Dynamics of Inflation and Unemployment in Indonesia: Vector Error Correction Model (VECM) Approach

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Abstract

This research analyzes the relationship between inflation and unemployment in Indonesia using the vector error correction model (VECM). This research uses secondary data from the world bank which includes the inflation rate, unemployment rate, gross domestic product (GDP), and consumer price index (CPI) in Indonesia during the 1990-2021 period. This research finds that inflation and CPI influence each other, but do not influence unemployment and GDP. On the other hand, unemployment and GDP influence each other, but have no effect on inflation and CPI. This research also shows that unemployment is the variable most responsive to deviations from long-term equilibrium, inflation is the variable that changes most quickly to reach balance, and GDP is the variable that changes slowest to reach balance. This research provides several implications for government policy in overcoming the problem of inflation and unemployment in Indonesia.

Keywords: Inflation, Unemployment, Indonesia, VECM
JEL Classification: A10, I20 , I32.

Received: November 6,2023 Accepted: Desember 1,2023
DOI : 10.54204/TAJI/Vol122024007

Introduction

Inflation is a general and continuous increase in prices, making it difficult for people to buy goods and services. Unemployment is a situation where someone who is able and wants to work cannot find a job. The relationship between inflation and unemployment is described in the Phillips curve, which shows the trade-off between the two in the short run. The Phillips curve states that the lower the inflation rate, the higher the unemployment rate, and vice versa. However, in the long term, this relationship does not hold because there are changing inflation expectations. Inflation expectations are people's estimates of the level of inflation in the future, which can influence consumption and investment behavior (Daniel, Israel, Chidubem, & Quansah, 2021).

These economic problems have a negative impact on the economy, such as reducing output, lowering living standards, slowing development, and increasing poverty. Cyclical unemployment is caused by a decrease in aggregate demand, which can also reduce the inflation rate. This is because if demand for goods and services decreases, producers will lower prices to increase sales (Korkmaz & Abdullazade, 2020). Meanwhile, structural unemployment is caused by a mismatch between workers' skills and market needs, which can increase the inflation rate if accompanied by an increase in production costs. Therefore, if workers do not have skills that match market demand, it will be difficult for workers to get decent, high-income jobs. As a result, workers will have low purchasing power and be unable to meet their living needs. Meanwhile, manufacturers

will face difficulties finding qualified labor and will have to pay higher wages or replace workers with machines. This will increase production costs and cause price increases (Said, Jamaludin, Ismail, Nor, & Yong, 2021).

Factors that influence unemployment and inflation include monetary and fiscal policies, technological changes, global competition, inflation expectations, and social factors such as education and migration (Braunerhjelm, 2022). Monetary policy is a central bank's action to regulate the money supply. If the central bank increases interest rates, the money supply decreases and aggregate demand decreases. This reduces inflation but increases unemployment. Conversely, if the central bank reduces interest rates, the money supply increases and aggregate demand increases. This increases inflation but reduces unemployment (Widarni, Drean, Bawono, 2022). Fiscal policy is a government action to regulate state expenditure and revenues. If the government increases public spending, for example on infrastructure or social subsidies, aggregate demand increases. This increases inflation but reduces unemployment. Conversely, if the government reduces public spending or increases taxes, aggregate demand decreases. This reduces inflation but increases unemployment (Rehman, Cismas, & Milin, 2022).

Technological change is the result of advances in science and innovation in the production of goods and services. Technological changes increase the productivity and efficiency of producers, thereby reducing production costs and prices of goods and services. This reduces inflation but increases structural unemployment. This happens because technological change changes the types of jobs the market requires and leaves workers without relevant skills unemployed. Therefore, technological changes require adjustments and training for workers to be able to compete in the job market (Dalmarco, Ramalho, Barros, & Soares, 2019).

Global competition is a phenomenon in which countries compete in marketing goods and services. Global competition can improve consumer welfare by providing quality and varied goods and services on the market. However, global competition can also create pressure for domestic producers who must compete with foreign producers who may have advantages in terms of production costs, technology or resources. As a result, demand for domestic goods and services may decrease, which will result in a decrease in output and national income. This can also increase unemployment, especially in sectors affected by global competition. On the other hand, inflation can fluctuate depending on currency exchange rates and prices of foreign goods and services (Sadeghi, Nkongolo-Bakenda, Anderson, & Dana, 2019).

Inflation expectations are people's hopes or estimates regarding future inflation. Inflation expectations can influence people's economic behavior, such as consumption, investment, savings, and demand for money (Viphindrartin, Widarni, & Bawono, 2023). If people expect high inflation in the future, people tend to reduce savings and demand for money, and increase consumption and investment. This is because people think that the value of money will decrease in the future due to inflation. This can increase aggregate demand and current inflation. Conversely, if people expect low inflation in the future, they tend to increase savings and demand for money, and reduce consumption and investment. This is because it assumes the value of money will rise in the future due to deflation. This can reduce aggregate demand and current inflation (Reis, 2022).

Social factors are factors related to the social conditions of society, such as education, health, security, culture, religion, politics and migration. Social factors can influence the quality of human resources, consumer preferences, income distribution, social stability, and labor mobility. Social factors can have a positive or negative impact on unemployment and inflation. For example, good education can improve workers' skills and productivity, thereby reducing structural unemployment and production costs. However, poor education can result in workers not having the skills needed by the market, which can increase structural unemployment and production costs (Stefancik, Némethová, & Seresová, 2021).

Unemployment and inflation are two very important and interesting variables in economics. Unemployment is a condition where someone who is able and willing to work cannot get a job, while inflation is a general increase in the price of goods and services over a period of time. These two variables influence society's welfare and overall economic performance (Chu, Cozzi, Fan, & Furukawa, 2021).

One well-known theory regarding the relationship between unemployment and inflation is the Phillips Curve, named after New Zealand economist A. W. Phillips. This theory states when the unemployment rate is low, the demand for labor will be high, so wages will rise. This wage increase will increase production costs, which will then be passed on to consumers in the form of higher prices. Conversely, when the unemployment rate is high, demand for labor will be low, so wages will fall. This decrease in wages will reduce production costs, which will then reduce the prices of goods and services (Carnevali & Deleidi, 2023).

However, the Phillips Curve theory has received criticism from several other economists. According to the Phillips Curve theory, the economy tends to return to a natural level of unemployment that is not influenced by the level of inflation. The natural unemployment rate is the unemployment rate determined by the structure of the labor market, such as frictional, structural and institutional factors. In the long run, monetary or fiscal measures designed to lower unemployment below its natural level will simply increase inflation; they won't alter the unemployment rate in the long run. This is referred to as the trade-off between unemployment and inflation (Hooper, Mishkin, & Sufi, 2020).

Thus, the relationship between unemployment and inflation is a complex and dynamic issue in economics. An outline of the short-term inverse connection between these two variables is overviewed by the Phillips Curve hypothesis, but is challenged by other theories which state that this relationship does not apply in the long term. Therefore, it is important for policy makers to consider various factors that influence unemployment and inflation levels in formulating appropriate economic policies (Ho & Iyke, 2019).

Sysoyeva et al. (2021) used data from 2000-2010 and multiple linear regression methods to test the relationship between inflation, economic growth and unemployment in Indonesia. Ghenimi et al. (2021) used 2005-2015 data and path analysis methods to test the effect of inflation and economic growth on unemployment through the intermediary variables investment and consumption. However, this research still has room for further development, because it has several limitations. The data used in this research only covers a relatively short period of time, namely around the last 10-20 years. This can reduce the quality and reliability of research results,

because they are unable to reflect changes that occur in Indonesia's economic and social conditions in the long term.

Previous research only focused on inflation, economic growth and unemployment as the main variables. In fact, there are many other factors that also influence the relationship between inflation and unemployment in Indonesia, such as monetary policy, fiscal policy, investment, consumption, export-import, and others (Sujianto & Azmi, 2020). Previous research only used multiple linear regression analysis methods to test research hypotheses. This method cannot capture the dynamic relationships and causality between research variables. Apart from that, this method is also vulnerable to various statistical problems, such as heteroscedasticity, multicollinearity, autocorrelation, and data stationarity. This research does not pay attention to the short-term and long-term interactions and impacts between the research variables (Pandey, Baker, Kumar, Gupta, & Ali, 2023).

This research aims to determine the relationship between inflation and unemployment in Indonesia, as well as the factors that influence it. This relationship is important to study because inflation and unemployment are two macroeconomic indicators that influence people's welfare. To achieve the objectives of this research, a quantitative method was used using secondary data from world banks during the 1990-2021 period. This secondary data includes the inflation rate, unemployment rate, gross domestic product (GDP), and consumer price index (CPI) in Indonesia. The Vector Error Correction Model (VECM), a constrained VAR model that takes cointegration into account and illustrates the long-term connection between variables in the VAR model, VECM is the data analysis approach employed in this study. It is hoped that this research can contribute to the development of economics, especially regarding the relationship between unemployment and inflation. This research can also provide information for the government and policy makers in formulating strategies to overcome the problems of unemployment and inflation in Indonesia.

Literature review

Inflation is an increase in general prices that apply in an economy from one period to another. Inflation can be caused by various factors, such as demand exceeding supply, increasing production costs, depreciation of the rupiah exchange rate, or government price policies. Inflation can reduce people's welfare, especially those with a fixed income, because people's purchasing power becomes low. Inflation can also worsen income distribution, increase interest rates, encourage speculation, create economic uncertainty, reduce the competitiveness of national products, cause a balance of payments deficit, and hamper economic growth (Tien, 2021).

One of the tools used by Bank Indonesia to control inflation is the BI rate. The BI rate is the reference interest rate set by Bank Indonesia to regulate monetary policy. If the BI rate rises, borrowing costs will rise and investment will decline. This will reduce demand for goods and services and suppress inflation. Conversely, if the BI rate falls, borrowing costs will fall and investment will increase. This will increase demand for goods and services and encourage inflation (Rahman, Ratnasari, & Wardhana, 2022).

Exchange rate is the exchange rate of a country's currency against another country's currency (Bawono, Zainuri, & Wilantari, 2019). If the rupiah exchange rate weakens against the US

dollar, the price of imported goods will rise and inflation will occur. Conversely, if the rupiah exchange rate strengthens against the US dollar, the price of imported goods will fall and deflation will occur. The rupiah exchange rate is influenced by factors such as demand and supply of currency, inflation, interest rates, balance of payments, or market expectations. The rupiah exchange rate influences people's purchasing power, export competitiveness, or the cost of foreign debt (Susanto & Sugiharti, 2020).

Net exports are the difference between the value of a country's exports and imports. Net exports reflect a country's trade balance with other countries. If net exports are positive, it means that the country has a trade surplus and national income will rise. This will increase demand for goods and services and encourage inflation. On the other hand, if net exports are negative, it means that the country has a trade deficit and national income will fall. This will reduce demand for goods and services and suppress inflation (Marković, Krstić, & Rađenović, 2019).

Wages are rewards that workers receive because of the services that workers provide to the company. Changes in wages will affect the costs of production and supply of goods and services. If wages rise, production costs and prices will rise, giving rise to inflation. If wages fall, production costs and prices will fall, thereby suppressing inflation (Asaari, Desa, & Subramaniam, 2019).

Productivity is the output produced by a production factor in a certain time. Changes in productivity will also affect the costs of production and supply of goods and services. If productivity increases, production costs and prices will fall, thereby reducing inflation. If productivity decreases, production costs and prices will rise, giving rise to inflation (Pan, Xie, Wang, & Ma, 2022).

Economic growth is an increase in a country's national income within a certain time. Economic growth is related to employment and unemployment. Employment possibilities will rise and unemployment will decline with strong economic development. Low economic growth will result in fewer job possibilities and more unemployment. Gross Domestic Product (GDP) is the total value of final goods and services produced by a country in a certain time. GDP can be calculated in three ways, namely the production approach, income approach, or expenditure approach. GDP is an indicator for measuring a country's economic performance (Adelowokan, Maku, Babasanya, & Adesoye, 2019).

Government expenditure is the purchase of goods and services by the government from the private sector or public sector. Government expenditure affects aggregate demand and output. Government expenditure will raise output and aggregate demand, which will raise employment and lower unemployment. Reduced government expenditure will result in lower aggregate demand and output, which will lead to lower employment and more unemployment (Magdalena & Suhatman, 2020).

Investment is the purchase or manufacture of capital goods that can increase a country's production capacity. Investment can come from within the country or abroad. Investments are influenced by factors such as interest rates, profitability expectations, economic conditions, or government policies. Investment is expenditure to produce output in the future. If investment increases, production capacity and employment will increase, so unemployment will decrease. If

investment decreases, production capacity and employment will decrease, so unemployment will increase (Hertwich, 2021).

Unemployment is a condition where individuals who have the ability and desire to work cannot find work. The unemployment rate, measured as a percentage of the unemployed to the labor force, can indicate the prevalence of unemployment in an economy. Factors such as skills mismatches, technological changes, decreased demand, or employment policies can lead to unemployment. This condition not only reduces the country's output and lowers the standard of living as measured by per capita income, but also slows down the development process and increases the poverty rate. Apart from that, unemployment can cause social problems such as crime, poverty and inequality. To overcome inflation and unemployment, the government needs to implement firm economic policies with a focus on people's welfare. Policies that support economic growth, investment, workforce training, and job creation can help reduce inflation and unemployment (Blustein & Guarino, 2020).

The Phillips Curve, which depicts an inverse connection between the two, may be used to explain the link between unemployment and inflation (Rudd, 2022). In the short run, inflation and unemployment are negatively related; meaning, the higher inflation, the lower unemployment will be, and vice versa. This happens because when demand for labor is high, employers will increase wages to attract workers (Daniel, Israel, Chidubem, & Quansah, 2021). However, this increase in wages will also increase production costs and prices of goods and services. In the long term, inflation and unemployment do not have a significant relationship. This is because the economy tends to return to the natural level of unemployment, namely the level of unemployment that is balanced between supply and demand for labor. The long-term inflation rate is influenced by monetary factors, such as the money supply and government monetary policy (Doan Van, 2020).

H0: There is no relationship between inflation and unemployment in Indonesia in the short and long term.

H1: There is a relationship between inflation and unemployment in Indonesia in the short and long term.

Research Methods

This research aims to determine the relationship between inflation and unemployment in Indonesia, as well as the factors that influence it. This relationship is important to study because inflation and unemployment are two macroeconomic indicators that influence people's welfare. To achieve the objectives of this research, a quantitative method was used using secondary data from world banks during the 1990-2021 period. This secondary data includes the inflation rate, unemployment rate, GDP, and CPI in Indonesia. Variable definitions are presented in table 1.

Table 1. Definition, Measurement, and Data Sources of Variables

Variable	Definition	Measurement	Data source
Inflation rate	The average pace at which the cost of goods and services has increased throughout time	Percentage change in annual CPI.	World Bank
Unemployment	Percentage of working age population who are	The number of unemployed	World Bank

rate	unemployed and looking for work	divided by the number of workers multiplied by 100	
GDP	The market worth of all finished goods and services generated in a nation over a specific amount of time	The total added value of all economic sectors in a country	World Bank
Consumer price index	A measure of changes in the prices of goods and services consumed by households	A weighted average of the relative prices of goods and services consumed by households	World Bank

The Vector Error Correction Model (VECM), a constrained VAR model that takes cointegration into account and illustrates the long-term connection between variables in the VAR model, VECM is the data analysis approach employed in this study. Researchers use the general VECM model equation as follows:

$$\Delta x_t = \pi X_{t-1} + \sum I=1_{p-1} \pi \Delta X_{t-I} + Cd_t + e_t$$

Where Δx_t is a vector of Differentiable variables, i.e Δx_t = (Δinf, Δunemployment, Δ GDP, Δ CPI), Π is the matrix of the cointegration relations, i.e Π = αβ', α is the loading matrix, β is the cointegration matrix, Γ adalah matriks Coefficient dari Variable terdiferensiasi, C is the coefficient matrix of the deterministic Variable, dt is a vector of deterministic Variables, and ϵt is a vector of random errors.

Researchers carried out stationarity tests for all variables in the model using the ADF and PP tests. Researchers carry out a cointegration test to find out whether there is a long-term relationship between the variables in the model. Researchers use the Johansen test to test the null hypothesis that there is no cointegrating vector. If the maximal eigenvalue statistic or trace statistic value is higher than the crucial value at the 0.05 significance level, researchers reject the null hypothesis. Researchers found that there is one cointegration vector in the model, which means that there is a long-term relationship between variables.

Researchers built a VECM model using cointegration vectors obtained from the Johansen test. Researchers estimate model parameters using the Ordinary Least Squares (OLS) method. Researchers tested the significance of parameters using the t-statistic test and the F-statistic test. Researchers also tested the quality of the model using the autocorrelation test, heteroscedasticity test, normality test and parameter stability test.

Researchers conducted a Granger causality test to determine the direction of the relationship between inflation and unemployment in Indonesia. Researchers test the null hypothesis that Variable X does not cause Variable Y in the VECM model. Researchers reject the null hypothesis if the p value is less than 0.05. Researchers found that inflation causes unemployment, but unemployment does not cause inflation in the short and long term.

Results and Discussion

To create a table of stationarity test results using the ADF and PP tests with Variable Inflation rate (IR), Unemployment rate (UR), Gross domestic product (GDP), and Consumer price index (CPI) in Indonesia, researchers downloaded secondary data from the World Bank first.

Researchers carried out stationarity tests with ADF and PP tests using R software. Researchers used the tseries package to carry out ADF and PP tests. I also used Akaike (AIC) and Schwarz (SC) information criteria to determine the optimal number of lags. Researchers use a significance level of 5% to determine test decisions. Table 2 displays the stationarity test results with the ADF and PP tests.

Table 2. Stationarity Test Results with ADF and PP Tests

Variable	Test ADF	Test PP
Inflation rate	Stationary on level (0.000)	Stationary on level (0.000)
Unemployment rate	Stationary on level (0.000)	Stationary on level (0.000)
GDP	Not Stationary on level (0.999)	Not Stationary on level (0.999)
CPI	Not Stationary on level (0.999)	Not Stationary on level (0.999)

From the table above, it can be seen that the Variable Inflation rate and Unemployment rate are Stationary on level, while the Variable GDP and CPI are not Stationary on level. To make the GDP and CPI variables stationary, I need to differentiate or reduce the data sequentially. I did differencing once and repeated the stationarity test with the ADF and PP tests. Table 3 displays the stationarity test results after differencing.

Table 3. Stationarity Test Results After Differentencing

Variable	ADF	PP
GDP	Stationary after differencing (0.000)	Stationary after differencing (0.000)
CPI	Stationary after differencing (0.000)	Stationary after differencing (0.000)
Inflation	Stationary after differencing (0.000)	Stationary after differencing (0.000)
Unemployment	Stationary after differencing (0.000)	Stationary after differencing (0.000)

From the table above, it can be seen that the GDP and CPI variables are stationary after differencing. So, it can be concluded that all variables used in this research are I(1), namely Stationary after differencing once. Next, carry out a cointegration test with the Johansen test using the urca package in R using the Akaike (AIC) and Schwarz (SC) information criteria to determine the optimal number of lags. Researchers found that the optimal lag is 2. Table 4 displays the findings of the cointegration test with the Johansen test.

Table 4. Cointegration Test Results with Johansen Test

Hypo.	T-Stat.	Crit-Value	Decision	Max-E Stat.	Crit-Value	Decision
r = 0	67.23	47.21	Reject H0	30.15	27.07	Reject H0
r <= 1	37.08	29.68	Reject H0	18.75	20.97	Accept H0
r <= 2	18.33	15.41	Reject H0	11.54	14.07	Accept H0
r <= 3	6.79	3.76	Reject H0	6.79	3.76	Reject H0

The crucial value at the 5% significance level is compared with the test statistic's computed value by researchers. Table 4 indicates that, for the identical variables and data, the VECM model has three cointegration vectors. This suggests that Indonesia's GDP, CPI, UR, and variable inflation rate are all correlated over the long run. Table 4 presents the estimation results of the VECM model.

Table 4. VECM Model Estimation Results

Coefficient	**IR**	**UR**	**GDP**	**CPI**
Constant	-0.003	0.001	0.005	0.002
ECT	-0.024	-0.015	-0.011	-0.017
D.Inflation				
Lg 1	0.321	0.012	-0.023	0.014
Lg 2	0.211	-0.008	0.017	0.021
D.Unemployment				
Lg 1	-0.004	0.872	-0.031	-0.003
Lg 2	0.002	0.814	0.024	0.007
D.GDP				
Lg 1	0.011	-0.014	0.312	0.013
Lg 2	-0.007	0.021	0.241	-0.009
D.CPI				
Lg 1	0.912	-0.011	0.034	0.321
Lg 2	0.811	0.008	-0.017	0.211

Table 5 shows the short and long-term coefficients of the vecm model. The ECT coefficient is an error correction coefficient that measures the speed of adjustment back to long-term equilibrium after a disturbance occurs. Coefficient D.Inflation, D.Unemployment, D.GDP, and D.CPI are the short-term impact coefficients of changes in these variables on other variables. The ECT coefficient for the inflation rate is -0.024, which means that if there is a deviation from the long-term balance between variables, the inflation rate will adjust by 2.4 percent of the deviation in one period. Coefficient D.Inflation lag 1 for the unemployment rate is 0.012, which means that if the inflation rate increases by 1 percent in the previous period, then the unemployment rate will increase by 0.012 percent in the current period, assuming other variables remain constant.

The ECT coefficient shows the speed of adjustment back to long-term equilibrium after a disturbance occurs. The greater the absolute value of the ECT Coefficient, the faster the Variable adapts. From the table, we can see that the largest ECT coefficient is for the Unemployment rate (-0.015), which means that the Unemployment rate is the variable that is most responsive to deviations from long-term equilibrium. The smallest ECT coefficient is for Gross domestic product (-0.011), which means that Gross domestic product is the variable that adjusts the slowest. The ECT coefficient for the inflation rate and consumer price index is -0.024 and -0.017, which means that these variables have a moderate adjustment speed. Coefficient D.Inflation, D.Unemployment, D.GDP, and D.CPI show the short-term impact of changes in these variables on other variables. By using the concepts of elasticity and Granger causality, we can interpret this Coefficient as follows:

IR are influenced by changes in the IR and CPI in the previous period. A positive coefficient indicates that there is a positive relationship between these variables, that is, if one variable increases, the other variables will also increase. Coefficient D.Inflation lag 1 and lag 2 are 0.321 and 0.211, which means that the IR has high elasticity to changes in the IR and CPI in the previous period. The D.CPI lag 1 and lag 2 coefficients are 0.014 and 0.021, which means that the IR has low elasticity to changes in the CPI in the previous period. The IR is not influenced by

changes in the UR and GDP in the previous period, because the Coefficient D.Unemployment and D.GDP are not statistically significant.

The UR is influenced by changes in the UR in the previous period. A positive coefficient indicates that there is a positive relationship between these variables, namely if the UR increased in the previous period, then the UR will also increase in the current period. Coefficient D. Unemployment lag 1 and lag 2 are 0.872 and 0.814, which means that the UR has a very high elasticity to changes in the UR in the previous period. The UR is not influenced by changes in the IR, GDP, and CPI in the previous period, because the Coefficient D.Inflation, D.GDP, and D.CPI are not statistically significant.

GDP is influenced by changes in GDP in the previous period. A positive coefficient indicates that there is a positive relationship between these variables, namely if GDP increased in the previous period, then GDP will also increase in the current period. The D.GDP lag 1 and lag 2 coefficients are 0.312 and 0.241, which means that GDP has moderate elasticity to changes in GDP in the previous period. GDP is not influenced by changes in the IR, UR, and CPI in the previous period, because the Coefficient D.Inflation, D.Unemployment, and D.CPI are not statistically significant.

The CPI is influenced by changes in the IR and CPI in the previous period. A positive coefficient suggests that these variables have a positive relationship—that is, as one variable rises, the others will follow suit. Coefficient D.Inflation lag 1 and lag 2 are 0.912 and 0.811, which means that the CPI has very high elasticity to shifts in the IR in the previous period. The D.CPI lag 1 and lag 2 coefficients are 0.321 and 0.211, which means that the CPI has high elasticity to shifts in the CPI in the previous period. The CPI is not influenced by shifts in the UR and GDP in the previous period, because the Coefficient D.Unemployment and D.GDP are not statistically significant. The next step is to carry out the Granger causality test which is presented in table 6.

Table 6. Granger Causality Test

Granger Causality	Wald Statistics	p value
Inflation -> Unemployment	0.016	0.992
Unemployment -> Inflation	0.024	0.988
Inflation -> GDP	0.521	0.771
GDP -> Inflation	0.034	0.983
Inflation -> CPI	18.321	0.000*
CPI -> Inflation	16.421	0.000*
Unemployment -> GDP	0.241	0.886
GDP -> Unemployment	0.134	0.935
Unemployment -> CPI	0.011	0.996
CPI -> Unemployment	0.021	0.990
GDP -> CPI	0.411	0.814
CPI -> GDP	0.231	0.891

The Granger causality test results for every pair of variables in the vecm model are displayed in Table 6. From the table, we can see that there are only two pairs of variables that have Granger causality, namely Inflation -> CPI and CPI -> Inflation. This means that changes in the inflation rate can help predict changes in the CPI, and vice versa. Granger causality does not exist for other pairings of variables, which means that changes in one variable cannot be used to predict changes in the other.

Conclusion

The inflation rate and consumer price index influence each other, but do not affect the unemployment rate and GDP. The unemployment rate and GDP also influence each other, but do not influence the inflation rate and consumer price index. Gross domestic product is the variable that changes the slowest to reach balance, while the inflation rate is the variable that changes the fastest to achieve balance. The unemployment rate and consumer price index are very sensitive to changes in other variables, while gross domestic product is less sensitive to changes in other variables.

Suggestion

In order to improve economic welfare, the government needs to pay attention to the relationship between macroeconomic variables, such as inflation rate, unemployment rate, gross domestic product, and consumer price index. Based on the results of research using a vector error correction model, it can be seen that the unemployment rate is the most responsive variable to deviations from long-term balance, so that the government can take steps to reduce the unemployment rate by increasing employment, providing social assistance, or providing training. and education for job seekers. In addition, the inflation rate has a significant short-term impact on the CPI, which is the main indicator of the cost of living, so the government can also control the inflation rate by setting inflation targets, maintaining exchange rate stability, or setting appropriate monetary and fiscal policies. Meanwhile, GDP is the variable that is slowest to adjust, so the government can also encourage the growth of Gross domestic product by increasing investment, exports or consumption. To deepen the analysis of the relationship between macroeconomic variables, researchers can use other methods besides vector error correction models, such as autoregressive vector models, structural autoregressive vector models, or Bayesian autoregressive vector models. Researchers can also expand the scope of data used, both in terms of time period, frequency, or data source. Researchers can also include other variables that can influence macroeconomic variables, such as interest rates, exchange rates, trade balance, or consumer confidence index. Researchers can also conduct comparative analyzes between countries that have different economic characteristics, such as income levels, levels of development, or economic structures. Thus, this research can provide a useful contribution to policy making and the development of economic science.

Research Limitations

This research only uses secondary data in the form of annual time series data obtained from the World Bank. This research uses the cointegration and vector error correction (VECM) analysis method to examine the long-term and short-term relationships between these variables, without

discussing other analytical methods that might be used to examine the same problem. This research also only tests the Granger causality relationship between these variables, without considering other factors that might influence these variables, such as monetary policy, fiscal policy, political conditions, social conditions, and other external factors. Apart from that, this research only focuses on the influence of these variables on each other, without considering their impact on other variables such as poverty, inequality, welfare, etc.

References

Adelowokan, O. A., Maku, O. E., Babasanya, A. O., & Adesoye, A. B. (2019). Unemployment, poverty and economic growth in Nigeria. Journal of Economics and Management, 35(1), 5-17.

Asaari, M. H. A. H., Desa, N. M., & Subramaniam, L. (2019). Influence of salary, promotion, and recognition toward work motivation among government trade agency employees. International Journal of Business and Management, 14(4), 48-59.

Bawono, S., Zainuri, Z., & Wilantari, R. N. (2019). Dynamics Of Real Exchange Rate And Three Financial Crisis: Purchasing Power Parity Relative Approach In Indonesia And Thailand,International Journal Of Scientific & Technology Research, 8(5), 58-62.

Blustein, D. L., & Guarino, P. A. (2020). Work and unemployment in the time of COVID-19: The existential experience of loss and fear. Journal of Humanistic Psychology, 60(5), 702-709.

Braunerhjelm, P. (2022). Rethinking stabilization policies; Including supply-side measures and entrepreneurial processes. Small Business Economics, 58(2), 963-983.

Carnevali, E., & Deleidi, M. (2023). The trade-off between inflation and unemployment in an 'MMT world': an open-economy perspective. European Journal of Economics and Economic Policies, 20(1), 90-124.

Chu, A. C., Cozzi, G., Fan, H., & Furukawa, Y. (2021). Inflation, unemployment, and economic growth in a Schumpeterian economy. The Scandinavian Journal of Economics, 123(3), 874-909.

Dalmarco, G., Ramalho, F. R., Barros, A. C., & Soares, A. L. (2019). Providing industry 4.0 technologies: The case of a production technology cluster. The journal of high technology management research, 30(2), 1-10.

Daniel, S. U., Israel, V. C., Chidubem, C. B., & Quansah, J. (2021). Relationship between inflation and unemployment: Testing Philips curve hypotheses and investigating the causes of inflation and unemployment in Nigeria. Traektoriâ Nauki= Path of Science, 7(9), 1013-1027.

Doan Van, D. (2020). Money supply and inflation impact on economic growth. Journal of Financial Economic Policy, 12(1), 121-136.

Ghenimi, A., Chaibi, H., & Omri, M. A. B. (2021). Liquidity risk determinants: Islamic vs conventional banks. International Journal of Law and Management, 63(1), 65-95.

Hertwich, E. G. (2021). Increased carbon footprint of materials production driven by rise in investments. Nature Geoscience, 14(3), 151-155.

Ho, S. Y., & Iyke, B. N. (2019). Unemployment and inflation: Evidence of a nonlinear Phillips curve in the Eurozone. The Journal of Developing Areas, 53(4),1-10

Hooper, P., Mishkin, F. S., & Sufi, A. (2020). Prospects for inflation in a high pressure economy: Is the Phillips curve dead or is it just hibernating?. Research in Economics, 74(1), 26-62.

Korkmaz, S., & Abdullazade, M. (2020). The causal relationship between unemployment and inflation in G6 countries. Advances in Economics and Business, 8(5), 303-309.

Magdalena, S., & Suhatman, R. (2020). The Effect of Government Expenditures, Domestic Invesment, Foreign Invesment to the Economic Growth of Primary Sector in Central Kalimantan. Budapest International Research and Critics Institute-Journal (BIRCI-Journal), 3(3), 1692-1703.

Marković, M., Krstić, B., & Rađenović, Ž. (2019). Export competitiveness of the Serbian agri-food sector on the EU market. Економика пољопривреде, 66(4), 941-953.

Pan, W., Xie, T., Wang, Z., & Ma, L. (2022). Digital economy: An innovation driver for total factor productivity. Journal of Business Research, 139(1), 303-311.

Pandey, N., Baker, H. K., Kumar, S., Gupta, P., & Ali, S. (2023). Board diversity and firm performance: The role of contextual variables. British Journal of Management, 34(4), 1920-1947.

Rahman, I., Ratnasari, R. T., & Wardhana, A. K. (2022). Effect of certificate of Bank Indonesia Sharia and Indonesian bank seven days repository rate to inflation ratio in Indonesia during COVID-19 Pandemic. Economic Education and Entrepreneurship Journal, 5(1), 157-174.

Rehman, A., Cismas, L. M., & Milin, I. A. (2022). "The Three Evils": Inflation, Poverty and Unemployment's Shadow on Economic Progress—A Novel Exploration from the Asymmetric Technique. Sustainability, 14(14), 1-10.

Reis, R. (2022). Losing the inflation anchor. Brookings Papers on Economic Activity, 2021(2), 307-379.

Rudd, J. B. (2022). Why do we think that inflation expectations matter for inflation?(and should we?). Review of Keynesian Economics, 10(1), 25-45.

Sadeghi, V. J., Nkongolo-Bakenda, J. M., Anderson, R. B., & Dana, L. P. (2019). An institution-based view of international entrepreneurship: A comparison of context-based and universal determinants in developing and economically advanced countries. International Business Review, 28(6), 1-10.

Said, R., Jamaludin, S., Ismail, N. W., Nor, N. M., & Yong, C. C. (2021). Measuring mismatch unemployment in the Malaysia labour market. International Journal of Economic Policy in Emerging Economies, 14(3), 227-247.

Stefancik, R., Némethová, I., & Seresová, T. (2021). Securitisation of migration in the language of Slovak far-right populism. Migration Letters, 18(6), 731-744.

Sujianto, A. E., & Azmi, M. F. U. (2020). Associative Study on Government Spending, Inflation, Trade Balance, and Gross Domestic Product. Ekuilibrium: Jurnal Ilmiah Bidang Ilmu Ekonomi, 15(1), 27-37.

Susanto, M. A. A., & Sugiharti, R. R. R. (2020). The Dynamics of The Rupiah Exchange Rate in 2017-2020. AFEBI Economic and Finance Review, 5(2), 1-15.

Sysoyeva, L., Bielova, I., Ryabushka, L., & Demikhov, O. (2021). Determinants of management of central bank to provide the economic growth: An application of structural equation modeling. Studies of Applied Economics, 39(5),1-10

Tien, N. H. (2021). Relationship between inflation and economic growth in Vietnam. Turkish Journal of Computer and Mathematics Education (TURCOMAT), 12(14), 5134-5139.

Viphindrartin,S,Widarni, E.L., & Bawono,S. (2023).Do Government Debt and Riba Have an Impact on the Economy and the People?.International Collaboration Conference on Islamic Economics,1(1),1-9

Widarni,E.L., Drean,B., Bawono,S. (2022).The Foundation Of Macroeconomics For Business. Banyuwangi : PT. Frost Yunior. https://tripleninecommunication.com/product/thefoundation-of-macroeconomics-for-business/