

## Analysis of Structural Break Using Dummy Variable Regression on Industrial Stock Returns in Indonesia Stock Exchange

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**Abstract.** This research examines the problem of structural breaks in sectoral stock returns resulting from the global economic crisis in 2022. The focus of this study is an investigation into the impact of fluctuations in global economic factors, which include Japanese capital market returns, the United States inflation rate, the level of Japanese interest rates, and the Japanese currency exchange rate, on the return volatility of sectoral stocks on the Indonesia Stock Exchange. This research aims to determine the structural break phenomenon in sectoral stock returns on the Indonesia Stock Exchange in relation to the global economic crisis in 2022. This study is quantitative, employing verification and explanatory research to test and explain the influence of global economic factors on the sensitivity of sectoral stock returns. The research method used is multiple linear regression analysis with dummy variables. This research produced two findings: (1) Structural changes in global economic factors before and during the 2022 economic crisis had different influences on sectoral stock returns on the Indonesia Stock Exchange; (2) Structural changes in global economic factors during and after the 2022 global economic crisis had differential impacts on the return characteristics of sectoral stocks.

**Keywords:** Structural breaks; Sectoral stock returns; Global economic crisis 2022

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### INTRODUCTION

Investments in ordinary shares are classified as long-term investments that provide investors with returns that are not fixed in magnitude (Bolton & Samama, 2013; Cochrane, 2022). This indicates that investment in common stock is a type of risky investment. The decision to invest in stocks is always guided by the trade-off risk and return (Bahri et al., 2022). In connection with investing in common stocks, investors will be faced with a wide selection of industry sectors. Sectoral investment analysis is important since it will make it easier for investors to make investment choices (Caporale et al., 2022).

The focus of this research is an investigation of time-varying volatility based on the structural break phenomenon of sectoral stock returns on the Indonesia Stock Exchanges because of global economic conditions.

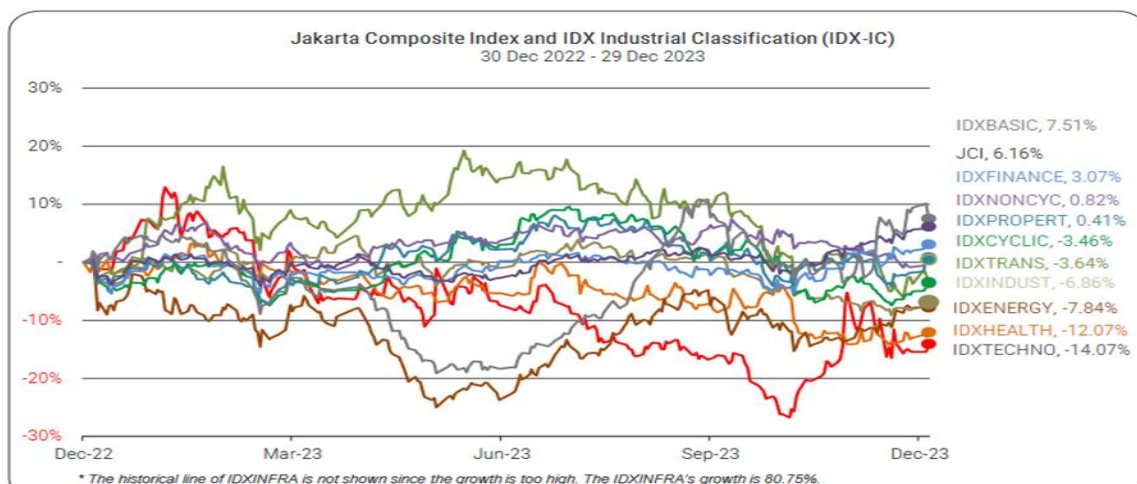
Economic globalization is a global economic environment that can be a source of investment risk because it will affect the performance of domestic stocks, both individually and industrially. Apart from that, technical analysts often state that domestic stock price movements are related to foreign economic fundamentals, both regional and international.

The main issue in this research is the phenomenon of time-varying volatility which is an interesting issue due to the element of time-varying risk. This issue assumes that risk is not constant due to the volatility clustering phenomenon in sectoral stock returns. Time-varying volatility is related to the presence of new information that causes investors to revise their assessment of the intrinsic value of a planned investment opportunity. One of the phenomena that needs to be investigated on this issue is the structural breaking phenomenon. Theoretically, it states that the structural break phenomenon shows that there are differences in the required rate of return and risk premium, systematic factors related to structural changes in sectoral stock returns.

Research on time-varying volatility of stock has been conducted by (Caporale et al., 2022), and (Nazif Çatik et al., 2020). The structural break problem shows the difference in the structure of stock

returns between various global economic conditions that have been studied by (Ngene et al., 2017), (Guo, 2018), (Fasanya et al., 2021), (Shah et al., 2023), (Xiong et al., 2024).

One of the interesting conditions to investigate in relation to the time-varying volatility problem is the global economic crisis in 2022, where in this period the monthly return volatility of sectoral shares in the Indonesian capital market has increased drastically. This is indicated by the monthly return variance of sectoral stocks as shown in Figure 1. Currently, the Indonesia Stock Exchange classifies industries based on IDX-IC which consists of eleven industrial sectors. The fluctuation of the sectoral share price index over five years is shown in Figure 1.



**Figure 1. Sectoral Share Price Development on the IDX in 2023**

Figure 1 shows that sectoral stock prices fluctuate which can have implications for sectoral stock returns. These stock price fluctuations can be caused by changes in global economic conditions (Silva et al., 2023), (Raza et al., 2023).

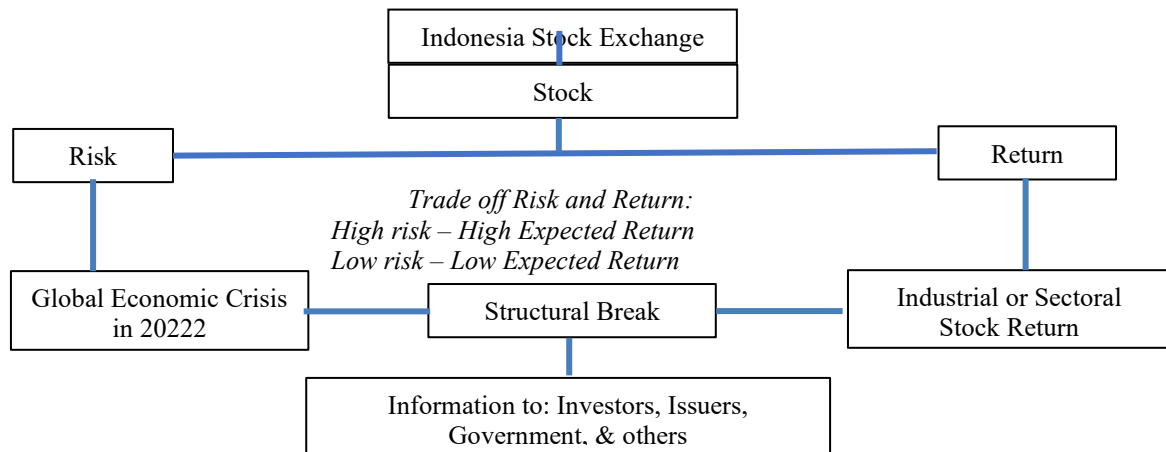
This structural break phenomenon still requires further research to capture global economic issues. The results of this study can be used as a reference for decision making for investment managers, as well as a policy basis for the Indonesian capital market authorities. In addition, it is also a reference for academic analysts who will conduct research relevant to this study.

Based on the background description above the problem to be investigated in this study is whether there is a structural break caused by global economic conditions on sectoral stock returns on the Indonesia Stock Exchange? Therefore, the purpose of this study is to analyze the structural break in sectoral stock returns on the IDX as an influence of global economic conditions.

The advantage of this research is investigating and testing the structural break phenomenon in industrial or sectoral stock returns based on the issue of the global economic crisis in 2022. This analysis is important for stakeholders, especially investors, to make portfolio investment decisions on sectoral shares with a global perspective.

## **MATERIALS AND METHOD**

This research is quantitative research with the type of verification and explanatory research which tests and explains the existence of global economy factors to the sensitivity of sectoral stock returns. Based on the results of literature searches sourced from various references, a framework of thought was built as shown in Figure 2.



**Figure 2. Research conceptual framework**

This study uses one dependent variable namely sectoral stock returns (Y) and four independent variables namely global economic risk factors which include Japanese capital market returns (X1), United States inflation rates (X2), Japanese interest rates (X3), and Japanese currency exchange rates (X4), as well as two dummy variables, namely conditions during the global economic crisis (D1) and conditions after the global economic crisis (D2).

This research fully uses secondary data that has been published by several sources. This research will use data time-series monthly for the period May 2021 to June 2024.

**Analysis Design and Hypothesis Testing**

Stage 1. Conduct descriptive analysis of sectoral stock returns. At the stage a descriptive analysis of the research variables is carried out. The aim to be achieved at this stage is to provide an overview or description to determine the characteristics of each research variable to be analyzed. The analysis uses descriptive statistical measures including mean and standard deviation.

Stage 2. Empirically test the existence of structural break problem. This stage is intended to determine the presence of time-varying volatility or time-varying risk problems. Basically, testing the time-varying volatility problem is a test of the conditional model to investigate the existence of structural breaks.

This test is intended to determine the impact of structural changes because of the global economic crisis in 2022 on the sectoral stock return regression model. To test the structural break problem a dummy variable regression model is used. In this case there are three categories namely the period before the global economic crisis, during the global economic crisis, and after the global economic crisis. Therefore, there are two dummy variables (K-1) namely dummy variable 1 (D1) is the period during the global economic crisis and dummy variable 2 (D2) is the period after the global economic crisis, while the period before the global economic crisis is a dummy exclude.

In this test, the F test and t test are used at the significance level ( $\alpha$ ): 1%, 5%, and 10%. This test is based on the p-value. The hypothesis tested is as follows:

“The level of expected returns and the sensitivity of global economic factors to sectoral stock returns are greater during the 2022 global economic crisis than before and after the 2022 global economic crisis”

The test of the research hypothesis was conducted on a time-series basis using the following equation:

$$Y_t = \alpha_1 D1 + \alpha_2 D2 + \beta_1 X1_t + \beta_2 X2_t + \beta_3 X3_t + \beta_4 X4_t + \beta_5 D1X1_t + \beta_6 D1X2_t + \beta_7 D1X3_t + \beta_8 D1X4_t + \beta_9 D2X1_t + \beta_{10} D2X2_t + \beta_{11} D2X3_t + \beta_{12} D2X4_t + \epsilon_t$$

**RESULTS AND DISCUSSION**

**Descriptive Statistics**

Descriptive statistical analysis includes descriptive statistics of sectoral stock returns. The analysis is explained in Table 1. Descriptive statistical analysis of sectoral stock returns aims to determine the characteristics of sectoral stock returns. Descriptive analysis of sectoral stock returns is based on two descriptive statistical indicators, namely mean and standard deviation. Descriptive analysis of sectoral stock returns includes analysis based on the entire period (May 2021 to June 2024). Then this analysis is decomposed into three sub-period categories based on the conditions of the global economic crisis in 2022. The results of calculating the two descriptive statistical indicators of monthly returns for sectoral stocks are shown in Table 1. This table shows that there are differences in the characteristics of monthly returns for sectoral stocks, both between sectors and between sub-periods.

**Table 1. Descriptive Statistics of Industrial Stock Returns**

Parameter	Sector 1	Sector 2	Sector 3	Sector 4	Sector 5	Sector 6	Sector 7	Sector 8	Sector 9	Sector 10	Sector 11
Panel a. Overall Period (Period May 2021 - June 2024)											
Mean	2.707	0.785	0.079	0.138	0.449	0.412	0.832	-0.451	2.851	1.946	1.135
Std. Dev.	8.115	5.563	4.501	2.787	3.722	2.957	3.667	3.222	30.825	8.055	7.699
Panel b. Sub Period Before the 2022 Global Economic Crisis (Period May 2021 - December 2021)											
Mean	5.943	-0.054	1.086	-1.473	2.425	1.363	1.804	-1.489	23.221	1.195	5.845
Std. Dev.	11.362	3.855	4.788	2.882	4.278	2.633	3.148	4.647	65.025	5.682	9.180
Panel c. Sub Period During the 2022 Global Economic Crisis (Period January 2022 - December 2022)											
Mean	6.117	0.013	1.181	0.682	-0.422	0.848	-0.564	-0.642	-4.294	-0.715	0.721
Std. Dev.	6.152	5.334	5.499	3.208	3.271	2.735	3.845	3.262	6.914	4.888	9.449
Panel d. Sub Period After the 2022 Global Economic Crisis (Period January 2023 - June 2024)											
Mean	-1.003	1.673	-1.103	0.492	0.151	-0.302	1.331	0.137	-1.440	4.053	-0.683
Std. Dev.	6.163	6.423	3.503	2.296	3.638	3.200	3.680	2.433	6.724	10.125	4.742

Source: Data Processing Results

**Structural Break Testing Results**

Hypothesis testing is based on an estimation model that has been adjusted to multicollinearity analysis as shown in the equation above. This analysis is differentiated based on the expected level of return and risk of global economic factors. Therefore, based on the hypothesis testing design, the hypothesis is divided into the two sub-hypotheses above. The results of testing structural break is shown in Table 2.

Results of Sub-hypothesis 1 Testing. Testing of sub-hypothesis 1 is intended to determine whether there are differences in the expected return levels of sectoral stocks during the 2022 global economic crisis when compared with before and after the 2022 global economic crisis. The results of testing sub-hypothesis 1 regarding differences in sectoral stock returns in relation to the existence of structural break as the impact of the global economic crisis in 2022 is shown in Table 2. The difference in expected return levels is shown by the variable regression intercept dummy sectoral stock returns. The test results regarding changes in the intercept between before and during the 2022 global economic crisis are shown as follows:

- 1) Test results regarding changes in the intercept between before and during the 2022 global economic crisis show shares in the Energy sector, Basic materials sector, Consumer Non-Cyclicals sector, Consumer Cyclicals sector, Healthcare sector, Financials sector, Property and Real Estate sector, Technology sector, as well as the Infrastructure sector have coefficients  $\beta_1$  which is not significant, either at the 1%, 5% or 10% level. This means  $H_0$  cannot be rejected. This indicates that structural changes before and during the 2022 economic crisis do not affect the intercept characteristics of the regression model for the nine sectoral stocks. This means that the level of return tends to be the same between before and during the 2022 global economic crisis for these nine sectoral stocks. Furthermore, the test results also show that the returns on shares in the Industrials sector and the Transportation and Logistics sector have a coefficient of  $\beta_1$  which is positive and significant at the 10% level. This indicates that structural changes before and during the global economic crisis in 2022 have a positive influence on the intercept characteristics of the regression model for the two sectoral shares. This means that the level of return was greater before the global economic crisis compared to during the global economic crisis in 2022 for these two sectoral stocks.

**Table 2. Test Results Structural Break Industrial Stock Returns**

Parameter	Sector 1	Sector 2	Sector 3	Sector 4	Sector 5	Sector 6	Sector 7	Sector 8	Sector 9	Sector 10	Sector 11
$Y_i = \delta_1 D_1 + \delta_2 D_2 + \beta_1 X_{i1} + \beta_2 X_{i2} + \beta_3 X_{i3} + \beta_4 X_{i4} + \beta_5 D1X_{i1} + \beta_6 D1X_{i2} + \beta_7 D1X_{i3} + \beta_8 D1X_{i4} + \beta_9 D2X_{i1} + \beta_{10} D2X_{i2} + \beta_{11} D2X_{i3} + \beta_{12} D2X_{i4} + \epsilon_i$											
$\delta_1$	52.058	32.268	48.287***)	4.367	9.779	-4.973	16.235	-15.711	16.363	17.845	90.454***)
$\delta_2$	57.688	54.241	-6.203	-32.258	-45.998	-33.991	-45.120	5.141	27.150	19.736	-58.483
$\beta_{i1}$	161.685**)	-34.862	122.567***)	45.232*)	30.416	-39.881	-12.054	-6.989	-265.360	-94.268	-28.483
$\beta_{i2}$	3.586	0.649	1.085	0.521	1.348	-0.711	0.927	2.270**)	-38.415***)	-0.103	3.765**)
$\beta_{i3}$	116.995	-117.178	128.415	-32.520	43.795	-37.042	10.194	102.733	-939.138**)	-45.886	4.578
$\beta_{i4}$	-1.134	1.023	-1.182	0.257	-0.423	0.371	-0.111	-1.021	10.104**)	0.426	-0.135
$\beta_{i5}$	-119.446	116.884**)	-55.071	-25.688	12.984	-1.756	43.902	52.153	324.201	113.121	120.111
$\beta_{i6}$	0.422	1.708	3.301	-2.164	-3.429	-0.403	-0.683	-1.762	36.114**)	3.343	0.686
$\beta_{i7}$	-152.134	96.563	-173.390**)	-10.964	-25.621	13.411	-16.784	-68.678	952.775**)	57.921	-111.543
$\beta_{i8}$	0.857	-1.223	0.963	0.197	0.312	-0.053	0.029	0.805	-10.241**)	-0.867	0.138
$\beta_{i9}$	-213.133**)	-1.807	-140.243***)	-55.071**)	-22.407	3.511	25.660	18.087	328.775	64.894	42.470
$\beta_{i10}$	-5.756**)	-3.452	-0.268	0.573	0.013	1.625	-0.345	-2.471**)	37.272***)	-2.049	-0.812
$\beta_{i11}$	-131.941	110.114	-134.363	25.290	-53.324	31.067	-8.031	-108.249	965.277**)	39.002	-8.517
$\beta_{i12}$	0.959	-1.219	1.256	0.009	0.794	-0.101	0.388	1.047	-10.544**)	-0.392	0.479

\*\*\*) significant at the 1% level ;\*\*) significant at the 5% level; \*) significant at the 10% level

$D_1 = 1$  for the period January - December 2022 (during the 2022 global crisis), other periods = 0;  $D_2 = 1$  for the period January 2023 – June 2024 (after the 2022 global crisis), other periods = 0;  $\beta_{i1}$  is the Japanese capital market beta;  $\beta_{i2}$  is the beta of the United States inflation rate;  $\beta_{i3}$  is the Japanese interest rate beta;  $\beta_{i4}$  is the Japanese currency exchange rate beta;  $\beta_{i5}$  is the beta of the interaction between variables dummy 1 with Japanese capital market returns;  $\beta_{i6}$  is the beta of the interaction between variables dummy 1 with the United States inflation rate;  $\beta_{i7}$  is the interaction beta between variables dummy 1 with Japanese interest rates;  $\beta_{i8}$  is the beta of the interaction between variables dummy 1 at the Japanese exchange rate;  $\beta_{i9}$  is the beta of the interaction between variables dummy 2 with Japanese capital market returns;  $\beta_{i10}$  is the beta of the interaction between variables dummy 2 with the United States inflation rate;  $\beta_{i11}$  is the interaction beta between variables dummy 2 with Japanese interest rates;  $\beta_{i12}$  is the beta of the interaction between variables dummy 2 with the Japanese currency exchange rate;

- 2) The test results regarding changes in the intercept between during and after the global economic crisis in 2022 show that all sectoral stocks have a coefficient  $\beta_2$  which is not significant, either at the 1%, 5%, or 10% level. This means  $H_0$  cannot be rejected. This indicates that structural changes during and after the global economic crisis in 2022 do not affect the intercept characteristics of the regression model for all sectoral shares. This means that the rate of return tends to be the same between during and after the global economic crisis in 2022. Results of Sub-hypothesis 2 Testing. Testing sub-hypothesis 2 is intended to determine whether there are differences in the

risk of global economic factors during the 2022 global economic crisis when compared with before and after the crisis. The results of testing sub-hypothesis 2 regarding differences in the risk of global economic factors on sectoral stock returns in connection with the existence of structural break as the impact of the global economic crisis in 2022 is shown in Table 2. This test is shown by the variable regression slope dummy sectoral stock returns as explained as follows:

1. Testing of differences in risk of global economic factors between before and during the 2022 global economic crisis is shown by the beta of the dummy variable D1. The test results for each sector and factor are explained as follows:
  - a. Energy sector (Sector 1)

Energy sector stocks have values  $\beta_{i5}$ ,  $\beta_{i6}$ ,  $\beta_{i7}$ , and  $\beta_{i8}$  not significant at the 1%, 5%, and 10% levels, which means  $H_0$  cannot be rejected. This indicates that structural changes in all global economic factors between before and during the 2022 global economic crisis have no impact on the stock return characteristics of Energy sector.
  - b. Basic materials sector (Sector 2)

Basic materials sector stocks have a value of  $\beta_{i5}$  which is positive and significant at the 10% level, which means  $H_0$  is rejected, while  $\beta_{i6}$ ,  $\beta_{i7}$ , and  $\beta_{i8}$  values are not significant at the 1%, 5%, and 10% levels, which means  $H_0$  cannot be rejected. This indicates that structural changes in Japanese capital market return factors have a positive impact on the return of stocks in the Basic materials sector between before and during the 2022 global economic crisis, while other global economic factors have no impact on the stock return characteristics of Basic materials sector.
  - c. Industrial Sector (Sector 3)

Industrial sector stocks have a value of  $\beta_{i7}$  which is negative and significant at the 10% level, which means  $H_0$  is rejected, while the values  $\beta_{i5}$ ,  $\beta_{i6}$ , and  $\beta_{i8}$  are not significant at the 1%, 5%, and 10% levels, which means  $H_0$  cannot be rejected. This indicates that structural changes in Japanese interest rate factors have a negative impact on the return risk premium for industrial sector stocks between before and during the 2022 global economic crisis, while other global economic factors have no impact on the characteristics of the return for Industrial sector stocks.
  - d. Consumer Non-Cyclical Sector (Sector 4)

Consumer Non-Cyclical sector shares have values  $\beta_{i5}$ ,  $\beta_{i6}$ ,  $\beta_{i7}$ , and  $\beta_{i8}$  not significant at the 1%, 5%, and 10% levels, which means  $H_0$  cannot be rejected. This indicates that structural changes in all global economic factors between before and during the global economic crisis in 2022 have no impact on the return characteristics of stocks in the Consumer Non-Cyclical sector.
  - e. Consumer Cyclical Sector (Sector 5)

Consumer Cyclical sector stocks have values  $\beta_{i5}$ ,  $\beta_{i6}$ ,  $\beta_{i7}$ , and  $\beta_{i8}$  not significant at the 1%, 5%, and 10% levels, which means  $H_0$  cannot be rejected. This indicates that structural changes in all global economic factors before and during the global economic crisis in 2022 have no impact on the return characteristics of stocks in the Consumer Cyclical sector.
  - f. Healthcare Sector (Sector 6)

Healthcare sector stocks have values  $\beta_{i5}$ ,  $\beta_{i6}$ ,  $\beta_{i7}$ , and  $\beta_{i8}$  not significant at the 1%, 5%, and 10% levels, which means  $H_0$  cannot be rejected. This indicates that the structural changes in

all global economic factors before and during the 2022 global economic crisis have no impact on the return characteristics of healthcare sector stocks.

g. Financials Sector (Sector 7)

Financials sector shares have values  $\beta_{i5}$ ,  $\beta_{i6}$ ,  $\beta_{i7}$ , and  $\beta_{i8}$  not significant at the 1%, 5%, and 10% levels, which means  $H_0$  cannot be rejected. This indicates that structural changes in all global economic factors between before and during the global economic crisis in 2022 have no impact on the return characteristics of financial sector stocks.

h. Property and Real Estate Sector (Sector 8)

Property and Real Estate sector shares have values  $\beta_{i5}$ ,  $\beta_{i6}$ ,  $\beta_{i7}$ , and  $\beta_{i8}$  not significant at the 1%, 5%, and 10% levels, which means  $H_0$  cannot be rejected. This indicates that structural changes in all global economic factors between before and during the global economic crisis in 2022 have no impact on the return characteristics of shares in the Property and Real Estate sectors.

i. Technology Sector (Sector 9)

Technology sector stocks have values  $\beta_{i6}$  and  $\beta_{i7}$  which are positive and significant at the 10% level, as well as  $\beta_{i8}$  which is negative and significant at the 10% level, which means  $H_0$  is rejected, while the value of  $\beta_{i5}$  is not significant at the 1%, 5%, and 10% levels, which means  $H_0$  cannot be rejected. This indicates that structural changes in the United States inflation rate and Japanese interest rates have a positive impact, and the Japanese currency exchange rate has a negative impact on the return for technology sector stocks between before and during the global economic crisis in 2022, while the capital market return factor Japan has no impact on the return characteristics of Technology sector stocks.

j. Infrastructure Sector (Sector 10)

Infrastructure sector shares have values  $\beta_{i5}$ ,  $\beta_{i6}$ ,  $\beta_{i7}$ , and  $\beta_{i8}$  not significant at the 1%, 5%, and 10% levels, which means  $H_0$  cannot be rejected. This indicates that the structural changes in all global economic factors between before and during the global economic crisis in 2022 have no impact on the return characteristics of Infrastructure sector shares.

k. Transportation and Logistics Sector (Sector 11)

Transportation and Logistics sector shares have values  $\beta_{i5}$ ,  $\beta_{i6}$ ,  $\beta_{i7}$ , and  $\beta_{i8}$  not significant at the 1%, 5%, and 10% levels, which means  $H_0$  cannot be rejected. This indicates that structural changes in all global economic factors before and during the global economic crisis in 2022 have no impact on the return characteristics of shares in the Transportation and Logistics sector.

2. Testing of differences in risk of global economic factors during and after the 2022 global economic crisis is shown by the beta of the dummy variable D2. The test results for each sector and factor are explained as follows:

a. Energy Sector (Sector 1)

Energy sector stocks have value  $\beta_{i9}$  and  $\beta_{i10}$  negative and significant at the 5% and 10% levels, which means  $H_0$  is rejected, temporarily  $\beta_{i11}$  and  $\beta_{i12}$  not significant at the 1%, 5%, and 10% levels, which means  $H_0$  cannot be rejected. This indicates that structural changes in Japanese capital market return factors and the United States inflation rate between during and after the global economic crisis in 2022 have a negative impact on the return risk premium characteristics of Energy sector stocks, while Japanese interest rate factors and the Japanese currency exchange rate have no impact on the return characteristics of Energy sector stocks.

- b. Basic materials Sector (Sector 2)  
Basic materials sector shares have values  $\beta_{i9}$ ,  $\beta_{i10}$ ,  $\beta_{i11}$ , and  $\beta_{i12}$  not significant at the 1%, 5%, and 10% levels, which means  $H_0$  cannot be rejected. This indicates that structural changes in all global economic factors during and after the global economic crisis in 2022 have no impact on the return characteristics of stocks in the Basic materials sector.
- c. Industrials Sector (Sector 3)  
Industrials sector shares have a value of  $\beta_{i9}$  which is negative and significant at the 1% level, which means  $H_0$  is rejected, while the coefficient  $\beta_{i10}$ ,  $\beta_{i11}$ , and  $\beta_{i12}$  are not significant at the 1%, 5%, and 10% levels, which means  $H_0$  cannot be rejected. This indicates that changes in the structural factors of the United States inflation rate, Japanese interest rates, and the Japanese currency exchange rate have no impact on the return characteristics of Industrials sector stocks.
- d. Consumer Non-Cyclicals Sector (Sector 4)  
Consumer Non-Cyclicals sector shares have a value  $\beta_{i9}$  which is negative and significant at the 1% level, which means  $H_0$  is rejected, while the coefficient  $\beta_{i10}$ ,  $\beta_{i11}$ , and  $\beta_{i12}$  are not significant at the 1%, 5%, and 10% levels, which means  $H_0$  cannot be rejected. This indicates that changes in the structural factors of the United States inflation rate, Japanese interest rates, and the Japanese currency exchange rate have no impact on the return characteristics of stocks in the Consumer Non-Cyclicals sector.
- e. Consumer Cyclicals Sector (Sector 5)  
Consumer Cyclicals sector shares have values  $\beta_{i9}$ ,  $\beta_{i10}$ ,  $\beta_{i11}$ , and  $\beta_{i12}$  not significant at the 1%, 5%, and 10% levels, which means  $H_0$  cannot be rejected. This indicates that structural changes in all global economic factors during and after the global economic crisis in 2022 have no impact on the return characteristics of shares in the Consumer Cyclicals sector.
- f. Healthcare Sector (Sector 6)  
Healthcare sector shares have values  $\beta_{i9}$ ,  $\beta_{i10}$ ,  $\beta_{i11}$ , and  $\beta_{i12}$  not significant at the 1%, 5%, and 10% levels, which means  $H_0$  cannot be rejected. This indicates that structural changes in all global economic factors during and after the global economic crisis in 2022 have no impact on the return characteristics of healthcare sector stocks.
- g. Financials Sector (Sector 7)  
Financials sector shares have values  $\beta_{i9}$ ,  $\beta_{i10}$ ,  $\beta_{i11}$ , and  $\beta_{i12}$  not significant at the 1%, 5%, and 10% levels, which means  $H_0$  cannot be rejected. This indicates that structural changes in all global economic factors during and after the global economic crisis in 2022 have no impact on the return characteristics of financials sector stocks.
- h. Property and Real Estate Sector (Sector 8)  
Property and Real Estate sector shares have a value of  $\beta_{i10}$  which is negative and significant at the 10% level, which means  $H_0$  is rejected, while the coefficient  $\beta_{i9}$ ,  $\beta_{i11}$ , and  $\beta_{i12}$  are not significant at the 1%, 5%, and 10% levels, which means  $H_0$  cannot be rejected. This indicates that structural changes in the inflation rate in the United States have a negative impact on the return characteristics of shares in the Property and Real Estate sectors, while Japanese capital market returns, Japanese interest rates, and the Japanese Currency Exchange have no impact on the characteristic returns Property and Real Estate sector shares.
- i. Technology Sector (Sector 9)

Technology sector stocks have values  $\beta_{i10}$  and  $\beta_{i11}$  which are positive and significant at the 1% and 10% levels, as well as  $\beta_{i12}$  which is negative and significant at the 5% level, which means  $H_0$  is rejected, while the coefficient  $\beta_{i9}$  not significant at the 1%, 5%, and 10% levels, which means  $H_0$  cannot be rejected. This indicates that structural changes in the United States inflation rate and Japanese interest rates have a positive impact, and the Japanese currency exchange rate has a negative impact on the return for technology sector stocks between during and after the global economic crisis in 2022, while the capital market return factor Japan has no impact on the return characteristics of Technology sector stocks.

j. Infrastructure Sector (Sector 10)

Infrastructure sector shares have values  $\beta_{i9}$ ,  $\beta_{i10}$ ,  $\beta_{i11}$ , and  $\beta_{i12}$  not significant at the 1%, 5%, and 10% levels, which means  $H_0$  cannot be rejected. This indicates that structural changes in all global economic factors during and after the global economic crisis in 2022 have no impact on the characteristics of the return for infrastructure sector stocks.

k. Transportation and Logistics Sector (Sector 11)

Transportation and Logistics sector shares have values  $\beta_{i9}$ ,  $\beta_{i10}$ ,  $\beta_{i11}$ , and  $\beta_{i12}$  not significant at the 1%, 5%, and 10% levels, which means  $H_0$  cannot be rejected. This indicates that the structural changes in all global economic factors before and during the global economic crisis in 2022 have no impact on the characteristics of the return for shares in the Transportation and Logistics sector.

This research produces findings regarding the structural break phenomenon in sectoral stock returns in connection with the global economic crisis in 2022, both before and after the crisis. The research results show that the structural break phenomenon was found to be inconsistent in all industrial sector stocks. This research investigates two structural break phenomena, namely the first is a structural break in the intercept of the stock return model to determine the existence of a structural break in the specific risk of each industrial sector and the second is a structural break in the slope of the stock return model to determine the existence of a structural break in the risk premium of each sectoral stock. . The results of investigations through testing and verification in the period before and during the crisis, as well as in the period during and after the crisis, found structural breaks in sector shares, although they were not consistent across all sectors and all global risk factors.

The results of this research are relevant and support the research of Yao et al., (2005) which states that the predictability of returns on industrial or sectoral stocks can be explained by the time-varying risk premium of economic factors; (Beltratti & Morana, 2006) found that the break process in stock return volatility is closely related to the break process of macroeconomic factors, such as inflation and federal interest rates; (Hartmann et al., 2008) stated that structural breaks caused by economic and financial crises can affect the predictability of stock returns; (Yao et al., 2005) who found differences in the required rate of return and the magnitude of the SML slope as a result of structural changes brought about by the financial crisis; (Babikir et al., 2012)[14] stated that empirically, structural breaks are relevant to stock return volatility in South Africa. Furthermore, the results of this research are in line with research conducted by (Caporale et al., 2022) which states that exchange rate returns have a larger influence than oil price returns. Because energy-dependent sectors are vulnerable to global volatility, appropriate energy regulations should be implemented to reduce risk. and (Shah et al., 2023) which states that investors should update their knowledge based on considering the endogenous and exogenous shocks on the stock market volatility. The research results are not fully supported by the research results of (Gordo et al., 2024) which states that monetary policy has only a limited effect overall on renewable energy stocks, as the long recent period of

alternative monetary policies has been found not to influence renewable energy stock prices. More time-disaggregated analysis undertaken by incorporating structural breaks identifies a significant influence during some time periods depending on the type of monetary policy being conducted.

## CONCLUSION

Testing time-varying volatility for the structural break phenomenon across eleven industrial sectors yielded two key empirical findings: (1) the required rate of return for investment in sectoral stocks tended to be lower during the 2022 economic crisis compared to before the crisis in five sectors, while the other six sectors showed no significant change during the crisis; and (2) the required rate of return tended to be higher during the crisis compared to the period after the crisis. These results highlight the influence of structural changes on the differing return characteristics of sectoral stocks. Future research could extend this analysis by incorporating additional macroeconomic variables and exploring the effects of structural breaks on sectoral stock returns over a longer time horizon to better understand the persistence and drivers of these changes.

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