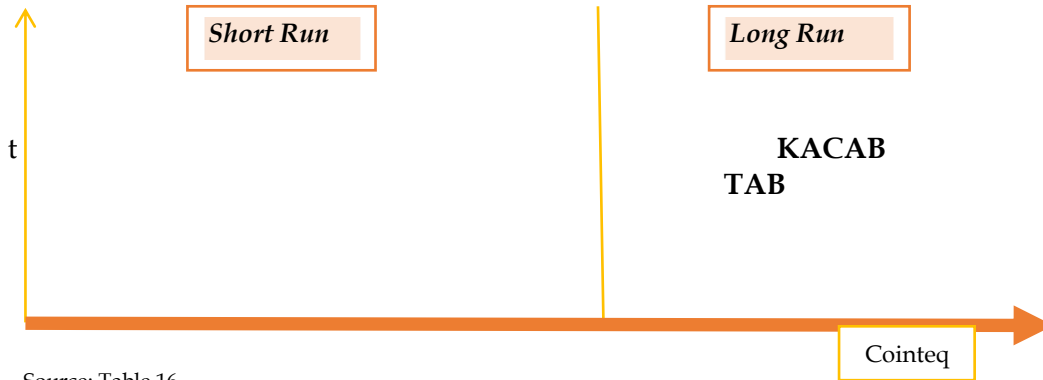
Source: Table 16

**Figure 6.** Summary ARDL Panel Model

It can be seen that for long-term stability, KACAB and TAB significantly influence INF in ASEAN-5 countries, while EMONEY does not. For short-term stability, there are no variables that significantly influence INF. The results of each ASEAN-5 country show that the effectiveness of financial inclusion and FinTech in determining the leading indicators of economic fundamentals for inflation rates shows that the three observational variables, namely KACAB, TAB, and EMONEY can become leading indicators of economic fundamentals for inflation rates in Thailand. It means that financial inclusion and FinTech are urgently needed to strengthen economic fundamentals in controlling Thailand's inflation rate. Meanwhile, in Indonesia, the Philippines, Vietnam, and Malaysia, the effectiveness of financial and FinTech inclusion is only the TAB and EMONEY variables, which can become leading indicators of economic fundamentals for controlling inflation.

TAB enormously contributes to reducing inflation in Indonesia, as seen from the highest coefficient value, namely -0.056 and a probability of 0.0000. EMONEY is also significant in influencing the decline in inflation in Indonesia, but KACAB was found not to influence inflation significantly. The characteristics of the Indonesian people prefer payment via card (Bisnis.com, 2021), in line with research results that through fintech can control inflation in Indonesia. The findings in Indonesia are also the same as the findings in Vietnam. These results are also supported by research (Bourainy, Salah , & El Sherif, 2021) (Mbutor & Uba, 2013) (Lenka & Bairwa, 2016). Policymakers in Indonesia and Vietnam should consider and optimize financial inclusion and FinTech as a tool to reduce inflation rates. It is proven that in 2020, Vietnam's e-commerce sector grew significantly. Regarding payment methods, Vietnamese people prefer debit or credit cards (Bisnis.com, 2021).

Like the Philippines, financial inclusion through the TAB variable and FinTech through the EMONEY variable also affected inflation significantly, but the relationship is positive. It is worth considering that some population has access to formal finance, but others still need to. The use of few banking products and the low number of people who make digital payments ultimately make inflation control in the Philippines less effective, following the habits of Filipino people who prefer cash in making payments (Bisnis.com, 2021). This finding aligns with (Khan, 2011) dan (Dupas, Keats, & Robinson, 2013).

In Malaysia, an immense contribution to reducing inflation also comes from the TAB variable. Financial inclusion has also been proven to reduce inflation rates in Malaysia, but FinTech influences inflation positively. Malaysians favor bank transfers as the most popular

payment option for online purchases (Bisnis.com, 2021). This condition also causes inflation control through FinTech in Malaysia less effective.

Thailand's most significant contribution to reducing inflation comes from the EMONEY variable. This finding is supported by (Mylonas, Schich, & Wehinger, 2000), who state that FinTech as a form of financial market development significantly affects the effectiveness of monetary policy through controlling inflation. (Mishra & Pradhan, 2008) also emphasized that showing FinTech as a form of financial innovation will strengthen interest rates in controlling inflation.

## CONCLUSION

Based on the analysis and discussion carried out, using the ARDL Panel model, financial inclusion and financial technology can find leading indicators of economic fundamentals in each of the ASEAN-5 countries. We found that the leading economic fundamental indicators of unemployment rates in Indonesia, the Philippines, Vietnam, Malaysia, and Thailand are the variables of the number of bank branches, savings, and e-money. It shows that the effectiveness of financial inclusion and financial technology is essential in reducing the unemployment rate in each of the ASEAN-5 countries. Furthermore, the leading fundamental economic indicators of inflation rates in Indonesia, the Philippines, Vietnam, and Malaysia are savings and e-money variables. It shows that the effectiveness of financial inclusion and financial technology is vital in reducing the unemployment rate in each of the ASEAN-5 countries. Finally, Thailand is the chosen country because the three observation variables, namely the number of bank branches, savings accounts, and e-money, can become leading indicators of economic fundamentals for controlling inflation.

Our recommendations for policymakers in each ASEAN-5 country should be to increase financial inclusion regarding access and use of financial technology to strengthen economic fundamentals and reduce poverty. Good collaboration will strengthen economic fundamentals, namely GDP, reduce unemployment, control inflation in each country, and ultimately reduce poverty. Along with technological developments, governments in each country also need to improve facilities related to ease of internet access because, in remote areas, many people still find it challenging to access the internet. In addition, it is necessary to carry out awareness campaigns and seminars for the uneducated and less educated workforce according to the needs of a competitive market so that unemployment can be reduced on the part of people who need help understanding information and communication technology skills.

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