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Original Paper

The Effect of Interest Rates, Exchange Rates and Output Gap on Inflation in Five ASEAN Countries: A Panel Data Evidence

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Abstract. Almost every country, both developed and developing ones, faces stability problems and economic growth problems. One of the issues that receives special attention in each country is inflation. Inflation is seen as a crucial variable for potential economic conditions where sustainable economic growth is the main goal of every country. Unstable inflation can be influenced by macroeconomic variables, including interest rates, exchange rates, and output gaps. Observing how the determinants affect inflation, we hypothesize that interest rates and exchange rates have a negative and significant effect on inflation while the output gap has a positive and significant effect on inflation. To explore our goals, we use panel data consisting of ASEAN countries including Indonesia, Malaysia, Singapore, Thailand and the Philippines. The panel data analysis method allows us to study the dynamics of changes with time series by using the Fixed Effect Model. The data used in this study are secondary data for 2000–2019 obtained from the World Bank and Global Economic Data, Indicators, Charts & Forecasts. The results showed that the variables Interest Rate, Exchange Rate and Output Gap together had a significant effect on inflation. Interest Rates and Exchange Rates have a negative and significant effect on Inflation in the five ASEAN countries. Meanwhile, the Output Gap has a positive and significant effect on inflation in the five ASEAN countries. Indonesia and the Philippines have the highest inflation estimates. Indonesia is the country with the highest inflation with an average inflation of 6.76%. The lowest inflation intercepts and estimates were in Singapore. The inflation rate over the past 20 years in Singapore has tended to fluctuate with an average of 1.53%.

Key words: inflation; interest rates; exchange rates; output gap.

JEL E4, E31, F2, F31

1. Introduction

The economic stability of a country is a benchmark for sustainable economic development. Correspondingly, the problem of economic stability is also a classic problem, especially for developing countries [1]. Almost every country, both developed and developing, faces stability problems and economic growth problems [2].

One of the issues that receives special attention in individual countries is inflation. Its ever-increasing development provides obstacles to economic growth in a better direction [3]. Inflation tends to occur in developing countries as well as countries in ASEAN [4].

Inflation is seen as a crucial variable for potential economic conditions, where sustainable economic growth is the main goal of every nation [5, 6]. Domestic failures or shocks will cause price fluctuations in the domestic market and end up with inflation in the economy.

The year-over-year rate of inflation continues to fluctuate due to erratic rises and decreases over time, after a major contraction occurred in 1998. Around the end of 1999, Bank Indonesia (BI) adopted inflation targeting as part of its approach to monetary policy [7]. In 2005 the Indonesian state had a high inflation rate of 17.1 percent because the world oil price increased.

In addition, Malaysia saw an increase in inflation of 3.5 percent, followed by Singapore's inflation rate of 1.3 percent, after which inflation in Thailand and the Philippines was 5.8 percent and 6.7 percent, respectively. Then in 2008 there was a global economic crisis centered in the United States. This crisis has had a considerable impact on the global economy, especially for countries that have very close economic ties with the United States.

In this regard, the five ASEAN countries also felt the impact, although not as much as the monetary crisis of 1998. The deepening global economic slowdown and the decline in global commodity prices [8; 9] and encouraged the decline in export growth of household consumption, investment, and imports in five ASEAN countries.

This study aims to analyze the effect of Interest Rates, Exchange Rates, and the Output Gap on inflation in five ASEAN countries. Observing how the determinants affect inflation, we hypothesize that interest rates and exchange rates have a negative and significant effect on inflation while the output gap has a positive and significant effect on inflation.

The hypothesis of the study: Interest rates and exchange rates have a negative and significant effect on inflation and the output gap has a positive and significant effect on inflation.

To explore our goals, we use panel data consisting of ASEAN countries including Indonesia, Malaysia, Singapore, Thailand, and the Philippines. The rest of the research is structured as follows, a literature review in the form of relevant previous articles discussing inflation, methodology, discussion, and final conclusions.

2. Literature Review

Unstable inflation developments can be influenced by macroeconomic variables [10], one of which is the interest rate variable. Carvalho et al. [11] in their study mentioned that the difference in inflation rates among countries is then often considered to come from the credibility of the government, the quality of monetary policy institutions, practical arrangements in the Central Bank. In terms of controlling inflation, it is likely to require more than a tight and vigilant monetary policy [12; 13].

According to McLeay et al. [14] and Smets [15] interest is one way for monetary authorities to control the money supply which will later maintain a balance of price levels. According to the findings of Islam et al. [16] the government's monetary policy can address the problem of high inflation in Malaysia, these policies include raising bank interest rates, selling securities in open markets, raising reserve ratios, and regulating consumer credit.

The next factor affecting inflation is the exchange rate. The exchange rate is an important macro variable in the economy because the exchange rate is used to measure the economic level of a country [17]. Exchange rate volatility have significant effect on trade [18] and another factor that can lead to inflation is the gap between excess aggregate demand that is not offset by aggregate supply in an economy. This gap is called the output gap.

The output gap is defined as the percentage difference between actual output and potential output [19; 20]. According to Baharumshah et al. [21] high and unstable inflation is very important to pay attention to considering its impact on the economy which can cause uncertainty for economic actors in making decisions that will ultimately disrupt a country's economy.

Research of Lim & Sek [22] discusses the factors that affect inflation in two groups of countries (high inflation group and low inflation group). Related results show that GDP growth and imported goods and services have a significant long-term path to inflation in low-inflation countries. The results of the study also show that the money supply, government spending, and GDP growth are the determinants of inflation which have a long-term impact on high inflation in countries experiencing inflation. Even in the short term, none of these variables has proven to be a significant factor in countries with high inflation. However, the money supply, imports of goods and services, and GDP growth are significantly related to inflation in countries with low inflation.

The paper researched by Khan & Gill [23] focuses on the determinants of inflation in Pakistan using four prices indicators, namely CPI, WPI, SPI, and GDP Deflator for the long term (period 1971–1972 to 2005–2006). Found that the depreciation of the exchange rate and increase in the value of imports contributed to increases in the CPI, WPI, SPI and GDP deflator.

Paper researched by Nguyen et al. [24] uses a simple macroeconomic inflation model to investigate empirically CPI inflation in Vietnam during the period 2001 to 2009. Using a time series estimation technique, this article finds that inflation persists and the money supply, interest rate, oil prices and rice prices have the strongest influence on CPI inflation.

The paper researched by Mohanty & John [25] attempts to identify the determinants of inflation in India. Identified domestic inflation determinants such as crude oil price, output gap, fiscal policy and monetary policy, and their relationship with inflation are studied in the structural vector automatic regression model (SVAR). It was found that the dynamics of inflation in India has changed over time with various determinants showing significant time variations in recent years, especially after the global financial crisis.

This paper provides an empirical analysis of the dynamics of inflation in factors Ghana uses boundary tests and other econometric approaches. In this article it is found that the real output, nominal exchange rates, broad money supply, nominal interest rates and fiscal deficits play a dominant role in inflation process in Ghana [26].

In the study conducted by Alexander et al. [27] investigated the main determinants of inflation in Nigeria for the period 1986–2011. Cointegration results show long term balance between the rate of inflation and its determinants. The estimated VAR results show that the fiscal deficit, exchange rates, imports of goods and services, the money supply and agricultural products have long-term influence on the inflation rate in Nigeria. Only loan interest rates affect inflation in the short and long term.

The literature described above has shown the determinants of variables that can influence inflation but with some of the variables we studied were not used in these studies. In addition, our research explores the effects affecting inflation in five ASEAN countries. From the points stated above we therefore formulate this hypothesis:

H0: Interest rates and exchange rates have a negative and significant effect on inflation and the output gap has a positive and significant effect on inflation.

3. Methodology

3.1. Data Types and Sources

The variables used in this study consisted of independent variables and dependent variables. The independent variables are interest rates, exchange rates and output Gap, while the dependent variables are inflation.

The data used in this study are 2000–2019.

The study covers five ASEAN countries Indonesia, Malaysia, Singapore,

Thailand, the Philippines. The choice was made because the five countries are major countries in ASEAN, the founder of ASEAN and one of the five ASEAN countries is a developed country according to the IMF, Singapore with an inflation rate below 5 percent per year.

Meanwhile, the other four countries Indonesia, Malaysia, Thailand, and the Philippines are still developing countries with relatively high inflation rates in Indonesia and the Philippines of 3 percent to 10 percent, while Malaysia and Thailand have relatively low inflation rates of 1 percent to 5 percent.

The data used in this study are secondary data issued by certain institutions obtained from Bank Indonesia, Global Economic Data, Indicators, Charts & Forecasts (Ceic), ASEANstats, World Bank, Central Statistics Agency (BPS Indonesia) as well as literature studies through journals, papers, articles, and others related to this research.

3.2. Model Specifications

The analysis technique used in this study is the estimation of panel data regression. Panel data regression analysis is a combination of cross-sectional data and time series data so that it has space and time dimensions [28].

The cross-section data is the five ASEAN countries, and the time series data is the time series in 2000–2019.

The following is the regression equation in this study as follows:

$$Inf = \beta_0 + \beta_1 SK_{it} + \beta_2 NTR_{it} + \beta_3 GDPGAP_{it} + \varepsilon_{it}, \qquad (1)$$

where: Inf=Inflation in country *i* year *t*; SK_{it} =Interest Rate in country *i* year *t*; NTR_{it} =Country currency *i* year *t*; GDP_{it} =Output Gap in country *i* year *t*; β_0 = Intercept or Constant; $\beta_1, \beta_2, \beta_3$ =Regression Coefficient; ε_{it} =Error Term.

4. Research Results *4.1. Inflation Trend in Five ASEAN Countries*

Inflation is an economic condition in which prices in general (basic necessities) increase. Inflation is one of macroeconomic factors in looking at the economic stability of a country [29].

The inflation rate differs from one period to another, and between countries it also differs. Sometimes the inflation rate is very low, reaching 2 percent or 3 percent. and sometimes experiencing high inflation. The inflation rate fluctuates greatly over time indicating that a country's economy is unstable. The importance of controlling inflation is based on the consideration that high inflation will have a negative impact on the social and economic situation of the people while countries that have low inflation have good monetary stability.The movement of inflation in the Five ASEAN countries from 2000–2019 can be seen in figure 1.

The economies in the five ASEAN Countries in the research period always fluctuated from year to year. The country that has the highest average inflation rate is Indonesia with an average inflation of 6,758 percent. while the country that has the lowest average inflation rate is Singapore with an average inflation of 1.53 percent during the observation year, the average of inflation in the five ASEAN countries is 3.29 percent per year.

In Figure 1, 2005 and 2008 were the years when the average inflation in five ASEAN countries experienced the highest level such as Indonesia in 2005 the inflation rate was 17.1 percent, an increase from the previous 6.4 percent in 2004. The cause of the increase in fuel oil (BBM) prices both through direct and follow-up impacts. Supply and distribution disruptions, high inflation expectations and rupiah depreciation have also exacerbated pressures.



Source: Worldbank, Inflation Consumer Prices (data processed)

In addition, several other adminsteredprices policies such as cigarette prices, toll tariffs and PAM also increased prices. Meanwhile, the other four countries with the highest inflation rates after Indonesia are the Philippines and Thailand with inflation rates of 6.7 percent and 5.8 percent. Meanwhile, Malaysia and Singapore have inflation rates of 3.5 percent and 1.3 percent.

Then in 2008 inflation began to increase again which previously fell in 2006 and 2007 in five ASEAN countries. This year there was a global crisis that had an impact on the decline in world food and oil prices [30].

Singapore experienced deflation in 2008 of 5.6 percent because of the Monetary Authority of Singapore (MAS) adopting an unconventional monetary policy during the global financial crisis, which involved the appreciation of the Singapore dollar to maintain the country's competitiveness and curb inflation. Currency appreciation, coupled with reduced demand, contributed to deflation in 2008 [31].

Meanwhile, Indonesia experienced an inflation rate of up to 11.1 percent in 2008. The source of inflationary pressure

in Indonesia comes from the high spike in global commodity prices, especially oil and food commodity prices [32]. This condition also has an impact on imported commodities and even encourages government policies to adjust subsidized fuel prices [33]. Then the highest inflation rate was also in the Philippines at 8.0 percent, this inflation increased from the previous year of 3.9 percent. This increase was due to the subsequent supply shock malaysian inflation also increased from 2.4 percent in 2007 to 4.4 percent in 2008 due to the drastic increase in oil prices due to the smuggling of subsidized petrol and diesel oil, thus reducing the financial burden on the government to increase oil prices. Meanwhile, Thailand experienced a decline in inflation from 3.2 percent to 0.4 percent in 2008.

The inflation rate in ASEAN countries during 2012–2016 experienced inflation with different turmoil, in 2012 the highest inflation occurred in Singapore at 4.60 percent, Indonesia experienced inflation of 4.30 percent. Meanwhile, the country experienced low inflation of 1.2 percent. Among the five ASEAN countries, Indonesia in 2013 and 2014 was the country with the highest inflation rate. The high inflation rate in 2013 and 2014 was 8.4 percent and 8.36 percent. The cause of high inflation is because the government raises subsidized fuel prices, which causes a domino effect on the increase in prices of necessities.

Meanwhile, inflation of neighboring Indonesia in 2014 was relatively low compared to Indonesia's inflation. Singapore experienced inflation about 2.30 percent lower than last year's 2.40 percent. Inflation in the country reached 3.30 per cent, an increase compared to the previous year which reached 2.10 per cent. Meanwhile, inflation in the Philippines stood at 4.40 percent. Thailand experienced inflation of 2.30 percent [34].

In 2015–2016 ASEAN countries that tend to be able to suppress and control inflation include Malaysia, the Philippines, and Indonesia. Meanwhile, in 2016 the country that was at the level of deflation, namely Singapore. For deflation in Singapore, the amount of deflation in 2014 was 0.1 and in 2015 it was 0.6 percent. In contrast to Thailand, which can control the inflation rate, from initially experiencing the highest deflation in ASEAN in 2015, which was 0.9 percent to experiencing inflation of 1.1 percent in 2016. This deflation can threaten a country's economic growth. The investors will not be interested in investing. In addition, entrepreneurs are also less likely to develop their business. This is due to the low incentives obtained. These conditions can lead to the creation of no new jobs. Then the country with the highest inflation rate is Indonesia with the same inflation rate of 3.0 percent. Inflation in Indonesia continues to decline every year. This shows that Indonesia is ready to compete with other ASEAN countries [35].

In 2019 ASEAN countries experienced a decline in inflation from 2.6 percent in 2018 to 2.1 percent in 2019. Almost all countries experienced a decrease in inflation, but not Singapore which actually experienced an increase. Singapore recorded an increase in inflation from 0.5 percent in 2018 to 0.6 percent.

The relatively low inflation increase was caused by price increases in the domestic transportation sector. Inflation in the Philippines has decreased from 6.6 percent in 2018 to 1.5 percent in 2019. This decrease in inflation was caused by a decrease in rice prices due to its abundant stocks. Meanwhile, Malaysia's inflation was recorded at 0.7 percent, up slightly from 1 percent in 2018. This decline is more due to the deflationary trend that has continued to occur from 2018 to the first quarter of 2019, as well as the decline in prices in the transportation sector.

The next country, Thailand, recorded stable inflation between 2018 and 2019 of 0.4 percent. Thailand's inflation rate is stable due to low world oil prices. Indonesia's inflation in 2019 was recorded at 2.7 percent or lower than 2018 inflation of 3.1 percent. This inflation rate is still within the government's target range of 2.5 to 4.5 percent. This achievement also continues the achievements that have been continuously in the target range for the last 4 years.

Low inflation in Indonesia is attributable to maintained domestic demand and appreciation of the rupiah exchange rate, as well as low inflation of administered prices.Low inflation is also attributable to the success of policies implemented by the government and bank Indonesia in controlling food prices.

4.2. Interest Rate Trend in Five ASEAN Countries

The interest rate is one of the monetary policy instruments implemented by raising and lowering the interest rate. This change in interest rates will affect changes in the amount of demand and supply of money in the domestic market. High interest rates will encourage people to keep money in the bank instead of investing. When interest rates are relatively high in a country compared to other countries, it results in capital flows from countries with low interest rates to high interest rate countries. This capital flow will have an impact on increasing the exchange rate to countries with high interest rates.

To measure the comparison of the actual interest rate in one country with another country, the real interest rate is usually used, which is an interest rate that has been adjusted to the rate of inflation.

Interest rates in five ASEAN countries fluctuate each year. The highest interest rate in Indonesia was 10.85 percent in 2003 and in 2010 the interest rate was at minus 1.7. Meanwhile, Malaysia had an interest rate that was in a high range in 2009 of 11.78 percent and in 2005 Malaysia experienced an interest rate of minus 2.6. Then Singapore had a high interest rate in 2008 of 6.86 percent. This interest rate hike was due to the financial crisis that made the central bank raise interest rates so that the inflation rate in this country fell or stabilized and in 2007 Singapore experienced an interest rate at minus 0.55 (Figure 2). Meanwhile, Thailand's highest interest rate in 2000 was 6.41. This increase was due to the Thai state in the phase of restoring the economy after the 1997 crisis and in 2005 Thailand experienced an interest rate at minus 0.4. Furthermore, the Philippines has an interest rate that is in the range between 1.0 percent – 6.42 percent in the period 2000 to 2019, with the highest interest rate in 2001 at 6.42 percent.

This increase is because the inflation rate this year is high, making the government raise interest rates so that inflation falls. High real interest rates can be beneficial for investors because the yield obtained is higher than the real estate value but will instead have a negative impact on creditors [36]. High interest rates also affect the business world, especially in the midst of slowing economic growth.

4.3. Exchange Rate Trend in Five ASEAN Countries

The exchange rate is the value of a country's currency expressed in the value of another country's currency. The weakening or strengthening of the exchange rate in a country depends on economic indicators. Changes in the exchange rate will have an



Source: Worldbank, Real Interest Rate (data processed)

impact on the price of domestic products, simply depreciation of the value of the currency, the price of imported goods becomes more expensive, so that the domestic people only have a choice of goods of national production.

Thus, the demand for domestic goods grew too high but the growth of inventory was not comparable so that prices increased. The exchange rate system in Indonesia uses a free-floating exchange rate system on August 14, 1997 [37], then the Thai state exchange rate system is floating bath according to the market mechanism on July 2, 1997 and the Philippines exchange rate system floats the peso on July 11, 1997.

Furthermore, Malaysia initially used a fixed exchange rate system, but on July 21, 2005, Malaysian state banks ended the fixed exchange rate system against the US Dollar and switched to a floating exchange rate system [38]. Singapore implemented its floating exchange rate in 1981.

Based on the data obtained, the exchange rate movements of the five ASEAN countries using exchange rate stability in the form of an index for the 2000–2019 period can be seen in figure 3.

Based on figure 3, it is explained that the lowest REER value in Indonesia was 82,212 in 2001 and the highest REER value was 124.85 in 2010 while the lowest REER value in Malaysia was 92,519 in 2017 and the highest REER value was 111.17 in 2002.

Furthermore, the lowest REER value in Singapore was 101.61 in 2006 and the highest REER value was 125.39 in 2013. then the lowest REER value in the country Thailand was 95,252 in 2004 and the highest REER value was 131.05 in 2019. Furthermore, the last REER value was the lowest in the Philippines at 94,565 in 2004 and the highest REER value at 136.35 in 2013. If the REER is above 100, it means that the exchange rate is above the actual value (*over value*), where the importer will be happy because the country's exchange rate is cheap but this condition is not favorable for exporters.

An increase in the Real Effective Exchange Rate below 100 indicates that the value of exports is more expensive and the value of imports is cheaper, the increase shows a decrease in trade competitiveness, and vice versa. Unstable exchange rate movements will interfere with decisionmaking in reducing selling prices and



Figure 3. Exchange Rates in Five ASEAN Countries *Source:* Ceic, Real Effective Exchange Rate (data processed)

will result in financial sector instability, decreased output and increased inflationary pressures [39].

The impact of the real exchange rate against inflation and economic growth can be seen through direct and indirect exchange rate transmission. Direct transmission of the exchange rate to inflation through changes in the prices of imported goods.

Meanwhile, indirect transmission is through aggregate demand, exports and imports as well as domestic demand such as consumption, investment and government spending.

4.4. Output Gap Trend in Five ASEAN Countries

The output gap is the difference between the actual output and the pontesial output. Actual output is the true value of economic output, while potential output is the optimum value of economic output that can be considered permanent and sunstainable in the medium term without shocks and inflationary pressures. Thus, the output gap can provide an idea of the existence of excess demand or excess supply in the economy. Actual output describes aggregate demand while potential output is said to be aggregate supply.

Based on Figure 4, the actual GDP data is the real GDP in the Five ASEAN Countries because this GDP describes economic growth from year to year and the potential GDP data is an estimate using the HP Filter method.

In the period from 2000 to 2019 the output gap has always undergone fluctuating changes in the five ASEAN countries. The development of the output gap in Indonesia in the past five years has experienced a negative output gap of 0.003 to 0.022 which indicates that the inflation rate in Indonesia has decreased. Meanwhile, Malayasia experienced a positive output gap during 2014 to 2019, which was 0.01 to 0.02.

Then in the country, the country experienced a negative output gap in 2016 to 2019, which was 0.01 to 0.15. Furthermore, Thailand had a negative output gap in 2014 to 2019, except for 2018 which had a positive output gap of 0.024, andthe last one was the Philippines which had negative output in 2014 to 2015, and in 2016 to 2019 experienced a positive output gap of 0.02 to 0.04. This negative output gap makes



supply tend to overdo it so that the price level in general decreases or deflation [40].

Meanwhile, the output gap is positive, indicating an excess of demand so that the price level in general increases or inflation. This excess demand includes the demand for imported goods so that the trade balance can experience a deficit which will eventually make the exchange rate depreciate.

4.5. Regression Result Analysis

Before making an estimate, according to Tinungki et al. [41], it is necessary to choose a regression method, first by conducting a Chow test, namely comparing Pooled Least Square (PLS) with Fixed Effect Model (FEM).

Based on the results of the Chow test, the inflation model shows the probability value is 0.000, meaning that the best

Table 1 Chow Test and Hausman Test

model chosen for the inflation model is the Fixed Effect Model because the chisquare probability value is less than the 5% significance level. The next test is to choose the best model between the Fixed Effect Model and the Random Effect Model by conducting a Hausman Test (Table 1).

Based on the Hausman test results, the Chi-Square probability value on the inflation model is 0.0295, meaning that the best model is the Fixed Effect Model. The test results have the same selection results in each test so there is no need for LM testing so that the selected model is a Fixed Effect Model. The following are the model estimates, which can be seen in Table 2.

Based on the results of the selection of panel data regression estimates that have been carried out with the Chow Test and Hausman Test, the most appropriate model

Test	Statistics	Probability			
Chow Test	20.807832	0.0000			
Hausman Test	8.982708	0.0295			

Source: Data Processed EViews 9 (2021)

Table 2. F	Panel Data	Regression	Estimation	Results	(Dependent \	Variables: INF)
					•	•

Variables	Coefficient	Std. Error	t-Statistics	Prob.
C SB? NTR? GDPGAP?	9.282481 -0.201364 -0.047510 6.407782	1.782189 0.063851 0.015802 2.653291	5.208471 -3.153671 -3.006617 2.415032	0.0000 0.0022 0.0034 0.0177
Fixed Effects (Cross) _INDONESIA – C _MALAYSIA – C _SINGAPORE – C _THAILAND – C _FILIPINA – C	3.683244 -1.760993 -1.572268 -1.444212 1.094229			
R-squared Adjusted R-squared S.E. of regression F-statistics Prob(F-statistic)	0.528086 0.492180 1.925738 14.70728 0.000000	Mean dependent var S.D. dependent var Sum squared reside Durbin-Watson stat		3.473989 2.566221 341.1791 1.789675

Source: Data Processed Eviews 9 (2021)

used in this study is the Fixed Effect Model. The following is the regression equation of the Fixed Effect Model:

INF = 9.2825 - 0.20136 SB - 0.04751 NTR + + 6.4078 GDPGAP

(1.782189) (0.063851)** (0.015802)** (2.653291)**

A constant value of 9.282481 indicates that if the independent variables *Interest Rate* (SB), *Exchange Rate* (NTR), and *Output Gap* (GDPGAP) are 0 then the amount of inflation produced by each of the five ASEAN countries is 9.282481.

The Interest Rate variable yields a regression coefficient value of -0.201364 with a probability of 0.0022 indicating a negative and significant relationship of $0.0022 < \alpha = 0.05$. That is, if the variable interest rate rises by 1 percent, then relative inflation will fall by 0.1364 and vice versa assuming that other variables are constant.

The *Exchange Rate* variable produces a regression coefficient value of -0.047510with a probability of 0.0034 indicating a negative and significant direction of 0.0034 <= 0.05. This means that if the Exchange Rate variable increases by 1 percent, then the amount of relative inflation decreases by 0.047510, and vice versa assuming that other variables are constant.

The *Output Gap* variable produces a regression coefficient value of 6.407782 with a probability of 0.0177 indicating a positive and significant direction of 0.0177 <= 0.05. That is, if the Output Gap variable is relatively increased by 1 percent, then Inflation will increase by 6.407782 and vice versa assuming that other variables are constant.

Based on the F-statistical test in table 2, the Prob (F-Statistic) value is 0.0000 < 0.05. While the critical F value (F_table) $\alpha = 0.05$ with = 3-1=2 and = $100 - 3 = 97 df_1 df_2$ is 3.09. Then $F_{statistik} > F_{table}$ with a value of 14.70728>3.09. It can be concluded that the *Interest Rate, Exchange Rate* and *Output Gap* together affect the inflation variables.

Based on the results of the regression t table at the level=0.05 and df=100-3=97 t-table of 1.66071, it is known that the t-statistical value of the Interest Rate variable is -3.153671, the t-statistical value of 1.66071 which means that some interest rate variables have a negative and significant effect on inflation.

The exchange rate variable has a t-statistical value of -3.00617, the statistical value is smaller than the t-table value of 1.66071 which means that the exchange rate has a negative and significant effect on inflation. While the output gap variable has a t-statistic of 2.415032, the statistical value is greater than the t-table value of 1.66071 which means that the output gap has a positive effect on inflation.

4.6. Classical Assumptions

To obtain good estimation results, the secondary data must first pass the classical assumption test, namely the Heterochedasticity Test (Table 3), the Multicollinearity Test and the Autocorrelation Test (Table 4).

B a s e d on the results of heterochedasticity testing, it shows the probability of an interest rate of 0.5888 > analpha level of 0.05 then based on the results of the exchange rate shows a probability of 0.1118 > an alpha level of 0.05. and gdpgap has a probability of 0.3334 > alpha level of 0.05. therefore the results of all variables show no heteroskedasticity.

Autocorrelation is the residual relationship of one observation with the residual of another observation. To find out whether there is autocorrelation used the *Durbin Watson Test method*.

When viewed from table 2, in the model used, namely the *Fixed Effect Model*, it shows the Durbin Watson test value of

Variables	Coefficient	Std. Error	t-Statistics	Prob.
С	2.913226	0.978160	2.978272	0.0037
SB	0.018239	0.033625	0.542421	0.5888
NTR	-0.013907	0.008662	-1.605494	0.1118
GDPGAP	1.421953	1.462190	0.972482	0.3334

Table 3. Heteroskedasticity Test Results

Source: Processed Data Eviews 9, 2021

Table 4. Multicholinearity Test Results

	SB	NTR	GDPGAP
SB	1.000000	0.107677	-0.306984
NTR	0.107677	1.000000	0.018130
GDPGAP	-0.306984	0.018130	1.000000

Source: Processed Data Eviews 9, 2021

1.789675 with k: 3 then obtained the dL value: 1.6131, dU value: 1.7364, 4-dL value: 2.3869 and 4-dU value: 2.2636, meaning that the dU value < DW < 4-dU so that the model is free and does not experience autocorrelation problems.

From the results of the *Correlation Matrix* in table 4, it can be seen that the correlation matrix coefficient between free variables is smaller than 0.80 so that there is no linear relationship between variables or there is no multicoliniearity problem.

4.7. Individual Analysis

Individual Analysis is an effect of the Fixed Effect Model (FEM). The heterogeneity generated by each city describes the existence of other factors or variables that belong to one country that are not owned by another. In other words that the state has an advantage over other variables beyond the independent variables in the model.

Based on Table 5, the interception results show the Fixed Effect Model (FEM) estimation coefficient, the interception values show that the five ASEAN countries have different inflation rates equal to the interception values of each country.

Indonesia has a higher intercept value than the other four countries, namely 12.9657 with an estimated INF of 6.75 percent. Then the second highest interception value after Indonesia is the

	•			
No	Country	Average Inflation	Interception Value	INF estimates
1	Indonesian	6.758	12.9657	6.7576
2	Malaysia	2.16	7.5214	2.1606
3	Singapore	1.533	7.7102	1.5336
4	Thailand	2.016	7.8382	2.0165
5	Philippines	3.842	10.3767	3.8421

Table 5. The Interception Value of Each Individual (State)

Sources: Excel Processed Data, 2021

Philippines at 10.3767 with an estimated INF of around 3.84 percent. Next is Singapore with an intercept value of 7.7102 and the lowest estimated INF in the Five ASEAN Countries, which is around 1.53 percent.

5. Discussion 5.1. The Effect of 1

5.1. The Effect of Interest Rates on Inflation

Based on the results of regression estimation using the fixed effect method in table 2, the Interest Rate variable has a probability value of 0.0022 which is less than = 5 % (0.05). This shows that individually, the independent variable (*Interest Rate*) has a negative and significant effect on inflation in the Five ASEAN Countries. The value of the variable coefficient of interest rates is -0.201364 which can be said that the higher the interest rate, the relatively lower the inflation rate in the five ASEAN countries.

When the inflation rate is high, in which the general price of goods and services increases, the central bank must make policies to reduce inflation. It is very difficult to assess real interest rate levels when inflation expectations move quickly [42].

According to Coibion et al. [43] when the inflation rate is high, to control it, the central bank raises interest rates so that the inflation rate decreases. When interest rates rise, loans become expensive because the costs also go up.

This condition will suppress public demand for loans, so that the loan amount decreases. If the demand for loans decreases, the money supply in the community will also decrease. This means that people have less money to spend. In other words, people's purchasing power towards goods and services is low. As a result, they will buy less goods and services.

The low purchasing power of the people will in turn lead to a decrease in demand for goods and services in general [44]. In a fixed supply or consistent supply, there will certainly be a decrease in the level of demand, so the price of goods and services in the market will fall [45]. With the decline in the price level of goods and services in general, it will automatically reduce the inflation rate [46].

The negative effect of interest rates on inflation is in accordance with the hypothesis put forward by the authors.

5.2. Effect of Exchange Rate on Inflation

Based on the results of regression estimation using the fixed effect method in table 2, the *Exchange Rate* variable has a probability value of 0.0034 which is less than = 5% (0.05). This shows that individually, an independent or independent variable (*Exchange Rate*) has a negative and significant effect on inflation in the Five ASEAN Countries.

The value of the variable coefficient of the exchange rate is -0.047510 which can be said that the lower the exchange rate or depreciation against the USD, the inflation rate in the Five ASEAN Countries is relatively increasing.

An important factor weighing on financial stability is the right choice of inflation target. Because inflation affects the extent to which central banks take into account exchange rate movements in implementing monetary policy [47].

When a country's currency appreciates (its value increases relative to other currencies), domestic goods become expensive compared to foreign goods assuming constant domestic prices in both countries [48]. Then when the currency depreciated, domestic goods became cheap compared to foreign goods. Exchange rate instability will have an impact on a country's trade activities and economic activities [49].

Depreciation of the value of a country's currency against the currency of another

country will lead to an increase in the cost of importing goods such as consumer goods, capital goods and an increase in industrial raw materials that cannot be produced domestically [50]. Or it can be called import inflation, which is inflation that occurs domestically due to the influence of price increases from abroad. An increase in the cost of imported raw materials leads to a shortage of manufactured goods. To cover the increase in import costs, domestic producers will increase the prices of their manufactured goods so as to increase prices at the domestic price level, this is a reflection of the inflation rate [51].

This is in line with research conducted by Islam et al. [16] which states that there is a relationship between there is a close relationship between the real exchange rate and the inflation rate, where the depreciation of the real exchange rate will encourage an increase in the inflation rate.

The negative effect of Exchange Rate on inflation is in accordance with the hypothesis put forward by the authors.

5.3. Effect of Output Gap on Inflation

Based on the results of regression estimation using the fixed effect method in table 2, the *Output Gap* variable has a probability value of 0.0177 which is less than = 5 % (0.05). This shows that individually, the independent variable (*Output Gap*) has a positive and significant effect on inflation in the Five ASEAN Countries. The value of the Output Gap variable coefficient is 6.407782 which can be said that the higher the Output Gap, the higher the inflation rate in the five ASEAN countries.

This is in line with generally accepted economic theory. Negative output gap in a given year, the central bank may consider implementing loose monetary policies, such as lowering interest rates and increasing the money supply, so that loans increase and ultimately increase economic growth.

Then if the output gap is positive, it is usually indicated by excessive demand so that prices tend to experience significant increases or too high inflation rates [52]. Economic conditions with positive output Gap are usually called over-heating. If the economy is over-heating, the savinginvestment balance would be expected to have deteriorated [53].

When the output gap is positive, the monetary authority slows economic growth by raising interest rates and slowing the growth of the money supply, thereby slowing credit growth which in turn will slow overall growth.

Therefore, when the economy is in a booming state, the demand for production factors will increase and this will ultimately drive the inflation rate. On the other hand, when the economy is in recession, the demand for production factors is relatively small and will then lower the inflation rate.

This is in line with research conducted by Poon & Lee [3], which state that the output gap is positively related to inflation. However, the findings of Asfuroglu [54] found that the output gap does not affect inflation. Other findings by Nishizaki et al. [55] and Yang [56] output gap negatively affect inflation.

The positive effect of Output Gap on inflation is in accordance with the hypothesis put forward by the authors.

6. Conclusion

Interest rates have a negative and significant effect on inflation in the Five ASEAN Countries. This is because if interest rates are low, the demand for loans increases, meaning that more money will be spent, so the economy grows, and the inflation rate increases.

In addition, the exchange rate has a negative and significant effect on inflation in the five ASEAN countries. This is because the depreciation of the exchange rate against other currencies will cause imported goods to increase and may increase the price of goods in the country.

Meanwhile, the output gap has a positive and significant effect on inflation in the five ASEAN countries. This is due to excessive demand for goods or services so that prices tend to experience significant increases or too high inflation rates.

The research confirmed the hypothesis of the research. Based on interception values, Indonesia and the Philippines have the highest inflation estimates with Indonesia's estimates at 6.75 percent and the Philippines at 3.84 percent, respectively. This is because inflation in the last 20 years shows that Indonesia is the country with the highest inflation with an average inflation of 6.76 percent. High inflation was caused by inflation in 2005 which reached 17.1 percent.

Meanwhile, the lowest inflation intercepts and estimates were in Singapore at 1.53 per cent. The value of this coefficient is the lowest value when compared to the other five ASEAN countries. The inflation rate over the past 20 years in Singapore has tended to fluctuate with an average of 1.53 per cent.

References

1. Urbano, D., Aparicio, S., Audretsch, D. (2019). Twenty-five years of research on institutions, entrepreneurship, and economic growth: what has been learned? *Small Business Economics*, Vol. 53, Issue 1, 21–49. DOI: https://doi.org/10.1007/s11187-018-0038-0.

2. Ogilvie, S., Carus, A.W. (2014). Institutions and Economic Growth in Historical Perspective. *In: Handbook of Economic Growth*. Edited by P. Aghion, S. N. Durlauf. Vol. 2. Elsevier B. V., 403–513. DOI: https://doi.org/10.1016/B978-0-444-53538-2.00008–3.

3. Poon, W.C., Lee, Y.S. (2014). Inflation targeting in ASEAN-10. *South African Journal of Economics*, Vol. 82, Issue 1, 141–157. DOI: https://doi.org/10.1111/saje.12028.

4. Aytaç, Ö. (2017). Exchange Rate-Based Stabilizations: a Literature Review. *Journal of Economic Surveys*, Vol. 31, Issue 3, 815–830. DOI: https://doi.org/10.1111/joes.12172.

5. Oikawa, K., Ueda, K. (2018). The optimal inflation rate under Schumpeterian growth. *Journal of Monetary Economics*, Vol. 100, 114–125. DOI: https://doi.org/10.1016/j.jmoneco.2018.07.012.

6. Feldkircher, M., Siklos, P.L. (2019). Global inflation dynamics and inflation expectations. *International Review of Economics & Finance*, Vol. 64, 217–241. DOI: https://doi.org/10.1016/j.iref.2019.06.004.

7. Kenward, L.R. (2013). Inflation targeting in Indonesia, 1999–2012: An ex-post review. *Bulletin of Indonesian Economic Studies*, Vol. 49, Issue 3, 305–327. DOI: https://doi.org/10.1080/00074918.2013.850630.

8. Gómez-Baggethun, E., Naredo, J.M. (2015). In search of lost time: the rise and fall of limits to growth in international sustainability policy. *Sustainability Science*, Vol. 10, Issue 3, 385–395. DOI: https://doi.org/10.1007/s11625-015-0308-6.

9. Joseph, A.A., Sumner, A. (2015). Growth, Poverty and Inequality under Jokowi. *Bulletin of Indonesian Economic Studies*, Vol. 51, Issue 3, 323–348. DOI: https://doi.org/10.1080/00074918. 2015.1110685.

10. Cioran, Z. (2014). Monetary Policy, Inflation and the Causal Relations between the Inflation Rate and Some of the Macroeconomic Variables. *Procedia Economics and Finance*, Vol. 16, 391–401. DOI: https://doi.org/10.1016/s2212–5671 (14) 00818-1.

11. Roncaglia de Carvalho, A., Ribeiro, R.S.M., Marques, A.M. (2018). Economic development and inflation: a theoretical and empirical analysis. *International Review of Applied Economics*, Vol. 32, Issue 4, 546–565. DOI: https://doi.org/10.1080/02692171.2017.1351531.

12. Manzur, M. (2018). Exchange rate economics is always and everywhere controversial. *Applied Economics*, Vol. 50, Issue 3, 216–232. DOI: https://doi.org/10.1080/00036846.2017.1313960.

13. Céspedes, L.F., Chang, R., Velasco, A. (2014). Is inflation targeting still on target? The recent experience of Latin America. *International Finance*, Vol. 17, Issue 2, 185–208. DOI: https://doi.org/10.1111/infi.12047.

14. 14. cLeay, M., Amar Radia, Thomas, R. (2014). Money creation in the modern economy. *Bank of England Quarterly Bulletin*, Vol. 54, Issue 1, 14–27. DOI: https://doi.org/10.1201/noe0824706326.ch390.

15. Smets, F. (2014). Financial stability and monetary policy: How closely interlinked? *International Journal of Central Banking*, Vol. 10, No. 2, 263–300. Available at: https://www.ijcb.org/journal/ijcb14q2a11.htm.

16. Islam, R., Bashawir, A., Ghani, A., Mahyudin, E., Manickam, N. (2017). Determinants of Factors that Affecting Inflation in Malaysia. *International Journal of Economics and Financial Issues*, Vol. 7, No. 2, 355–364. Available at: http://www.econjournals.com/index.php/ijefi/article/ view/3817.

17. Flores-Sosa, M., Avilés-Ochoa, E., & Merigó, J.M. (2022). Exchange rate and volatility: A bibliometric review. *International Journal of Finance and Economics*, Vol. 27, Issue 1, 1419–1442. DOI: https://doi.org/10.1002/ijfe.2223.

18. Dada, J.T. (2021). Asymmetric effect of exchange rate volatility on trade in sub-Saharan African countries. *Journal of Economic and Administrative Sciences*, Vol. 37, Issue 2, 149–162. DOI: https://doi.org/10.1108/jeas-09-2019-0101.

19. Fernald, J.G. (2014). Productivity and potential output before, during, and after the great recession. *NBER Macroeconomics Annual*. Vol. 29, No. 1, 1–51. DOI: https://doi.org/10.1086/680580.

20. Holston, K., Laubach, T., Williams, J.C. (2017). Measuring the natural rate of interest: International trends and determinants. *Journal of International Economics*, Vol. 108, Supplement 1, S59–S75. DOI: https://doi.org/10.1016/j.jinteco.2017.01.004.

21. Baharumshah, A.Z., Soon, S.V., Wohar, M.E. (2017). Markov-switching analysis of exchange rate pass-through: Perspective from Asian countries. *International Review of Economics and Finance*, Vol. 51, 245–257. DOI: https://doi.org/10.1016/j.iref.2017.05.009.

22. Lim, Y.C., Sek, S.K. (2015). An Examination on the Determinants of Inflation. *Journal of Economics, Business and Management*, Vol. 3, No. 7, 678–682. DOI: https://doi.org/10.7763/joebm.2015.v3.265.

23. Khan, R.E.A., Gill, A.R. (2010). Determinants of Inflation: A Case of Pakistan (1970–2007). *Journal of Economics*, Vol. 1, Issue 1, 45–51. DOI: https://doi.org/10.1080/09765239. 2010.11884923.

24. Nguyen, H.M., Cavoli, T., Wilson, J. (2012). The Determinants of Inflation in Nigeria. *African Journal of Economics and Sustainable Development*, Vol. 5, Issue 3, 54–72. DOI: https://doi.org/10.52589/ajesd-vli3agib.

25. Mohanty, D., John, J. (2015). Determinants of inflation in India. *Journal of Asian Economics*, Vol. 36, 86–96. DOI: https://doi.org/10.1016/j.asieco.2014.08.002.

26. Adu, G., Marbuah, G. (2011). Determinants of Inflation In Ghana: an Empirical Investigation. *South African Journal of Economics*, Vol. 79, Issue 3, 251–269. DOI: https://doi.org/10.1111/j.1813–6982.2011.01273.x.

27. Alexander, A.A., Helen, A.A., Danpome, M.G. (2015). The Main Determinants of Inflation in Nigeria. *Research Journal of Finance and Accounting*, Vol. 6, No. 2, 144–155. Available at: https://core.ac.uk/download/pdf/234630439.pdf.

28. Smith, R.J., Hsiao, C. (1988). Analysis of Panel Data. *Economica*, Vol. 55, No. 218, 284. DOI: https://doi.org/10.2307/2554479.

29. Aydın, C., Esen, Ö., Bayrak, M. (2016). Inflation and Economic Growth: A Dynamic Panel Threshold Analysis for Turkish Republics in Transition Process. *Procedia – Social and Behavioral Sciences*, Vol. 229, 196–205. DOI: https://doi.org/10.1016/j.sbspro.2016.07.129.

30. Basnet, H.C., Upadhyaya, K.P. (2015). Impact of oil price shocks on output, inflation and the real exchange rate: evidence from selected ASEAN countries. *Applied Economics*, Vol. 47, Issue 29, 3078–3091. DOI: https://doi.org/10.1080/00036846.2015.1011322.

31. Mohanty, M. (2014). The transmission of unconventional monetary policy to the emerging markets – An overview. BIS Papers Chapters. *In: Bank for International Settlements*, Vol. 78, 1–24. Available at: http://ideas.repec.org/h/bis/bisbpc/78–01.html.

32. Hochman, G., Rajagopal, D., Timilsina, G., Zilberman, D. (2014). Quantifying the causes of the global food commodity price crisis. *Biomass and Bioenergy*, Vol. 68, 106–114. DOI: https://doi.org/10.1016/j.biombioe.2014.06.012.

33. Garnaut, R. (2015). Indonesia's Resources Boom in International Perspective: Policy Dilemmas and Options for Continued Strong Growth. *Bulletin of Indonesian Economic Studies*, Vol. 51, Issue 2, 189–212. DOI: https://doi.org/10.1080/00074918.2015.1061910.

34. Central Bureau of Statistics. (2015). *Indonesia Economic Report 2015*. 1858–0963, 195 p. Available at: https://www.bi.go.id/en/publikasi/laporan/Documents/Indonesian%20Economic%20 Report%202015.pdf.

35. Central Bureau of Statistics. (2017). *Indonesia Economic Report 2017.* 1858–096, 178 p. Available at: https://www.bi.go.id/en/publikasi/laporan/Documents/Economic-Report-on-Indonesia-2017.pdf.

36. Roberts, P.W. (2013). The Profit Orientation of Microfinance Institutions and Effective Interest Rates. *World Development*, Vol. 41, 120–131. DOI: https://doi.org/10.1016/j.worlddev.2012.05.022.

37. Holtemöller, O., Mallick, S. (2013). Exchange rate regime, real misalignment and currency crises. *Economic Modelling*, Vol. 34, 5–14. DOI: https://doi.org/10.1016/j.econmod.2012.09.017.

38. Goh, S.K., McNown, R. (2015). Examining the exchange rate regime-monetary policy autonomy nexus: Evidence from Malaysia. *International Review of Economics and Finance*, Vol. 35, 292–303. DOI: https://doi.org/10.1016/j.iref.2014.10.006.

39. Juhro, S.M., Goeltom, M.S. (2015). Monetary policy regime in Indonesia. *In: Macro-Financial Linkages in the Pacific Region*. Edited by A. Kohsaka. Routledge, 219–248. Available at: https://ssrn.com/abstract=2875631.

40. Alberola, E., Gondo, R., Lombardi, M., Urbina, D. (2017). Output Gap and stabilisation policies in Latin America: The effect of commodity and capital flow cycles. *Ensayos Sobre Política Económica*, Vol. 35, Issue 82, 40–52. DOI: https://doi.org/10.1016/j.espe.2016.11.003.

41. Tinungki, G.M., Robiyanto, R., Hartono, P.G. (2022). The Effect of COVID-19 Pandemic on Corporate Dividend Policy in Indonesia: The Static and Dynamic Panel Data Approaches. *Economies*, Vol. 10, Issue 1, Article No. 11. DOI: https://doi.org/10.3390/economies10010011.

42. Taylor, J.B. (2019). Inflation targeting in high inflation emerging economies: Lessons about rules and instruments. *Journal of Applied Economics*, Vol. 22, Issue 1, 102–115. DOI: https://doi.org/10.1080/15140326.2019.1565396.

43. Coibion, O., Gorodnichenko, Y., Wieland, J. (2012). The Optimal Inflation Rate in New Keynesian Models: Should Central Banks Raise Their Inflation Targets in Light of the Zero Lower Bound? *Review of Economic Studies*, Vol. 79, Issue 4, 1371–1406. DOI: https://doi.org/10.1093/restud/rds013.

44. Kakwani, N., Son, H.H. (2016). Global poverty estimates based on 2011 purchasing power parity: where should the new poverty line be drawn? *Journal of Economic Inequality*, Vol. 14, Issue 2, 173–184. DOI: https://doi.org/10.1007/s10888–016–9322-x.

45. Borio, C., Hofmann, B. (2017). Is monetary policy less effective when interest rates are persistently low? *BIS Working Paper*, No. 628. Bank for International Settlements, 59–87. Available at: https://ssrn.com/abstract=2957961.

46. Thanh, S.D. (2015). Threshold effects of inflation on growth in the ASEAN-5 countries: A Panel Smooth Transition Regression approach. *Journal of Economics, Finance and Administrative Science*, Vol. 20, Issue 38, 41–48. DOI: https://doi.org/10.1016/j.jefas.2015.01.003.

47. Froyen, R.T., Guender, A.V. (2017). What to Aim for? The Choice of an Inflation Objective when Openness Matters. *Open Economies Review*, Vol. 28, Issue 1, 167–190. DOI: https://doi.org/10.1007/s11079-016-9409-9.

48. Gomes, S., Jacquinot, P., Mohr, M., Pisani, M. (2013). Structural reforms and macroeconomic performance in the euro area countries: A model-based assessment. *International Finance*, Vol. 16, Issue 1, 23–44. DOI: https://doi.org/10.1111/j.1468–2362.2013.12025.x.

49. Beckmann, J., Czudaj, R.L., Arora, V. (2020). The relationship between oil prices and exchange rates: Revisiting theory and evidence. *Energy Economics*, Vol. 88, 104772. DOI: https://doi.org/10.1016/j.eneco.2020.104772.

50. Bützer, S., Habib, M.M., Stracca, L. (2012). Global Exchange Rate Configurations: Do Oil Shocks Matter? *ECB Working Paper No. 1442*. European Central Bank, 34 p. DOI: https://doi.org/10.2139/ssrn.2066527.

51. Ebiringa, O.T., Anyaogu, N.B. (2014). Exchange Rate, Inflation and Interest Rates Relationships: AnAutoregressive Distributed Lag Analysis. *Journal of Economics and Development Studies*, Vol. 2, No. 2, 263–279. Available at: http://jedsnet.com/journals/jeds/Vol_2_No_2_June_2014/15.pdf.

52. Eggertsson, G., Ferrero, A., Raffo, A. (2014). Can structural reforms help Europe? *Journal of Monetary Economics*, Vol. 61, 2–22. DOI: https://doi.org/10.1016/j.jmoneco.2013.11.006.

53. Konuki, T. (2010). Estimating potential output and the output gap in Slovakia. *Eastern European Economics*, Vol. 48, Issue 2, 39–55. DOI: https://doi.org/10.2753/EEE0012-8775480203.

54. Asfuroglu, D. (2021). The Determinants of Inflation in Emerging Markets and Developing Countries: A Literature Review. *Anadolu Universitesi Sosyal Bilimler Dergisi*, Vol. 21, Issue 2, 483–504. DOI: https://doi.org/10.18037/ausbd.959251.

55. Nishizaki, K., Sekine, T., Ueno, Y. (2014). Chronic Deflation in Japan. *Asian Economic Policy Review*, Vol. 9, Issue 1, 20–39. DOI: https://doi.org/10.1111/aepr.12041.

56. Sim, C.-Y. (2021). A Review on Output-Inflation Trade-off Based on New Classical and New Keynesian Theories. *MPRA Paper No. 105767*. Germany, University Library of Munich, 7 p. Available at: https://mpra.ub.uni-muenchen.de/105767/1/MPRA paper 105767.

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Влияние процентных ставок, обменных курсов и разрыва в объеме производства на инфляцию в пяти странах ACEAH: данные панели

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Аннотация. Почти каждая страна, как развитая, так и развивающаяся, сталкивается с проблемами стабильности и экономического роста. Инфляция является одним из вопросов, которому уделяется особое внимание в каждой стране. Инфляция рассматривается как важнейшая переменная для потенциальных экономических условий, где устойчивый экономический рост является главной целью каждой страны. Нестабильная инфляция может зависеть от макроэкономических переменных, включая процентные ставки, обменные курсы и разрывы в выпуске. Наблюдая за тем, как детерминанты влияют на инфляцию, мы предполагаем, что процентные ставки и обменные курсы оказывают негативное и значительное влияние на инфляцию, в то время как разрыв в выпуске оказывает положительное и значительное влияние на инфляцию. Для подтверждения нашей гипотезы мы используем панельные данные, состоящие из стран АСЕАН, включая Индонезию, Малайзию, Сингапур, Таиланд и Филиппины. Метод панельного анализа данных позволяет изучать динамику изменений с временными рядами с помощью модели фиксированного эффекта. Данные, используемые в этом исследовании, являются вторичными данными за 2000–2019 гг., полученными от Всемирного банка и глобальных экономических данных, индикаторов, диаграмм и прогнозов. Резцльтаты показали, что переменные «Процентная ставка», «Обменный курс» и «Разрыв выпуска» вместе оказали значительное влияние на инфляцию. Процентные ставки и обменные курсы оказывают негативное и значительное влияние на инфляцию в пяти странах АСЕАН. Между тем разрыв в объеме производства оказывает положительное и значительное влияние на инфляцию в пяти странах АСЕАН. Мы показываем, что Индонезия и Филиппины имеют самые высокие показатели инфляции. Индонезия является страной с самой высокой инфляцией на уровне 6,76%. Самые низкие показатели инфляции и оценки были в Сингапуре. Уровень инфляции за последние 20 лет в Сингапуре, как правило, колебался в среднем на уровне 1,53%.

Ключевые слова: инфляция; процентные ставки; обменные курсы; разрыв в объеме производства.

Список использованных источников

1. Urbano D., Aparicio S., Audretsch D. Twenty-five years of research on institutions, entrepreneurship, and economic growth: what has been learned? // Small Business Economics. 2019. Vol. 53, Issue 1. Pp. 21–49. DOI: https://doi.org/10.1007/s11187-018-0038-0.

2. *Ogilvie S., Carus A. W.* Institutions and Economic Growth in Historical Perspective // In: Handbook of Economic Growth / Edited by P. Aghion, S. N. Durlauf. Vol. 2. Elsevier B. V., 2014. Pp. 403–513. DOI: https://doi.org/10.1016/B978-0-444-53538-2.00008–3.

3. Poon W. C., Lee Y. S. Inflation targeting in ASEAN-10 // South African Journal of Economics. 2014. Vol. 82, Issue 1. Pp. 141–157. DOI: https://doi.org/10.1111/saje.12028.

4. *Aytaç Ö*. Exchange Rate-Based Stabilizations: a Literature Review // Journal of Economic Surveys. 2017. Vol. 31, Issue 3. Pp. 815–830. DOI: https://doi.org/10.1111/joes.12172.

5. Oikawa K., Ueda K. The optimal inflation rate under Schumpeterian growth // Journal of Monetary Economics. 2018. Vol. 100. Pp. 114–125. DOI: https://doi.org/10.1016/ j.jmoneco.2018.07.012.

6. *Feldkircher M., Siklos P. L.* Global inflation dynamics and inflation expectations // International Review of Economics & Finance. 2019. Vol. 64. Pp. 217–241. DOI: https:// doi.org/10.1016/j.iref.2019.06.004.

7. *Kenward L. R.* Inflation targeting in Indonesia, 1999–2012: An ex-post review // Bulletin of Indonesian Economic Studies. 2013. Vol. 49, Issue 3. Pp. 305–327. DOI: https://doi.org/ 10.1080/00074918.2013.850630.

8. *Gómez-Baggethun E., Naredo J. M.* In search of lost time: the rise and fall of limits to growth in international sustainability policy // Sustainability Science. 2015. Vol. 10, Issue 3. Pp. 385–395. DOI: https://doi.org/10.1007/s11625-015-0308-6.

9. Joseph A. A., Sumner A. Growth, Poverty and Inequality under Jokowi // Bulletin of Indonesian Economic Studies. 2015. Vol. 51, Issue 3. Pp. 323–348. DOI: https://doi.org/10.1080/00074918.2015.1110685.

10. *Cioran Z.* Monetary Policy, Inflation and the Causal Relations between the Inflation Rate and Some of the Macroeconomic Variables // Procedia Economics and Finance. 2014. Vol. 16. Pp. 391–401. DOI: https://doi.org/10.1016/s2212–5671 (14) 00818-1.

11. Roncaglia de Carvalho A., Ribeiro R. S.M., Marques A. M. Economic development and inflation: a theoretical and empirical analysis // International Review of Applied Economics. 2018. Vol. 32, Issue 4. Pp. 546–565. DOI: https://doi.org/10.1080/02692171.2017.1351531.

12. *Manzur M*. Exchange rate economics is always and everywhere controversial // Applied Economics. 2018. Vol. 50, Issue 3. Pp. 216–232. DOI: https://doi.org/10.1080/00036846. .1313960.

13. Céspedes L. F., Chang R., Velasco A. Is inflation targeting still on target? The recent experience of Latin America // International Finance. 2014. Vol. 17, Issue 2. Pp. 185–208. DOI: https://doi.org/10.1111/infi.12047.

14. *McLeay M., Amar Radia, Thomas R.* Money creation in the modern economy // Bank of England Quarterly Bulletin. 2014. Vol. 54, Issue 1. Pp. 14–27. DOI: https://doi.org/10.1201/ noe0824706326.ch390.

15. *Smets F*. Financial stability and monetary policy: How closely interlinked? // International Journal of Central Banking. 2014. Vol. 10, No. 2. Pp. 263–300. URL: https://www.ijcb.org/journal/ijcb14q2a11.htm.

16. Islam R., Bashawir A., Ghani A., Mahyudin E., Manickam N. Determinants of Factors that Affecting Inflation in Malaysia // International Journal of Economics and Financial Issues. 2017. Vol. 7, No. 2. Pp. 355–364. URL: http://www.econjournals.com/index.php/ijefi/article/view/3817.

17. *Flores-Sosa M., Avilés-Ochoa E., Merigó J. M.* Exchange rate and volatility: A bibliometric review // International Journal of Finance and Economics. 2022. Vol. 27, Issue 1. Pp. 1419–1442. DOI: https://doi.org/10.1002/ijfe.2223.

18. *Dada J. T.* Asymmetric effect of exchange rate volatility on trade in sub-Saharan African countries // Journal of Economic and Administrative Sciences. 2021. Vol. 37, Issue 2. Pp. 149–162. DOI: https://doi.org/10.1108/jeas-09-2019-0101.

19. *Fernald J. G.* Productivity and potential output before, during, and after the great recession // NBER Macroeconomics Annual. 2014. Vol. 29, No. 1. Pp. 1–51. DOI: https:// doi.org/10.1086/680580.

20. *Holston K., Laubach T., Williams J. C.* Measuring the natural rate of interest: International trends and determinants // Journal of International Economics. 2017. Vol. 108, Supplement 1. Pp. S59–S75. DOI: https://doi.org/10.1016/j.jinteco.2017.01.004.

21. Baharumshah A. Z., Soon S. V., Wohar M. E. Markov-switching analysis of exchange rate pass-through: Perspective from Asian countries // International Review of Economics and Finance. 2017. Vol. 51. Pp. 245–257. DOI: https://doi.org/10.1016/j.iref.2017.05.009.

22. *Lim Y. C., Sek S. K.* An Examination on the Determinants of Inflation // Journal of Economics, Business and Management. 2015. Vol. 3, No. 7. Pp. 678–682. DOI: https:// doi.org/10.7763/joebm.2015.v3.265.

23. *Khan R. E.A., Gill A. R.* Determinants of Inflation: A Case of Pakistan (1970–2007) // Journal of Economics. 2010. Vol. 1, Issue 1. Pp. 45–51. DOI: https://doi.org/10.1080/09765239. 2010.11884923.

24. Nguyen H. M., Cavoli T., Wilson J. The Determinants of Inflation in Nigeria // African Journal of Economics and Sustainable Development. 2012. Vol. 5, Issue 3. Pp. 54–72. DOI: https:// doi.org/10.52589/ajesd-vli3agib.

25. *Mohanty D., John J.* Determinants of inflation in India // Journal of Asian Economics. 2015. Vol. 36. Pp. 86–96. DOI: https://doi.org/10.1016/j.asieco.2014.08.002.

26. Adu G., Marbuah G. Determinants of Inflation In Ghana: an Empirical Investigation // South African Journal of Economics. 2011. Vol. 79, Issue 3. Pp. 251–269. DOI: https:// doi.org/10.1111/j.1813–6982.2011.01273.x.

27. Alexander A. A., Helen A. A., Danpome M. G. The Main Determinants of Inflation in Nigeria // Research Journal of Finance and Accounting. 2015. Vol. 6, No. 2. Pp. 144–155. URL: https://core.ac.uk/download/pdf/234630439.pdf.

28. *Smith R. J., Hsiao C.* Analysis of Panel Data // Economica. 1988. Vol. 55, No. 218. P. 284. DOI: https://doi.org/10.2307/2554479.

29. Aydın C., Esen, Ö. Bayrak M. Inflation and Economic Growth: A Dynamic Panel Threshold Analysis for Turkish Republics in Transition Process // Procedia – Social and Behavioral Sciences. 2016. Vol. 229. Pp. 196–205. DOI: https://doi.org/10.1016/j.sbspro.2016.07.129.

30. *Basnet H. C., Upadhyaya K. P.* Impact of oil price shocks on output, inflation and the real exchange rate: evidence from selected ASEAN countries // Applied Economics. 2015. Vol. 47, Issue 29. Pp. 3078–3091. DOI: https://doi.org/10.1080/00036846.2015.1011322.

31. *Mohanty M*. The transmission of unconventional monetary policy to the emerging markets – An overview. BIS Papers Chapters // In: Bank for International Settlements. 2014. Vol. 78. Pp. 1–24. URL: http://ideas.repec.org/h/bis/bis/bis/pc/78–01.html.

32. Hochman G., Rajagopal D., Timilsina G., Zilberman D. Quantifying the causes of the global food commodity price crisis // Biomass and Bioenergy. 2014. Vol. 68. Pp. 106–114. DOI: https://doi.org/10.1016/j.biombioe.2014.06.012.

33. *Garnaut R*. Indonesia's Resources Boom in International Perspective: Policy Dilemmas and Options for Continued Strong Growth // Bulletin of Indonesian Economic Studies. 2015. Vol. 51, Issue 2. Pp. 189–212. DOI: https://doi.org/10.1080/00074918.2015.1061910.

34. Indonesia Economic Report 2015. 1858–0963. Central Bureau of Statistics, 2015. 195 p. URL: https://www.bi.go.id/en/publikasi/laporan/Documents/Indonesian%20Economic%20 Report%202015.pdf.

35. Indonesia Economic Report 2017. 1858–096. Central Bureau of Statistics, 2017. 178 p. URL: https://www.bi.go.id/en/publikasi/laporan/Documents/Economic-Report-on-Indonesia-2017.pdf.

36. *Roberts P. W.* The Profit Orientation of Microfinance Institutions and Effective Interest Rates // World Development. 2013. Vol. 41. Pp. 120–131. DOI: https://doi.org/10.1016/j.worlddev.2012.05.022.

37. *Holtemöller O., Mallick S.* Exchange rate regime, real misalignment and currency crises // Economic Modelling. 2013. Vol. 34. Pp. 5–14. DOI: https://doi.org/10.1016/j.econmod.2012.09.017.

38. *Goh S. K., McNown R.* Examining the exchange rate regime-monetary policy autonomy nexus: Evidence from Malaysia // International Review of Economics and Finance. 2015. Vol. 35. Pp. 292–303. DOI: https://doi.org/10.1016/j.iref.2014.10.006.

39. Juhro S. M., Goeltom M. S. Monetary policy regime in Indonesia // In: Macro-Financial Linkages in the Pacific Region. Edited by A. Kohsaka. Routledge, 2015. Pp. 219–248. URL: https://ssrn.com/abstract=2875631.

40. *Alberola E., Gondo R., Lombardi M., Urbina D.* Output Gap and stabilisation policies in Latin America: The effect of commodity and capital flow cycles // Ensayos Sobre Política Económica. 2017. Vol. 35, Issue 82. Pp. 40–52. DOI: https://doi.org/10.1016/j.espe.2016.11.003.

41. *Tinungki G. M., Robiyanto R., Hartono P. G.* The Effect of COVID-19 Pandemic on Corporate Dividend Policy in Indonesia: The Static and Dynamic Panel Data Approaches // Economies. 2022. Vol. 10, Issue 1. Article No. 11. DOI: https://doi.org/10.3390/economies10010011.

42. *Taylor J. B.* Inflation targeting in high inflation emerging economies: Lessons about rules and instruments // Journal of Applied Economics. 2019. Vol. 22, Issue 1. Pp. 102–115. DOI: https:// doi.org/10.1080/15140326.2019.1565396.

43. *Coibion O., Gorodnichenko Y., Wieland J.* The Optimal Inflation Rate in New Keynesian Models: Should Central Banks Raise Their Inflation Targets in Light of the Zero Lower Bound? // Review of Economic Studies. 2012. Vol. 79, Issue 4. Pp. 1371–1406. DOI: https://doi.org/10.1093/ restud/rds013.

44. *Kakwani N., Son H. H.* Global poverty estimates based on 2011 purchasing power parity: where should the new poverty line be drawn? // Journal of Economic Inequality. 2016. Vol. 14, Issue 2. Pp. 173–184. DOI: https://doi.org/10.1007/s10888–016–9322-x.

45. *Borio C., Hofmann B.* Is monetary policy less effective when interest rates are persistently low? // BIS Working Paper. No. 628. Bank for International Settlements, 2017. Pp. 59–87. URL: https://ssrn.com/abstract=2957961.

46. *Thanh S. D.* Threshold effects of inflation on growth in the ASEAN-5 countries: A Panel Smooth Transition Regression approach // Journal of Economics, Finance and Administrative Science. 2015. Vol. 20, Issue 38. Pp. 41–48. DOI: https://doi.org/10.1016/j.jefas.2015.01.003.

47. *Froyen R. T., Guender A. V.* What to Aim for? The Choice of an Inflation Objective when Openness Matters // Open Economies Review. 2017. Vol. 28, Issue 1. Pp. 167–190. DOI: https:// doi.org/10.1007/s11079-016-9409-9.

48. *Gomes S., Jacquinot P., Mohr M., Pisani M.* Structural reforms and macroeconomic performance in the euro area countries: A model-based assessment // International Finance. 2013. Vol. 16, Issue 1. Pp. 23–44. DOI: https://doi.org/10.1111/j.1468–2362.2013.12025.x.

49. *Beckmann J., Czudaj R. L., Arora V.* The relationship between oil prices and exchange rates: Revisiting theory and evidence // Energy Economics. 2020. Vol. 88. P. 104772. DOI: https:// doi.org/10.1016/j.eneco.2020.104772.

50. Bützer S., Habib M. M., Stracca L. Global Exchange Rate Configurations: Do Oil Shocks Matter? // ECB Working Paper No. 1442. European Central Bank, 2012. 34 p. DOI: https:// doi.org/10.2139/ssrn.2066527.

51. *Ebiringa O. T., Anyaogu N. B.* Exchange Rate, Inflation and Interest Rates Relationships: AnAutoregressive Distributed Lag Analysis // Journal of Economics and Development Studies. 2014. Vol. 2, No. 2. Pp. 263–279. URL: http://jedsnet.com/journals/jeds/Vol_2_No_2_June_2014/15.pdf.

52. Eggertsson G., Ferrero A., Raffo A. Can structural reforms help Europe? // Journal of Monetary Economics. 2014. Vol. 61. Pp. 2–22. DOI: https://doi.org/10.1016/j.jmoneco.2013.11.006.

53. *Konuki T*. Estimating potential output and the output gap in Slovakia // Eastern European Economics. 2010. Vol. 48, Issue 2. Pp. 39–55. DOI: https://doi.org/10.2753/EEE0012-8775480203.

54. *Asfuroglu D*. The Determinants of Inflation in Emerging Markets and Developing Countries: A Literature Review // Anadolu Universitesi Sosyal Bilimler Dergisi. 2021. Vol. 21, Issue 2. Pp. 483–504. DOI: https://doi.org/10.18037/ausbd.959251.

55. Nishizaki K., Sekine T., Ueno Y. Chronic Deflation in Japan // Asian Economic Policy Review. 2014. Vol. 9, Issue 1. Pp. 20–39. DOI: https://doi.org/10.1111/aepr.12041.

56. Sim C.-Y. A Review on Output-Inflation Trade-off Based on New Classical and New Keynesian Theories // MPRA Paper No. 105767. Germany: University Library of Munich, 2021. 7 p. URL: https://mpra.ub.uni-muenchen.de/105767/1/MPRA_paper_105767.

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