The Relationship Between Inflation And Carbon Emissions, And Their Role In The Indonesian Economy

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Abstract

This research study aims to identify and analyze inflation and CO2 emissions and their relationship to economic growth in Indonesia. The data used in this research comes from the World Bank and is categorized as secondary data with the range of the period measured being 1995-2020. We use inflation, CO2 emissions, and GDP for economic growth as variables in this study. The results, we indicate that the inflation rate is currently increasing as a result of inflation that occurred in the past that occurred in Indonesia. An increase in inflation will have a detrimental negative impact on economic growth so that it will reduce GDP. However, the interesting thing is that GDP has a beneficial positive effect on carbon emissions which indicates that an increase in economic growth in the past will increase carbon emissions at this time. Thus, it is necessary to have policies that focus on handling carbon emissions as a result of activities to increase economic growth. In addition, policies are also needed to control the inflation rate in Indonesia.

Background

Inflation has a nonlinear relationship with economic growth, that is, there is an inflation threshold that is estimated to be in the range of 3% to 4%, above which the positive effect of inflation on economic growth disappears, and this effect begins to fade in the range of 5.5% to 7.5 % that happened in Vietnam. Policymakers are required to target inflation lower than 6% to boost GDP growth, as the impact of inflation on GDP as a whole is negative (Tien, 2021). Growth of economic both long-term and short-term are positively and significantly impacted by CO2 emissions, energy consumption, and trade liberalization. Long-term and short-term CO2 emissions and energy consumption are positively and significantly impacted by economic expansion. This suggests that the nation is dealing with the environmental Kuznets curve (EKC) conundrum, whereby economic development results in environmental deterioration. So it is necessary to have a low-carbon development path that balances economic and environmental goals (Wasti & Zaidi, 2020). In China, inflation has effect on carbon emissions, although the sign of inflation varies. In addition, there is relationship between inflation and carbon emissions in Shenzhen and Guangdong. This suggests that there is an inflation threshold beyond which the positive effect of inflation on carbon emissions turns negative. In addition, since 2019 the worldwide pandemic has created a conflict between health and the economy, which has an impact on the harmonious growth of the environment and economy. (Xu, Li, & Zhang, 2023; Sasongko, Nehruddin, Musriyatun, Siswanto, 2023).

The declining inflation rate will give problems to CO2 emissions. If inflation decreases accompanied by the price of building materials also decreases while the value of construction work

increases it will have a direct impact on environmental sustainability which triggers CO2 emissions. This is also due to the fact that there is no calculator available to estimate carbon emissions so that it cannot estimate how much the level of emissions and the value of construction work is in Malaysia (Musarat et.al, 2021; Rusminingsih, Askar,Mutia, Fitria, Wahyudi, 2023). Inflation control can be enforced with a Inflation Reduction Act. The clean electricity performance program, the clean energy accelerator, and the methane fee are the primary drivers of the Inflation Reduction Act's economy-wide carbon reductions of 43 to 48% below 2005 levels by 2035. Inflation Reduction Act will have positive effects on energy innovation, energy security, and environmental justice. Inflation Reduction Act is a strong step towards achieving the US nationally determined contribution under the Paris Agreement and advancing the global transition to a net-zero economy. Inflation Reduction Act will unlock a new reality for the electricity grid and households in America, as well as create opportunities for international cooperation and leadership (Bistline et.al, 2023; Irawan, Sasongko, Mukhlis, Yanto, & Wulandari, 2022). Economic growth tends to increase CO2 emissions. On the other hand, increasing revenue from coal exploitation will reduce CO2 emissions so that a supportive regulatory policy is needed. Better regulation of coal leases in the form of carbon breakdown costs will increase CO2 emissions. This shows that in order to achieve growth, and to achieve reduced CO2 emission levels for green growth and sustainable development, stricter energy-environmental regulations are inevitable (Adedoyin et.al, 2020; Priyanto, Widarni, & Bawono, 2022).

Consumption of renewable energy is negatively impacted by CO2 emissions, but this effect is moderated by the level of economic complexity. The degree of economic complexity will determine how CO2 emissions are impacted by renewable energy sources. Economic complexity reflects the diversity and sophistication of a country's productive structure, which influences its energy demand and supply patterns. Countries with higher economic complexity tend to have higher CO2 emissions due to their higher production scale and energy intensity (Khezri, Heshmati, & Khodaei, 2022). Other studies have explained that carbon emissions are affected by cycle times and order quantities, and the cost of carbon emissions directly affects the overall profit of buyers. Retailers have various concerns about delivery, cycle time, and order size since they want to be able to specify these parameters during a commercial transaction. Because of changes in order amount, retailers frequently make poor selections that result in losses (Alamri, Jayaswal, Khan, & Mittal, 2022). In the long run, CO2 emissions have a negative and significant correlation impact on economic growth, but they are negligible in the near term. Due to the inverse relationship between GDP and inflation, an increase in inflation slows down economic growth over time (Hussain et.al, 2019). Although the effect varied by location and income level, economic growth in Africa had a detrimental negative effect on CO2 emissions. Economic expansion and energy intensity were associated with higher changes in CO2 emissions, but renewable energy greatly aided the reduction of emissions during the next ten years (Namahoro et.al, 2021). This reesearch study aims to identify and analyze inflation and CO2 emissions and their relationship to economic growth in Indonesia.

Research Method and Materials

This study will analyze and examine the relationship between inflation and carbon emissions in Indonesia. Data sourced from the World Bank with a range of periods measured 1991-2021. The variables we use are inflation, CO2 emissions, and economic growth which are analyzed using the Vector Autoregressive (VAR) with the following systematic equation:

$$INF_t = \beta_0 + \beta_1 CE_{t1} + \beta_2 GDP_{t2} + e_t$$

$$CEt = \beta0 + \beta1INFt1 + \beta2GDPt2 + et$$
$$GDPt = \beta0 + \beta INFt1 + \beta2CEt2 + et$$

Information:

INF = Inflation
CE = CO2 Emissions
GDP = Economic Growth (in percent)
β = Konstanta
e = Error term
t = Time Period

Result and Discussion

The unit root test needs to be done to find out which variables are stationary at a certain level. This test is intended to see and ensure there are no problems with data stationarity shown in table 1.

Table 1. Stationerity Test INF, CE, and GDP Result.

Variable	Level		First Difference	
	Prob.	Description	Prob.	Description
INF	0.0055	Fulfil	0.0009	Fulfil
CE	0.7098	Not fulfil	0.0037	Fulfil
GDP	0.0118	Fulfil	0.0001	Fulfil

Based on the stationary unit root test in table 1. All variables are stationary at the first difference level so there is no problem with data stationarity. Furthermore, the optimum lag determination test was carried out to determine the optimum lag to be used in this research study. The optimum lag test will be shown in below.

Table 2. Lag Optimum Test Result.

Lag	LogL.	LR	FPE	AIC	SC	HQ
0	-93.46794	NA	0.622202	8.038995	8.186252	8.078063
1	-68.03827	42.38279*	0.159716*	6.669856*	7.258883*	6.826125*
2	-63.19495	6.861367	0.235731	7.016246	8.047043	7.289717

Based on the results of the optimum lag test in table 2, the lag that will be used as the optimum lag is lag 1. Then a cointegration test was carried out to find out the use of the Vector Autoregressive (VAR) model shown in table 3.

Table 3. Cointegrating Test Result

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0,05 Critical Value	Probability
None	0.462509	21.88842	29.79707	0.3047
At most 1	0.249341	6.988187	15.49471	0.5790
At most 2	0.004361	0.104888	3.841466	0.7460

The test in table 3 above shows that there is no cointegration so that the VAR model test can be continued. VAR testing is shown in table 4.

Table 4. VAR Test Result

	INF	CE	GDP
INF(-1)	0.421117	0.000905	-0.012795
	(0.60974)	(0.00046)	(0.16851)
	[0.69065]	[1.95456]	[-0.07593]
INF(-2)	0.642156	-0.000154	-0.045838
	(0.56473)	(0.00043)	(0.15607)
	[1.13711]	[-0.35901]	[-0.29370]
CE(-1)	144.2491	0.927968	-55.66142
	(398.032)	(0.30242)	(110.003)
	[0.36241]	[3.06850]	[-0.50600]
CE(-2)	-198.3839	-0.172893	99.88078
	(378.122)	(0.28729)	(104.501)
	[-0.52466]	[-0.60180]	[0.95579]
GDP(-1)	1.469726	0.002398	0.067063
	(2.45510)	(0.00187)	(0.67851)
	[0.59864]	[1.28550]	[0.09884]
GDP(-2)	1.788519	-0.000709	-0.264744
	(2.05937)	(0.00156)	(0.56914)
	[0.86848]	[-0.45290]	[-0.46516]
C	-4.385325	0.035415	-3.800554
	(37.5436)	(0.02853)	(10.3758)
	[-0.11681]	[1.24155]	[-0.36629]

Based on the in table 4 above resilt of VAR test, it can be seen that INF(-1) and CE have a significant effect on the t-statistic value [1.95456]. These results illustrate that the increase in inflation in the previous period can affect current carbon emissions. GDP(-1) and CE significantly influence t-stat [1.28550]. This relationship also proves that an increase in GDP economic growth in the past period will have an impact or correlation with carbon emissions in the current period. In addition, INF(-2) and GDP have a significant effect on the t-statistic [-0.29370].

Inflation in the past has a significant relationship and impact on current carbon emissions. In addition, inflation in the past also had a negative impact on current economic growth. On the other hand, there is an interesting thing, namely the relationship between GDP and carbon emissions. GDP has a positive beneficial influence on carbon emissions so that an increase in economic growth in the past will encourage an increase in carbon emissions at this time.

Conclusion
The inflation rate is currently increasing as a result of inflation that occurred in the past that occurred in Indonesia. An increase in inflation will have a negative impact on economic growth so that it will reduce GDP. However, the interesting thing is that GDP has a positive effect on carbon emissions which indicates that an increase in economic growth in the past will increase carbon emissions at this time. Thus, it is necessary to have policies that focus on handling carbon emissions as a result of activities to increase economic growth. In addition, policies are also needed to control the inflation rate in Indonesia.

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