The Effect of Exchange Rate and Unemployment on Inflation in Aceh Province

Tri Puspita Rahmawati[1], Muhammar Syafii[2], Dian Annisa Putri[3]
Study Program economics Faculty Ekonomy University Negeri Medan (1,2,3)

Abstract

This study aims to analyze the effect of exchange rates and unemployment rates on inflation in Aceh Province using the Vector Error Correction Model (VECM) method. Secondary data was obtained from the Central Statistics Agency (BPS) for exchange rate, unemployment, and inflation variables for the period 1988-2021. The research method used a quantitative approach with stationary tests, cointegration tests, and VECM estimation. The results show that in the short term, no variables significantly affect inflation. In the long term, the unemployment rate has a negative and significant effect on inflation. The research model has a good fit with an R-squared value of 90.78%. The research conclusion is that the influence of exchange rates and unemployment rates on inflation differs between the short and long term. These findings are expected to serve as a reference in formulating economic policies, particularly in managing inflation in Aceh Province through exchange rate and unemployment level control.
Keywords*: Inflation, Exchange Rate, Unemployment Rate,*

Abstrak

Penelitian ini bertujuan menganalisis pengaruh nilai tukar dan tingkat pengangguran terhadap inflasi di Provinsi Aceh menggunakan metode Vector Error Correction Model (VECM). Data sekunder diperoleh dari Badan Pusat Statistik (BPS) untuk variabel nilai tukar, pengangguran, dan inflasi periode 1988-2021. Metode penelitian menggunakan pendekatan kuantitatif dengan uji stasioner, uji kointegrasi, dan estimasi VECM. Hasil penelitian menunjukkan bahwa dalam jangka pendek, tidak ada variabel yang signifikan memengaruhi inflasi. Dalam jangka panjang, tingkat pengangguran berpengaruh negatif dan signifikan terhadap inflasi. Model penelitian memiliki tingkat kesesuaian baik dengan nilai R-squared 90,78%. Kesimpulan penelitian adalah pengaruh nilai tukar dan tingkat pengangguran terhadap inflasi berbeda antara jangka pendek dan jangka panjang. Penelitian ini diharapkan menjadi referensi dalam merumuskan kebijakan ekonomi, terutama dalam mengelola inflasi di Provinsi Aceh melalui pengendalian nilai tukar dan tingkat pengangguran.

INTRODUCTION

The economic structure in developing countries is generally very vulnerable to shocks that lead to economic instability. When economic instability occurs in developing countries, it can result in economic problems such as hindered economic growth, unemployment, and inflation. Therefore, macroeconomics plays an important role in analyzing these issues and targeting policies to achieve economic stability. According to Rahardja and Manurung (2008), a government is considered to have failed if it does not succeed in addressing the issues of inflation and unemployment.

Unemployment and inflation are key indicators of macroeconomics, and changes in these two indicators can have a direct impact on economic growth. Policymakers have two main objectives for creating economic stability: to achieve stable inflation and to maintain low unemployment rates. However, in monetary policy analysis, A.W. Phillips stated that there is a strong and stable relationship between inflation and unemployment. Rapid economic growth can lead to a reduction in unemployment problems but may also result in increased inflation (Mankiw, 2020). This occurs because, in the short term, an increase in inflation can lead to a decrease in unemployment. When the unemployment rate falls, wage levels tend to rise. As wages increase, this leads to a rise in aggregate demand, and the increase in aggregate demand subsequently causes a rise in price levels, resulting in inflation (Dornbusch et al., 2008). This phenomenon is known as the "Phillips Curve Theory," which illustrates the trade-off between unemployment and inflation.

Inflation is a general and continuous increase in prices (Sukirno, 2011). Every country or region experiences inflation, and the factors that cause inflation in a particular area can vary. Therefore, local governments must be able to analyze and control the factors that can lead to inflation. Some of the factors that can influence inflation include unemployment, inflation expectations, exchange rates, the money supply, and the income of a country or region (GDP/GRDP).

The comparison graph of inflation in Indonesia and Aceh for the period 2011-2021 is as follows :
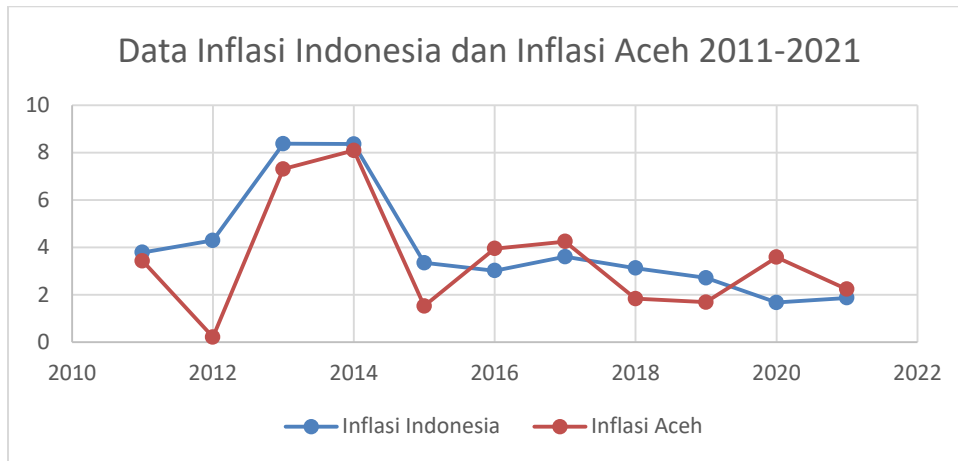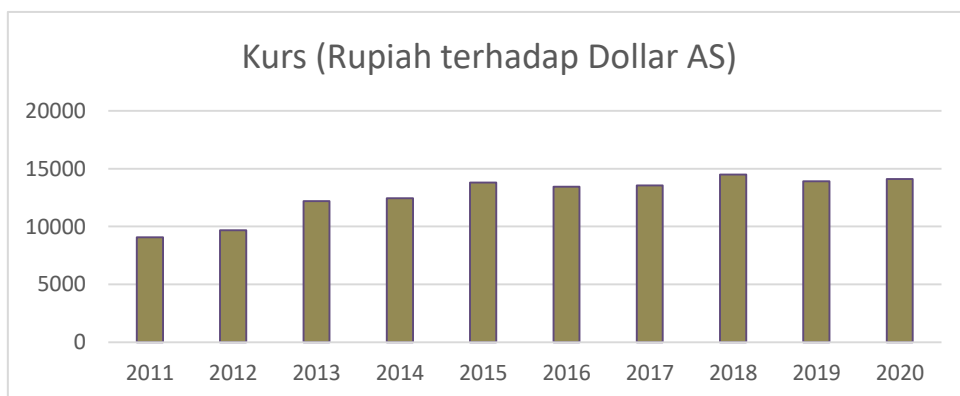
Source. Central Statistics Agency

Picture 1.1. Inflation Graph of Indonesia and Aceh 2011-2021.

According to the inflation data for Indonesia and Aceh, it can be concluded that inflation in both Indonesia and Aceh has continued to fluctuate. It is noted that during the years 2020-2021, inflation in Indonesia remained relatively stable, even though Indonesia and the world were facing the COVID-19 pandemic. Similarly, inflation in Aceh was also stable, although it experienced a slight decline. In 2020, during the global economic turmoil caused by the COVID-19 pandemic, Indonesia's inflation tended to be stable, whereas the inflation rate in Aceh tended to increase.

One of the theories that explains the relationship between inflation and exchange rates is the Purchasing Power Parity (PPP) theory. According to this theory, the exchange rate between two countries should be equal to the ratio of the price levels in those two countries. Thus, an increase in inflation caused by rising domestic prices will be followed by a depreciation of a country's currency in the foreign exchange market. It is known that fluctuations in exchange rates affect an economy (Ruslan, 2011). The following is the data on the value of the Rupiah against the Dollar, which has continued to fluctuate from 2011 to 2020:

Source. Central Statistics Agency of Aceh Province

Figure 1.2. Aceh Province Exchange Rate Chart 2011-2020

From the graph above, we can see that the exchange rate of the Rupiah against the US Dollar has experienced fluctuations each year. However, in 2013, there was a noticeable depreciation of the exchange rate, which increased significantly from Rp 9,670 in 2012 to Rp 12,189 in 2013. One of the contributing factors was the increase in fuel prices in June 2013, by the Minister of Energy and Mineral Resources Regulation No. 18/2013. This also affected the inflation rate in Aceh Province; in the same year, 2013, inflation rose by 1.06%, from 9.06% to 10.12%, resulting in a moderate inflation level. From the explanation above, it can be concluded that the Purchasing Power Parity theory aligns with the phenomenon observed in 2013. When there is a depreciation of the currency, it tends to increase the inflation rate. This phenomenon is consistent with the findings of Ferayanti et al. (2014), which state that there is a positive and significant relationship between the exchange rate and inflation.

RESEARCH METHODS

The procedure for compiling the research data was assisted by the use of Microsoft Excel 2013 and Eviews 10. The examination procedure focused on important models under various conditions, utilizing the Vector Error Correction Model (VECM) approach or strategy, which is a subordinate technique to Vector Auto Regression (VAR).

This research employs a quantitative approach by utilizing secondary data sourced from the Central Statistics Agency (BPS) regarding exchange rates, unemployment, and inflation in Aceh Province.

Secondary data was chosen because it can provide extensive and in-depth information regarding the variables being studied without the need to collect primary data, which requires more time and costs.

According to Bryman & Bell (2015), secondary data offers significant advantages in economic research, allowing researchers to save time and resources by utilizing data that is already available.
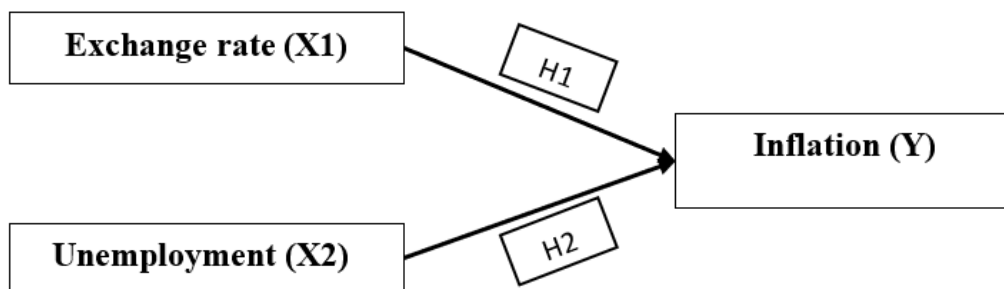
Hypothesis

H1 : The exchange rate has a positive and significant effect on inflation in Aceh Province in the long term and short term.

H2 : In the short term, the unemployment rate has a negative and significant effect on inflation in Aceh Province. In the long term, the unemployment rate has a positive and significant effect on inflation in Aceh Province.

RESULTS AND DISCUSSION

Table 1. Stationary test uses ADF test at Level level

Variable	ADF	Critical Value Mackinon			Prob	Information
	Statistics	1%	5%	10%		
Inflation	-5.477793	-3.646342	-2.954021	-2.615817	0.0001	Stationary
Exchange rate	-1.587848	-3.646342	-2.954021	-2.615817	0.4774	Nonstationary
Unemployment	-2.181672	-3.646342	-2.954021	-2.615817	0.2163	Nonstationary

Source : The data was processed using Eviews 10.

Based on the results of the stationarity test in Table 1 above, there are two variables that are non-stationary at the level: the exchange rate and the unemployment rate. Both variables have a probability greater than 5% (probability value > 0.05). Data is considered stationary if the ADF value is less than the critical value (0.05); in this case, the inflation variable is already stationary at the level. To ensure that all variables pass the stationarity test, a further stationarity test will be conducted at the 1st *difference* using the Augmented Dickey-Fuller (ADF) test. Below are the results of the stationarity test at the 1st *difference.*

Table 2 Stationary Test using ADF test at the level of 1st difference

Variable	ADF	Critical Value Mackinon			Prob	Information
	Statistics	1%	5%	10%		

Inflation	-7.126766	-3.661661	-2.960411	-2.619160	0.0000	Stationary
Exchange rate	-4.493075	-3.653730	-2.957110	-2.617434	0.0012	Stationary
Unemployment	-7.247435	-3.653730	-2.957110	-2.617434	0.0000	Stationary

Source: Data processed using Eviews 10.

Based on the results of the stationarity test in Table 2, it is known that the inflation, exchange rate, and unemployment variables are stationary at the 1st difference, with ADF statistics greater than the critical value or probability values less than 0.05. The next step is to determine the optimum lag.

Table 3: Results of the Optimum Lag Test

Lag	LogL	LR	FPE	AIC	SC	HQ
0	28.83226	NA	8.79e-09	-1.522151	-1.241911	-1.432500
1	113.4789	129.7915	3.62e-10	-4.765258	-2.803582*	-4.137701
2	161.1228	53.99640*	2.28e-10*	-5.541517	-1.898404	-4.376054*
3	204.0762	31.49920	3.88e-10	-6.005080*	-0.680530	-4.301711

Source: Data processed using Eviews 10.

Based on the results in Table 3, the optimum lag test indicates that the optimal lag length is two (2). The first lag shows the selected lag order based on the criteria. Therefore, the optimum lag for this data is lag 2. Consequently, for the subsequent tests, lag 2 must be used.

Table 4 Results of Stability Testing

Root	Modulus
-0.774735	0.774735
-0.332036 - 0.674618i	0.751903
-0.332036 + 0.674618i	0.751903
0.207646 - 0.683024i	0.713890
0.207646 + 0.683024i	0.713890
0.597187 - 0.338573i	0.686486
0.597187 + 0.338573i	0.686486
-0.576240 - 0.320774i	0.659506
-0.576240 + 0.320774i	0.659506
0.522174	0.522174
-0.384271	0.384271
0.136291	0.136291

Based on the results of the stability test in Table 4, it is known that the VAR model stability test has passed, indicating that the model is stable. This is evident from the modulus being less than one, which means that the existing VAR estimates can be used for Impulse Response Function (IRF) analysis and Variance Decomposition (VD) analysis, and are stable and valid.

Table 5 Results of Johansen's Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.919537	161.0928	95.75366	0.0000
At most 1 *	0.682442	85.49406	69.81889	0.0017
At most 2 *	0.548541	51.08120	47.85613	0.0241
At most 3	0.379917	27.22307	29.79707	0.0963
At most 4	0.274662	12.88603	15.49471	0.1191
At most 5	0.102746	3.252490	3.841466	0.0713

The results of the cointegration test in Table 5 above indicate that the trace statistic value suggests the presence of cointegration between the two variables, with the trace statistic being greater than the critical value at a significance level of 5% or the p-value being less than or equal to 5%. This result shows an initial indication of a long-term relationship, suggesting that the variables form a linear relationship. According to the VAR modeling, if the data exhibits cointegration, the next model to be used is the Vector Error Correction Model (VECM). Therefore, the model to be used subsequently will be VECM.

Table 6 Results of VECM Estimation Test

Short-term			
Variable	Coefficient	t-statistic	Information
CointEq1	-1.456651	[-2.34966]	Insignificant
D(INF(-1))	0.142016	[0.29106]	Insignificant

D(LOGNT(-1))	33.42581	[1.34548]	Insignificant
D(TPT(-1))	-1.769458	[-0.80766]	Insignificant
C	3.242871		
Long-term			
Variable	**Coefficient**	**t-stats**	**Information**
LOGNT(-1)	-27.74288	[-2.63217]	Significant
TPT(-1)	-1.631834	[-2.82708]	Significant
C	-370.4471		
R-squared	0.907835		
Adj. R-squared	0.832951		

Based on the results of the VECM estimation in Table 6, it is known that the R-squared value is 0.907835, which indicates that inflation, exchange rates, and the unemployment rate together can explain 90.78% of inflation, while the remaining percentage is explained by other variables.

In the short term, there are no variables that significantly affect inflation in the current period. Additionally, in the long term, there are 2 (two) variables that significantly influence inflation at the 5% level, namely the exchange rate and the unemployment rate. These variables have a significant impact on inflation, as indicated by the t-statistic values of each variable being greater than the t-table value (2.04841).

In the short term, all variables do not have a significant effect on inflation. In the long term, there are 2 (two) variables that also do not have a significant impact, namely inflation expectations and GDP. This is because, at the 5% significance level, the t-statistic is smaller than the t-table value (2.04841).

The results of the VECM estimation at lag 2 for the observation period from 1988 to 2021 indicate that the VECM model for the variables has the following short-term VECM equation:

D(INF) = 3.242871 - 0.438034 D(INF(-1)) − 1.550799 D(TPT(-1)) + 94.24307 D(LOGNT(-1)) −

0.926943 (ECT)

In the short term, there are 2 (two) variables that influence inflation, namely inflation itself and the exchange rate. Additionally, there is 1 variable that does not have a significant effect on inflation, which is the unemployment rate. The following is the interpretation of the results of the VECM estimation in the short term:

a. **The Effect of Inflation on Itself**

In the inflation variable (D(INF (-1))), the coefficient value is -0.438034. This means

that if there is an increase of one unit in the previous year, inflation will decrease by -0.438034 in the current year, ceteris paribus. The t-statistic value is -3.32349, while the t-table value at the 5% significance level is 2.04841. Since the t-statistic (-3.32349) is less than -t-table (-2.04841), it can be concluded that inflation has a significant effect on itself. This indicates that in the short term, inflation has a negative and significant effect on itself. This suggests that an increase in inflation in the previous period tends to be followed by a decrease in inflation in the current period, which may reflect an adjustment mechanism in the economy.

b. **The Effect of Exchange Rate on Inflation**

   In the exchange rate variable (D(LOG(NT(-1))), the coefficient value is 94.24307. This means that if there is an increase of one unit in the previous year, inflation will increase by 94.24307 in the current year, ceteris paribus.The t-statistic value is 6.36910, while the t-table value at the 5% significance level is 2.04841. Since the t-statistic (6.36910) is greater than the t-table value (2.04841), it can be concluded that the exchange rate has a positive and significant effect on inflation in Aceh Province in the short term.

c. **The Effect of Unemployment Rate on Inflation**

   In the unemployment rate variable (D(TPT(-1))), the coefficient value is -1.550799. This means that if there is an increase of one unit in the previous year, inflation will decrease by -1.550799 in the current year, ceteris paribus. The t-statistic value is -1.25416, while the t-table value at the 5% significance level is 2.04841. Since the t-statistic (-1.25416) is less than the t-table value (2.04841), it can be concluded that the unemployment rate has a negative and insignificant effect on inflation in Aceh Province in the short term.

The following is the VECM equation in the long term:

$$INF = -288.9494 - 3.998111 \, TPT(-1) - 10.23671 LOGNT(-1)$$

a. **The Effect of Exchange Rate on Inflation**

   The exchange rate variable (LOGNT(-1)) has a coefficient value of -10.23671. This means that if there is an increase of one unit in the previous year, inflation will decrease by -10.23671 in the current year, ceteris paribus. The t-statistic value is -1.79716, which leads to the conclusion that t-statistic (-1.79716) is less than the t-table value (2.04841). Therefore, it can be stated that the exchange rate has a negative and insignificant effect on inflation in Aceh Province in the long term.

b. **The Effect of Unemployment Rate on Inflation**

   The unemployment rate variable (TPT(-1)) has a coefficient value of -3.998111. This means that if one unit increases in the previous year, inflation will decrease by -3.998111 in the current year, ceteris paribus. The t-statistic value is -4.92317, which leads to the conclusion that t-statistic (-4.92317) is greater than the t-table value

(2.04841). Therefore, it can be stated that the unemployment rate has a negative and significant effect on inflation in Aceh Province in the long term.

What needs to be considered in the VECM estimation results is that the ECT (Error Correction Term) coefficient value or CointEq1 must have a significance level greater than or equal to 5% to reflect the adjustment level to disequilibrium conditions. If the ECT is insignificant, it indicates a violation of the disequilibrium assumption.

The ECT result shows a negative (convergent) value of -0.926943 and is significant at the 5% level, with a t-statistic of (-5.55363) > t-table (2.04841). The ECT value of -0.926943 means that if there is an imbalance in the previous period of one unit, inflation (INF) will adjust by decreasing by -0.926943%. In other words, if there is an imbalance in the previous period of 100 percent, the inflation rate will adjust by reducing by 92.6%.

This interpretation indicates that the adjustment mechanism to imbalances in inflation is quite strong, and inflation tends to return to its equilibrium path relatively quickly.

Table 7 Results of Granger Causality Test

Sample: 1988 2021 Lags: 1			
Null Hypothesis:	Obs	F-Statistic	Prob.
TPT does not Granger Cause INF	33	0.18084	0.6737
NF does not Granger Cause TPT		0.09187	0.7639
LOGNT does not Granger Cause INF	33	0.48898	0.4898
NF does not Granger Cause LOGNT		2.13261	0.1546

Variables that have causality are variables whose probability value is less than 5% or a value of $\alpha= 0.05$ which means that the variable has an influence on other variables. And the results of the granger competence test in table 7 are as follows:

a. It is known that the exchange rate does not significantly affect inflation with a probability value of 0.4898 > 0.05, and also inflation does not significantly affect the exchange rate with a probability value of 0.1546 > 0.05. So it can be concluded that there is no causal relationship between exchange rates and inflation.

b. It is known that the unemployment rate does not significantly affect inflation with a probability value of 0.6737 > 0.05, and also inflation does not significantly affect the unemployment rate with a probability value of 0.7639 >0.05. So it can be concluded that there is no causal relationship between the unemployment rate and inflation.

From the results of the causality test above, it can be concluded that there are no variables that have a one-way causality relationship.

CONCLUSION

This study aims to analyze the effect of exchange rates and unemployment rates on inflation in Aceh Province using the Vector Error Correction Model (VECM) method. The results show that, in the short term, none of the variables significantly influence inflation. However, inflation is negatively and significantly affected by itself, while the exchange rate has a positive and significant effect on inflation. On the other hand, the unemployment rate shows a negative but insignificant effect on inflation. In the long term, the exchange rate negatively affects inflation but is not significant, while the unemployment rate has a negative and significant impact on inflation. The model used demonstrates a good level of fit, with an R-squared value of 90.78%, indicating that inflation can be explained collectively by the exchange rate and unemployment rate. Based on these findings, it can be concluded that the influence of exchange rates and unemployment rates on inflation differs between the short and long term. These findings are expected to serve as a reference in formulating economic policies, particularly in managing inflation in Aceh Province through the control of exchange rates and unemployment levels.

Reference

Bank Indonesia. (2022). Laporan Perekonomian Provinsi Aceh

Bank Indonesia. (2013). Penjelasan BI Rate sebagai Suku Bunga Acuan

Ferayanti, dkk. (2014). Faktor- Faktor yang Mempengaruhi di Provinsi Aceh. *Jurnal Ilmu Ekonomi*, 2 (2): 14-21

Ginting, A.M. (2013). Pengaruh Nilai Tukar Terhadap Ekspor Indonesia. Buletin Ilmiah Litbang Perdagangan, 7(1): 1-18

umondor, Nichen, dkk. (2021). Pengaruh Nilai Tukar dan Jumlah Uang Beredar Terhadap Inflasi Di Indonesia Pada Masa Pandemi Covid-19

Suseno dan Iskandar Simonongkir. (2004). Sistem Kebijakan Nilai Tukar

Afriadi, Yogi dan Mike Triani. (2019). Kurva Phillips di Indonesia

Phillips A.W. (1958). The Relation between Unemployment and the Rate of Change of Money Wage Rates

Siagian, Yosua dan Banatul Hayati. (2020). Analisis Pengaruh Tingkat Pengangguran, Output Gap dan Upah Minimum Provinsi Terhadap Inflasi di 33 Provinsi di Indonesia

Gujarati, D. dan D.C. Porter (2009). Basic Econometrics

Mankiw, N. Gregory. (2006). Pengantar Teori Ekonomi Makro

Nanga, Muana. (2005). Makro Ekonomi Teori, Masalah dan Kebijakan

Sukirno, Sadono. (2011). Makroekonomi Teori Pengantar edisi Ketiga