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Kangaroo Market Phenomenon: Identification and Impact on Indonesia's Economic Growth

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ABSTRACT

The stock market holds a crucial role in a country's economy, including Indonesia. As an indicator, the Jakarta Composite Index (JCI) experiences volatility alongside changes in the Indonesian economy. The presence of a kangaroo market in JCI returns can pose a risk of future economic slowdown, making it crucial for monetary authorities to intervene to stabilize the stock market. Therefore, this study identifies the kangaroo market phenomenon, structural economic changes, and the impact of the kangaroo market phenomenon on Indonesia's economic growth. The study focuses on many variables, including JCI returns, kangaroo market, and economic growth from Q3 1995 to Q4 2023. By using the Hodrick-Prescott Filter to define a kangaroo market as JCI returns that lack a deterministic trend, have high volatility, and deviate by one standard deviation from their volatility trend, the results show that most kangaroo phenomena occur during undervaluation. Following the kangaroo market phenomenon, Indonesia's economy underwent five structural changes based on the multiple breakpoint test. Using dynamic linear regression, the overvaluation kangaroo phenomenon negatively affects Indonesia's economic growth, while the undervaluation kangaroo phenomenon has no impact but shows a positive direction.

1. Introduction

Indonesia is a developing country with an open economic system. According to Mankiw (2013), an open economy means that the people of a country can freely engage in international trade, such as exporting and importing goods or services, as well as transactions in the stock market. Additionally, an open economy involves differences in resources, needs, and interests between countries, which become the basis for the necessity of economic relations (Putri & Mudakir, 2019). However, economic relations that create dependency pose a challenge to the freedom of people in trade transactions. This results in differing values of financial instruments in the stock market. Yet, the stock market holds a crucial role in the national economy through two main functions (Pakpahan, 2003). In its economic function, the stock market provides a facility that brings together two interests: the public as capital owners (investor) and companies offering shares (issuer). Then, in its financial function, the stock market offers opportunities for investors to earn returns as future profits.

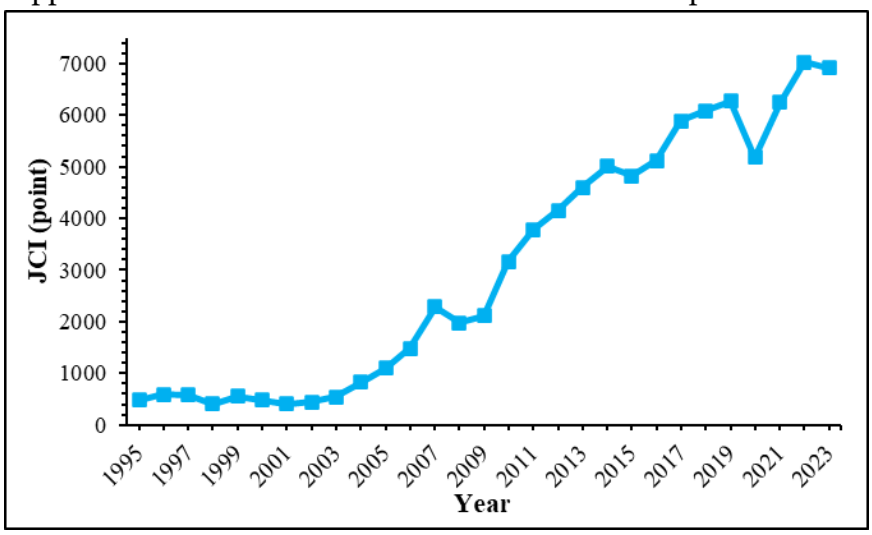

Figure 1. JCI 1995 to 2023
Source: Yahoo Finance, processed

To ensure the continuity of both functions, the Indonesian government established an official institution called the Indonesia Stock Exchange (IDX). Since May 22, 1995, IDX has implemented an automated trading system for securities using computers, known as the Jakarta Automated Trading System (JATS). The IDX has grown rapidly, particularly since the introduction of the JATS, enhancing market efficiency and liquidity. However, it is still considered by Jogiyanto (2010) to be a thin market, characterized by higher volatility compared to more mature markets like Japan and Hong Kong, where the stock markets are more stable and liquid. According to Usman et al. (1997), JATS has been able to encourage the growth of the Indonesian stock market, thereby increasing its liquidity. However, as shown in Figure 1, the stock market's growth, reflected in the Jakarta Composite Index (JCI) movement, does not accurately represent this liquidity. Saputra and Yuniarti (2023) state that in JATS, JCI fluctuations have become larger due to the rapid price changes of stocks within seconds.

The fluctuating and unpredictable movement of the JCI causes volatility, which prevents the stock market from functioning properly. Clarke and Statman (1997) explain that market volatility is classified by investors into three pattern categories: bearish, bullish, and correction. Bearish refers to a declining stock price index movement, akin to a bear striking downward when attacking its prey. Bullish refers to a rising stock price index movement, similar to a bull attacking upward with its horns. The last category, correction, is a decline in the stock market that is expected to correct in the near term and increase in the long term.

According to Tretina (2023), bearish periods are shorter than bullish periods, averaging 289 days or less than 10 months. Historically, bullish periods last for 973 days or 2.7 years.

During a bear market, economic growth tends to weaken due to the significant decline in the stock price index of companies in a country. In contrast to a bear market, during a bull market, a country's economic growth tends to strengthen because of strong demand for stocks. However, Figure 2 shows that bear and bull markets didn't occur in the Indonesian stock market from 1995 to 2023. During this period, the JCI returns continuously fluctuated without creating an upward or downward trend, resulting in what is called a kangaroo market. A kangaroo market has a sideways trend where stock prices fluctuate within a narrow range over the long term. Consequently, stock price volatility in the stock market becomes high.

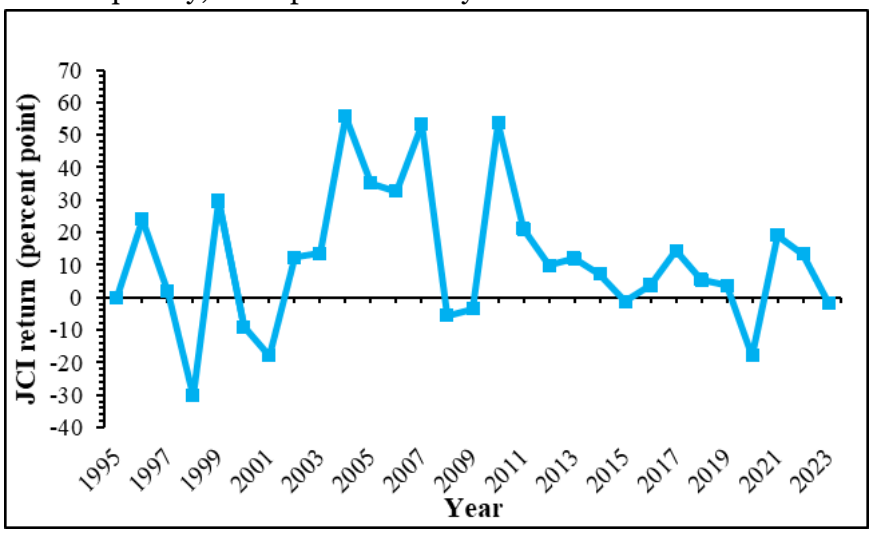

Figure 2. Return of JCI 1995 to 2023
Source: Yahoo Finance, processed

In Indonesia, the kangaroo market phenomenon emerged alongside the stock market bubble. According to Carter et al. (2011), a bubble occurs when the stock market experiences high volatility. Manurung (2012) explains that bubbles in the stock market are generally measured through the return of a stock. Figure 2 shows that the JCI returns drastically dropped by -30.23 percentage points in 1998 and surged to 53.23 percent in 2007. Return that exceed the maximum limit of their high volatility are termed as kangaroo overvaluation. Meanwhile, return that fall below the minimum limit of their high volatility are termed as kangaroo undervaluation.

Theoretically, the presence of bubbles in the kangaroo market can occur in unlimited amounts. Roubini (2006) explains that stock market bubbles can occur from time to time, leading to economic instability. Minsky (1986) explains that the presence of bubbles can be identified through five recurring stages of the economic cycle. In the first phase, displacement occurs when investors become attracted to a new paradigm, such as technological innovation and low interest rates. The second phase (boom) happens when prices start to rise slowly and then surge due to increased investor interest. In the euphoria phase, the price of an asset increases drastically, causing investors to ignore caution in their investments. Next, in the fourth phase, investors begin to notice signs of the bubble bursting, prompting them to sell assets quickly to take profits. Finally, the panic phase occurs when asset prices reverse direction after a rise, resulting in a rapid decline.

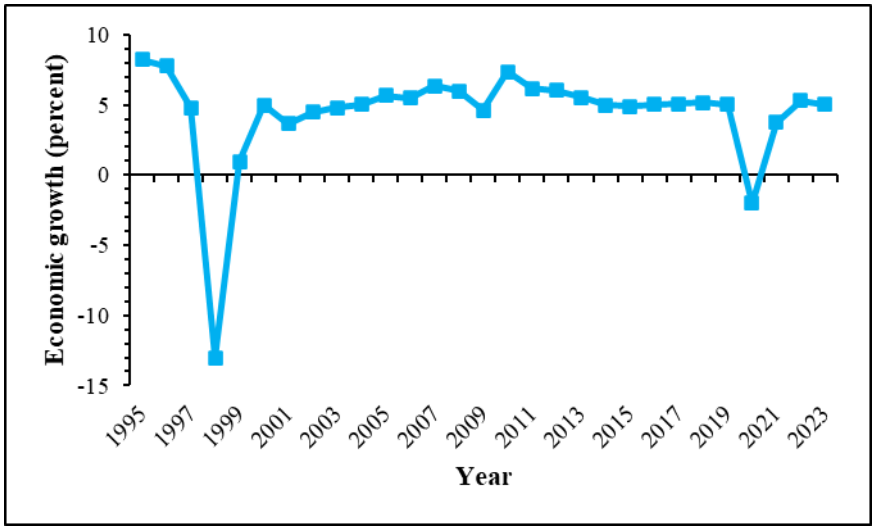

Figure 3. Economic growth 1995 to 2023
Source: BPS, processed

Detecting the kangaroo market phenomenon in the JCI is crucial because of its role as an indicator of economic growth. Figure 3 shows that Indonesia's economic growth tends to be positive but fluctuates from 1995 to 2023. This fluctuation is caused by the volatile movements in JCI returns, as seen in Figure 2. During 1996-1997, economic growth declined due to the implementation of JATS by the IDX. Additionally, economic growth experienced two major contractions in 1998 and 2020. First, economic growth contracted by -13.02 percent due to the 1998 monetary crisis. Following this, economic growth increased to 0.97 percent in 1999. However, this growth was not as significant as in the periods before and after the monetary crisis. Second, economic growth contracted again by -2.00 percent in 2020 due to the COVID-19 pandemic. Economic growth then rebounded during 2021 and 2022. However, Indonesia's economy declined again to 5.05 percent in 2023 as a result of the commodities boom cycle (Nugroho, 2024).

The kangaroo market phenomenon not only occurred in the Indonesian stock market, but also during Black Monday, when the U.S. stock market crashed throughout 1987. At that time, DJIA plummeted by 22.61 percent (Browning, 2007). Additionally, a kangaroo market occurred during the Brexit event on June 23, 2016. Brexit increased uncertainty about the global economic outlook, causing investor optimism in the stock market to decline. Furthermore, the Nepalese stock market crashed after four years of stability in March 2019, with the NEPSE index dropping drastically to 1349.38 points.

From these various cases, monetary authorities have concerns when the stock market experiences a kangaroo market phenomenon. Under the supervision of the Financial Services Authority (OJK), monetary authorities have made every effort to reduce volatility in the JCI. Reducing the volatility in the JCI can provide certainty in the investment world and monetary stability in the form of controlled macroeconomic indicators. One of these efforts includes intervention to stabilize the stock market (OJK, 2023). According to Melani (2021), the frequency of intervention by monetary authorities is higher within JATS. This intervention behavior is one of the ways monetary authorities support the country's economy. However, intervention becomes a very costly endeavor for economic growth when monetary authorities have to stabilize it. Therefore, this study aims to identify the kangaroo market phenomenon, structural changes in economic growth, and the impact of the kangaroo market on Indonesia's economic growth.

2. Literature Review

Conventional Theory

According to Eliza (2013), conventional theory explains the use of fundamental analysis through a top-down approach by investors to understand stock price movements. Fundamental analysis is an investment analysis method for stocks using a top-down approach, starting with macroeconomic analysis, followed by industry and company analysis in the long-term stock market (Makkulau & Yuana, 2021). This aims to help investors make decisions on the allocation of funds in the form of stocks, bonds, or other capital market instruments.

Black Swan Theory

According to Taleb (2004), the black swan theory explains rare events or phenomena that cannot be predicted. These phenomena are extreme and have a significant impact globally (Aven, 2015). Here are three types of Black Swan phenomena.

a. Phenomena that have never been known in the scientific realm.
b. In risk analysis, phenomena that are not on the list of known phenomena.
c. Phenomena that happen with a less probability so its can be ignored.

In this theory, uncertainty becomes the main focus. An example of black swan phenomenon is the Subprime Mortgage crisis in the U. S. Therefore, when a black swan event occurs, the stock market tends to become volatile and may even collapse, providing opportunities to purchase high-quality stocks at low prices.

Stock Market

The stock market is defined as a long-term financial market where securities such as debt, stocks, and other financial instruments can be traded (Darmadji & Fakhruddin, 2008). In a broad sense, the stock market is an organized financial system that includes commercial banks, all financial intermediary institutions, and circulating securities. In a narrow sense, the stock market is a market prepared for trading stocks, bonds, and other types of securities using the services of brokerage intermediaries (Sunariyah, 2011).

In addition, the stock market holds a crucial role in the country's economy through two main functions (Pakpahan, 2003). In the economic function, the stock market is a meeting place for two interests, namely investors and issuers. Following its financial function, the stock market provides opportunities for investors to obtain returns as future profits. Rustiana and Ramadhani (2022) state that the existence of the stock market brings several benefits, such as long-term alternative financing for issuers, spurring economic growth, and providing employment for the community. For this reason, the stock market is an attraction for investors, issuers, and the government.

Kangaroo Market

Kamath (2022) defines a kangaroo market as a stock market phenomenon that fluctuates over a certain period without a strong upward or downward trend. This phenomenon is described as the end of economic peak activity transitioning from booming to crisis. Jain (2020) defines a kangaroo market as a stock market condition with high volatility without a strong upward or downward trend. According to Danielsson et al. (2018), high volatility occurs when the deviation from the trend of stock index returns is positive.

Additionally, a kangaroo market can be used to explain stock price fluctuations over a period of time due to investor behavior (Mitro, 2022). The term kangaroo market can be interpreted as a jumping distance. The energy entering the jump is likened to speculative investor behavior, causing periodic and unpredictable jumps. When a jumping distance increases, the jump becomes higher. Conversely, when the jumping distance decreases, the movement becomes lower. In an economic context, a kangaroo market generally explains a

condition where the price of a stock, financial asset, or other instruments experiences fundamental value fluctuations with a flat margin. Meanwhile, in finance, the kangaroo market becomes the All-Ordinaries Index in the Australian stock market (Nicole, 2024).

Jakarta Composite Index (JCI)

The Jakarta Composite Index (JCI) is one of the indicators of stock market development in Indonesia. According to Sunariyah (2011), JCI describes a series of historical information about the movement of all stock prices within a certain period of time. On April 1, 1983, the JCI was first introduced by the IDX with a base day of August 10, 1982. The JCI was set with a base value of 100 for a total of 13 issuers. The index number is a comparison between changes in stock prices over time. In its calculation, the stock price index number uses two time periods, namely the base period and the given period.

Economic Growth

Economic growth refers to the activities within an economy that lead to an increase in the production of goods and services, thereby enhancing societal prosperity (Sukirno, 2001). Abdillah (2023) notes that the government aims for economic growth by enhancing production capacity to achieve output, which is measurable through Gross Domestic Product (GDP) or Gross Regional Domestic Product (GRDP) in a specific area. Economic growth can also be understood as a continuous process of improving a country's economic conditions towards a more favorable state (Hasyim, 2016).

In 1957, Robert Solow built a model regarding the determinants of economic growth in the long run. In aggregate, Solow's model prioritizes the interaction between capital and labor relativity in determining the amount of goods and services produced. When capital increases, investment will be increased by new supply in a growing stock market (Nugraha, 2007). Then, joint ventures occur in both the same and different industry sectors, causing a positive effect on output. With the increase in output produced by the company, the level of aggregate supply will increase, thus increasing economic growth.

Previous Research

Babatunde (2013) determines the impact of stock market volatility on Nigeria's economic growth from 1980 to 2010. Using autoregressive analysis, the study found that Nigeria's stock market volatility experienced prolonged volatility that could disrupt economic growth. Krieken's (2018) study aimed to investigate the effect of high volatility on the likelihood of stock market crashes in the United States (S&P) and Germany (DAX) from January 1965 to December 2017. The research findings indicated that the increase in the credit-to-GDP ratio in both the United States and Germany was caused by high volatility averages.

Dabwor et al. (2020) research aimed to investigate the impact of stock market volatility on economic growth from 1981 to 2018. Their findings indicated that returns had a positive but not significant effect on economic growth. Nizar's (2011) study titled "The Influence of Tourism on Economic Growth in Indonesia" aimed to investigate the impact of tourism on economic growth from 1995 to 2000. Using VAR analysis, it was found that economic growth in the previous one and two quarters positively influenced growth in the current period. In addition, the use of VAR by Chikwira and Mohammed (2023) shows that the stock market has an influence on increasing economic growth.

Research Framework

The framework for this study, grounded in theoretical foundations and prior research, is illustrated in Figure 4. At the initial stage, identification of the kangaroo market in the JCI was carried out. Confidence theory of stock price explains that the JCI moves following the

confidence of investors to trade in the stock market, thus encouraging a kangaroo market. Investors will decide to trade if the return value of the JCI is in accordance with the amount of investment risk obtained. Then, one of the tasks of the monetary authority is to achieve the stability of the JCI so as to encourage intervention behavior and structural breaks in economic growth.

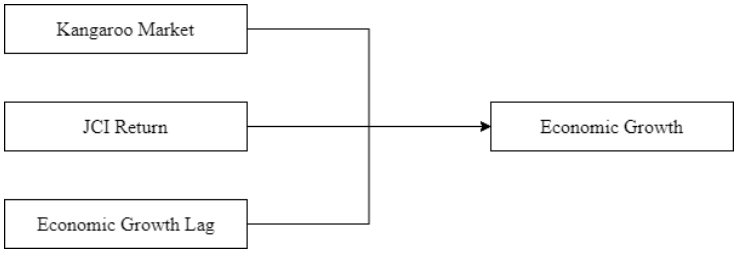

Figure 4. Research framework
Source: author, processed

Tobin (1966) in Fortuna (2014) explains that the state maintains the level of economic growth through the valuation of company shares. According to the conventional theory of stock price, companies will anticipate changes in their earnings so as to give monetary authorities the confidence to intervene in accordance with fluctuations in stock prices (Eliza, 2013). Therefore, the kangaroo market phenomenon affects Indonesia's economic growth. JCI return as a variable that is estimated for volatility so that it has an influence on economic growth. Then, the economic growth lag is included in the modeling so that it can provide information in the past. Compared to previous studies, this research introduces a new concept of the kangaroo market, which will be identified for its impact on economic growth.

Hypothesis

The research hypothesis used to answer the research objectives are as follows.

H_0 : The kangaroo market phenomenon didn't occur in the JCI from Q3 1995 to Q4 2023.
H_1 : The kangaroo market phenomenon occurred in the JCI from Q3 1995 to Q4 2023.
H_0 : No structural change phenomenon occurred in Indonesia's economic growth following the kangaroo market phenomenon from Q3 1995 to Q4 2023.
H_2 : Structural change phenomenon occurred in Indonesia's economic growth following the kangaroo market phenomenon from Q3 1995 to Q4 2023.
H_0 : Neither the kangaroo market overvaluation nor undervaluation impacted Indonesia's economic growth from Q3 1995 to Q4 2023.
H_3 : Both the kangaroo market overvaluation and undervaluation impacted Indonesia's economic growth from Q3 1995 to Q4 2023.

3. Research Method

Research Scope

This study aims to identify the kangaroo market phenomenon, changes in economic structure, and the impact of the kangaroo market on Indonesia's economic growth. The scope of analysis in the study is the country of Indonesia. This study uses time series data from the Q3 1995 to the Q4 2023. The period was used to determine the kangaroo market that occurred in JCI and its impact when Indonesia implemented JATS.

Data Collection

The research utilizes secondary data sourced from the Central Statistics Agency (BPS) and Yahoo finance. The following are the data used along with the units and sources.

Tabel 1. Data and Source

Data	Unit	Source
Gross Domestic Product	Billion rupiah	Badan Pusat Statistik
Jakarta Composite Index	Point	Yahoo finance

Operational Definitions

The value return is the JCI in the current time period compared to the previous time period.

$$R_t = \frac{JCI_t - JCI_{t-1}}{JCI_{t-1}} \times 100 \quad \text{.....(1)}$$

Note :

R_t : Return at given period

JCI_t : Jakarta Composite Index at given period

JCI_{t-1} : Jakarta Composite Index at prior period

JCI volatility is a value that indicates the risk of investment in the Indonesian stock market obtained from the estimation of the conditional variance equation of the GARCH model of JCI returns. Meanwhile, high volatility is the positive value of cyclical volatility decomposed with the Hodrick Prescott Filter (HPF) so that the volatility category is defined as follows.

$$\delta_t^{high}(\lambda) = \begin{cases} \sigma_t - \tau_t(\lambda), & \text{if } \sigma_t \geq \tau_t(\lambda) \\ 0, & \text{otherwise} \end{cases} \quad \text{.....} \quad (2)$$

Note :

δ_t^{high} : High volatility at given period

λ : A positive number

σ_t : Volatility at given period

τ_t : Volatility trend at given period

Kangaroo market that occurs when the JCI return is overvalued is given code 1. Meanwhile, a kangaroo market that occurs when the JCI return is undervalued is given code 2. The kangaroo market category is defined as follows.

$$\text{Kangaroo} = \begin{cases} 1, & R_t > \tau_t + sd(\delta_t^{high}) \\ 2, & R_t < \tau_t - sd(\delta_t^{high}) \\ 0, & \text{otherwise} \end{cases} \quad \text{.....} \quad (3)$$

Note :

sd : Standard deviation

Multiple Breakpoint Test

Chow (1960) first introduced the multiple breakpoint test to test for structural changes that occur in a known regime. Later, Andrews (1993) extended the Chow test to estimate single structural change with unknown time. The single break model is a threshold model with time as the its threshold variable.

In this study, structural change testing was conducted on economic growth. This test was conducted because economic growth is the accumulation of Gross Domestic Product (GDP) which continues to increase in each period. In other words, the value of economic growth is always different in each period.

The multiple breakpoint test procedure is based on simple regression modeling with economic growth as the dependent variable. Meanwhile, the independent variable is the

regression intercept. The break method used in this study is the global L breaks vs none with sequential selection as the criteria for selecting the optimal number of breaks. The trimming value used is 0.10 ($\varepsilon = 0.10$). Below is the partial break model with an unknown number of break periods k.

$$EG_t = \beta_0 + (\beta_1 D_{1t} + \cdots + \beta_k D_{kt}) + u_t \quad (4)$$

Note :
β_0 : Intercept
$\beta_1, \ldots, \beta_k$: Regression coefficient at dummy period with k number of breaks
u_t : Error term

Generalized Autoregressive Conditional Heteroskedasticity (GARCH)

Before proceeding to dynamic regression analysis, it is necessary to consider the volatility of JCI as one of the variables to identify the kangaroo market phenomenon. Therefore, GARCH is used to obtain estimation results of JCI volatility. The following are the steps in GARCH analysis.

a. Stationerity test

In testing for stationarity, the method used is the ADF test when there is correlation in the error term u_t. This test was developed from the DF test by Dickey and Fuller in 1984. Below is the equation for Augmented Dickey Fuller with drift and trend.

$$\Delta Y_t = \beta_1 + \beta_2 T + \sum_{i=1}^{m} a_i \Delta Y_{t-i} + \vartheta Y_{t-1} + u_t \quad (5)$$

Note :
ΔY_t : Intercept
β_1 : Regression coefficient at dummy period with k number of breaks
β_2 : Error term
T : Deterministic trend

With the hypothesis tested as follows.

$H_0: \vartheta = 0$ (unit root exists)

$H_1: \vartheta < 0$ (no unit root exists)

The ADF test can be conducted by calculating the tau-statistic value using the following formula.

$$\tau = \frac{\hat{\vartheta}}{se(\hat{\vartheta})} \quad (6)$$

Note :
τ : Tau statistics
$se(\hat{\vartheta})$: Standard error of estimated slope coefficient

If the absolute value of the tau-statistic (τ) exceeds the critical value from the McKinnon distribution, or if the p_{value} is less than the significance level (α), the null hypothesis is rejected. Consequently, it can be concluded that the data does not exhibit a unit root and is stationary (Wiranatakusuma & Habibullah, 2024).

b. ARMA modelling

The Autoregressive Moving Average is a combined model of autoregressive and moving average components. The ARMA model states that the current observation (Y_t) is linearly influenced not only by a number of p periods of past values but also by a number of q periods of past errors. Additionally, all variables are assumed to be stationary at the level.

Firstly, a correlogram analysis is conducted to observe the orders p and q on the ACF and PACF plots. Using the Box-Jenkins methodology, initial identification, parameter estimation, and diagnostic testing of the model are performed. In this study, the selection of the best model is based on the smallest AIC and SIC values. The equation for the ARMA model is as follows.

$$R_t = \theta + \sum_{i=1}^{p} \alpha_i R_{t-i} + \sum_{j=1}^{q} \beta_j \varepsilon_{t-j} + \varepsilon_t \quad (7)$$

Note :
θ : Intercept
α_i : Autoregressive coefficient at i period
β_j : Moving average coefficient at j period
ε_{t-j} : Moving average error term
ε_t : Error term

c. ARMA model diagnostic test

The formed ARMA model needs to undergo diagnostic testing, which includes testing for white noise and homoscedasticity. White noise testing is performed by testing the stationarity of the ARMA model residuals using ADF with drift and trend. If the resulting residuals are stationary at the level, the white noise assumption is met. Subsequently, homoscedasticity testing is conducted using the ARCH-LM test. The modeling for the ARCH-LM test is as follows.

$$\hat{\varepsilon}_t^2 = \phi + \psi_1 \hat{\varepsilon}_{t-1}^2 + \cdots + \psi_r \hat{\varepsilon}_{t-r}^2 + z_t \quad (8)$$

Note :
ϕ : Intercept
$\hat{\varepsilon}_t^2$: Squared residuals of ARMA model at given period
$\psi_1, \ldots, \psi_r$: Squared residuals lag regression coefficient
$\hat{\varepsilon}_{t-1}^2, \ldots, \hat{\varepsilon}_{t-r}^2$: Squared residuals $t-1$ to $t-r$ period
z_t : Error term

With the hypothesis tested as follows.

$H_0: \psi_1 = \psi_2 = \cdots = \psi_r = 0$

H_1: at least one $\psi_k \neq 0, k = 1, 2, \ldots, r$

Here are the ARCH-LM test statistics.

$$LM = nR^2 \sim \chi_r^2 \quad (9)$$

Note :
R^2 : Determination coefficient
n : Observations that accordance to lag

The decision to fail to reject H_0 occurs if $LM < \chi_{tabel}^2$ or $p - value > \alpha$, indicating that the homoscedasticity assumption is met. However, if the ARCH-LM test results in rejecting H_0, the homoskedasticity assumption is not met, thus necessitating further modeling with ARCH-GARCH.

d. GARCH modeling

Bollerslev (1986) developed a more flexible volatility model called GARCH. In GARCH modeling, testing is conducted to determine if there are asymmetric effects or not, in order to identify the best model. The first step involves creating standardized residuals (s_t), which are

estimates of the proportion of residuals ($\hat{\varepsilon}_t$) to standard deviation ($\hat{\sigma}_t$). Then, regression modeling between standardized residuals is performed as follows.

$$\hat{s}_t^2 = \theta + \sum_{m=1}^{u} \delta_m s_{t-m} + \varepsilon_t \quad (10)$$

With $\hat{s}_t^2$ being the estimated square of the residual and δ_m epresenting the coefficient of the standardized residual for the m-th period, the Sign Bias Test hypothesis is as follows.

$H_0: \delta = 0$ (no leverage effect exists)

$H_1: \delta \neq 0$ (leverage effect exists)

If the probability parameter δ (p_{value}) exceeds the significance level (α), the Sign Bias Test decision indicates a failure to reject the null hypothesis. This suggests that there is no asymmetric effect present, indicating that the GARCH model is suitable for use.

e. GARCH model diagnostic test

The formed GARCH model needs to undergo diagnostic testing, which includes testing for white noise and homoscedasticity. White noise testing is performed by testing the stationarity of the GARCH model residuals using ADF with drift and trend. Next, homoscedasticity testing is conducted using the ARCH-LM test. If both assumptions are met, the next step is to estimate the conditional variance to generate JCI volatility.

Hodrick Prescott Filter

Danielsson et al. (2018) developed the Hodrick-Prescott Filter method to decompose volatility. They argue that the volatility that occurs over time series (σ_t) also consists of trend components (τ_t) and deviations or cycles (σ_t). Then, to identify high (δ_t^{high}) and low (δ_t^{low}) volatility occurrences, the cyclical component is decomposed as follows.

$$\delta_t^{high}(\lambda) = \begin{cases} \sigma_t - \tau_t(\lambda), & \text{if } \sigma_t \geq \tau_t(\lambda) \\ 0, & \text{otherwise} \end{cases}$$
$$\delta_t^{low}(\lambda) = \begin{cases} |\sigma_t - \tau_t(\lambda)|, & \text{if } \sigma_t < \tau_t(\lambda) \\ 0, & \text{otherwise} \end{cases} \quad (11)$$

Hodrick and Prescott (1997) used a lambda value of 1600 for quarterly data. However, in different periods, Mise, Kim, and Newbold (2005) adjusted the lambda value. In their adjustment, they multiplied the standard lambda value (1600) by the square of the relative observations to quarterly data (Melati & Kurniawan, 2023). For example, if the relative frequency is three for monthly data and $\frac{1}{4}$ for yearly data. Thus, the lambda value becomes 14,400 for monthly data and 100 for yearly data.

Dynamic Regression

Furthermore, the stages of dynamic regression analysis are as follows.

a. Kangaroo market identification

In the first stage, JCI volatility is decomposed into high and low volatility. Kangaroo market identification in high volatility uses the method of one standard deviation deviation from the trend obtained with the Hodrick Prescott Filter. Then, the kangaroo market variable is grouped into three categories: kangaroo overvaluation, kangaroo undervaluation, and non-kangaroo. Thus, two kangaroo dummies are added to the dynamic regression modeling.

b. Stationarity test

In dynamic regression, the first step is testing for stationarity on all variables used. In this study, stationarity testing is conducted on economic growth and JCI return variables using ADF with drift and trend. If the test results indicate non-stationarity at the level, differencing is performed until obtaining variables that are stationary at both the first and second levels.

c. Dynamic regression modelling

Dynamic regression modeling is conducted after obtaining the identification results of kangaroo market occurrence periods. Then, additional independent variables are added to the model, such as JCI return and lag of economic growth. After adding the variables, dynamic regression analysis is performed using the OLS method. Below is the equation for dynamic regression in this study.

$$\Delta EG_t = \alpha + \beta_1 DKangaroo_{uv_t} + \beta_2 DKangaroo_{ov_t} + \beta_3 R_t + \beta_4 \Delta EG_{t-1} + \beta_5 \Delta EG_{t-2} + \beta_6 \Delta EG_{t-3} + \varepsilon_t \quad (12)$$

Note	:	
α	:	Intercept
$\beta_1, \beta_2, \beta_3$	:	Dependent variable coefficient
$\beta_4, \beta_5, \beta_6$	:	Dependent variable lag coefficient
ΔEG_t	:	Economic growth changes at given period
$\Delta EG_{t-1}, \Delta EG_{t-2,}$ ΔEG_{t-3}	:	Economic growth changes at prior period
$DKangaroo_{ov_t}$	:	Dummy kangaroo overvaluation
$DKangaroo_{uv_t}$	:	Dummy kangaroo undervaluation
ε_t	:	Error term

d. Model significance test

1) Determination coefficient

The determination coefficient (R^2) measures the model accuration. It utilized is the adjusted R-squared (R^2_{adj}), which accounts for the number of research variables. A value of the determination coefficient that approaches one suggests that the model more effectively explains the variation in the dependent variable.

2) Simultan test

The simultaneous test aims to test the significance of all independent variables in the regression model. This test is conducted using the F-test statistic. The hypothesis used in the simultaneous testing are as follows.

$H_0: \beta_1 = \beta_2 = \cdots = \beta_6 = 0$

H_1: at least one $\beta_k \neq 0$

The decision to reject H_0 occurs when $F_{hit} > F_{(\alpha;p-1,n-p)}$ or $p - value < \alpha$, which means that there is at least one independent variable that significantly influences the model.

3) Partial test

Partial test aims to determine which independent variable has a significant effect in the regression model. This test is conducted using the t test statistic. The hypothesis used in partial testing are as follows.

$H_0: \beta_j = 0$

$H_1: \beta_j \neq 0, j = 1,2, \ldots,6$

The decision to reject H_0 occurs when $|t_{hit}| > |t_{\left(1-\frac{\alpha}{2};n-p\right)}|$ or $p - value < \alpha$, which means that j-th independent variable that significantly influences the dependent variable in the model.

e. Classiccal assumption test

1) Normality

The normality test aims to determine whether the error in the dynamic regression follows a normal distribution or not. This study uses the Jarque-Bera normality test because the data has a large sample size. The hypotheses tested are as follows.

$H_0: u_t \sim N(0, \sigma^2)$

$H_1: u_t \nsim N(0, \sigma^2)$

The decision to reject H_0 occurs if the $JB > \chi^2_{\alpha,2}$ or $p - value < \alpha$, which means the error doesn't have a normal distribution, thus violating the normality assumption. Gujarati (2004) states that when the normality assumption is violated, the OLS estimator isn't a Best Linear Unbiased Estimator (BLUE).

2) Homoskedasticity

The homoscedasticity test aims to determine the inequality of error variance over time. This study uses the Breusch-Pagan Godfrey test with the test statistic $\chi^2_{hit} = nR^2 \sim \chi^2_{\alpha;m-1}$. The hypotheses for the Breusch-Pagan Godfrey test are as follows.

$H_0: \eta_1 = \eta_2 = \cdots = \eta_k$

$H_1:$ at least one $\eta_i \neq 0,$ for $i = 1, 2, \ldots, k$

The decision to reject H_0 occurs if $\chi^2_{hit} > \chi^2_{\alpha;m-1}$ or $p - value < \alpha$, which means that the homoscedasticity assumption is violated. Baltagi (2008) states that when the error variance is not constant, the variance will not be minimized, resulting in a model that is not optimal.

3) Non-autocorrelation

The non-autocorrelation test aims to determine whether there is any correlation in the errors produced by the model. This study uses the Breusch-Godfrey test. The hypotheses for the Breusch-Godfrey test are as follows.

$H_0: \omega_1 = \omega_2 = \cdots \omega_l = 0$

$H_1:$ at least one $\omega_m \neq 0, m = 1,2, \ldots, l$

The decision to reject H_0 occurs if $F_{hit} > F_{\alpha;p;T-p}$ or $p - value < \alpha$, which means that the non-autorrelation assumption is violated. Gujarati (2004) states that autocorrelation leads to widened confidence intervals and underestimated standard errors, making partial and simultaneous tests invalid.

4) Non-multicolinearity

Detecting non-multicollinearity is aimed at determining whether there is any correlation among the independent variables used. In this study, the detection of non-multicollinearity is conducted using the Variance Inflation Factor (VIF). Gujarati (2004) states that if the VIF value exceeds 10, a violation of the non-multicollinearity assumption occurs in the regression model. A violated assumption of non-multicollinearity leads to large variances and covariances, which enlarge the confidence interval and make the estimated coefficients insignificant.

4. Results and Discussion

Kangaroo Market Phenomenon

When viewed from the its return, the movement of JCI experienced fluctuations throughout 1995 to 2023. Initially, the fluctuations in JCI were caused by the implementation of the JATS as an adjustment to financial liberalization by the monetary authorities. Additionally, it can be seen that the movement of JCI returns from 1995 to 2023 experienced

a sideways trend, meaning that during this period, JCI returns fluctuated within a tight range over the long term without experiencing an upward or downward trend, resulting in high volatility. Throughout the period from the Q3 1995 to the Q4 2023, JCI returns experienced the highest overvaluation in the Q3 2009, at 25.87 percent. Meanwhile, JCI returns experienced the highest undervaluation in the Q1 2020, at 14.07 percent.

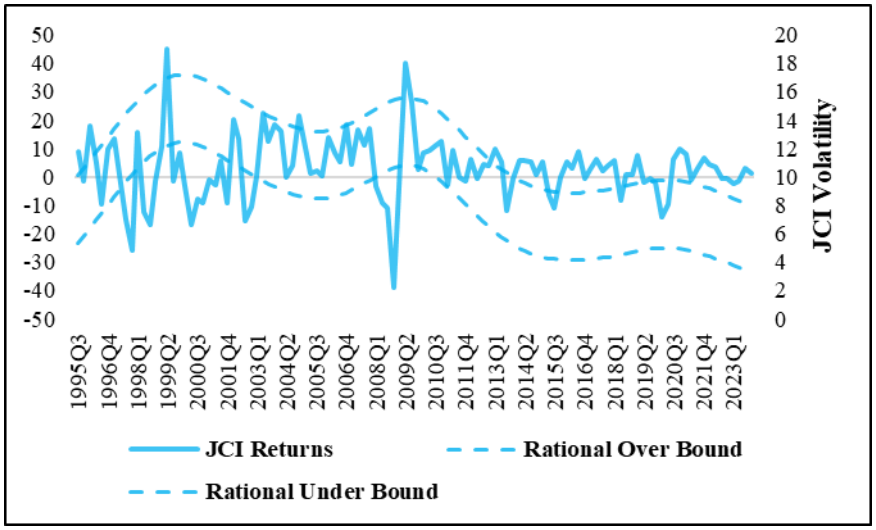

Figure 5. Kangaroo market phenomenon
Source: author, processed

Figure 5 shows the kangaroo market phenomenon that occurred in JCI returns during the period from the Q3 1995 to the Q4 2023. The kangaroo market phenomenon, measured by the deviation of one standard deviation of high JCI volatility from its trend, resulted in 39 kangaroo markets out of a total of 114 observations. Of the 39 identified kangaroo markets, 4 experienced overvaluation, and the remaining 35 experienced undervaluation. The kangaroo market phenomenon mostly occurred between 1998 and 2000, 2008 and 2010, and 2018 and 2021. During these periods, it can be seen that the kangaroo market phenomenon mostly experienced undervaluation. Meanwhile, the kangaroo market experienced overvaluation in the Q1 1998, the Q1 2004, the Q2 2009, and the Q3 2009.

Economic Growth Breakpoint Phenomenon

In this study, tests were conducted on structural changes in economic growth. The test results indicated that there were five structural changes in Indonesia's economic growth. These structural changes occurred in (I) the Q2 1998, (II) the Q1 2001, (III) the Q4 2004, (IV) the Q3 2018, and (V) the Q2 2021.

Table 2. Multiple Breakpoint Test

No	Period	F-Statistics	Critical Point
I	Q2 1998	16,13*	9,10
II	Q1 2001	20.22*	7,92
III	Q4 2004	15.98*	6,84
IV	Q3 2018	13.03*	6,03
V	Q2 2021	10.84*	5,37

Note: *sig 0,05
Source: Eviews 12, processed

The number of kangaroo markets that appeared before the economic growth breakpoint phenomenon in the Q2 1998 was two (2) kangaroo markets. Then, the number of kangaroo markets that appeared before the breakpoint phenomenon in the Q1 2001, or between the Q2 1998 and the Q4 2000, was nine (9) kangaroo markets. In the period before the third breakpoint, which is the Q4 2004, there were four (4) kangaroo markets. Furthermore, there

were 15 kangaroo markets before the Q3 2018. After that, there were seven (7) kangaroo markets before the Q2 2021. In the last three years or after the Q2 2021 until now, there were two (2) kangaroo markets.

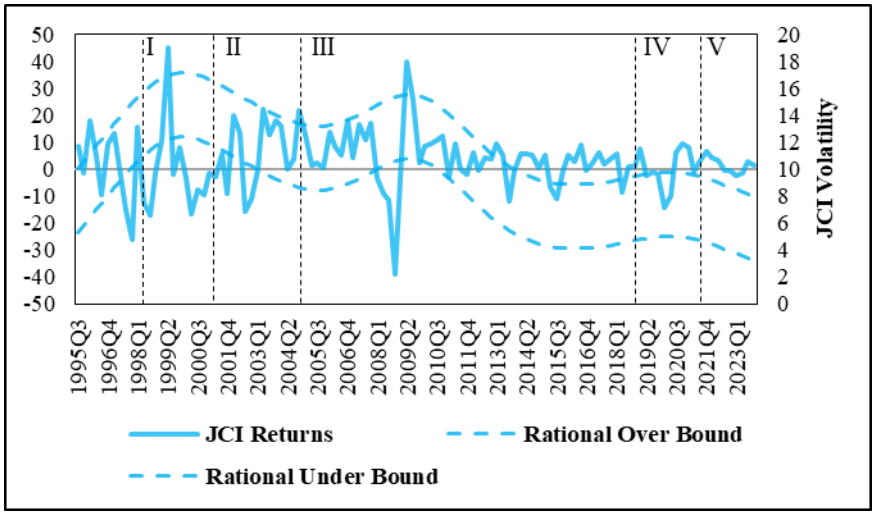

Figure 6. Kangaroo market and breakpoint economic growth phenomenon
Source: author, processed

As shown in Figure 6, following the kangaroo market phenomenon, Indonesia experienced a structural change in its economic growth. This transformation in the economy started in the Q2 1998, triggered by the 1997 crisis. The kangaroo market, which represents high volatility in JCI, became a driving force behind the structural change in economic growth. From internal factors, the number of stock issuances only amounted to six companies or drastically decreased by 80 percent compared to the previous year (Vauzi, 2022). Meanwhile, from external factors, Iriana and Sjoholm (2001) stated that the instability of macroeconomic indicators as a contagion effect obtained from Thailand had an impact on the decline in asset transactions in the Indonesian stock market (Sari & Fakhruddin, 2016).

In the Q1 2001, the structural change in Indonesia's economy was a continuation of the post-crisis period of 1997-1998. In response to this structural change, Bank Indonesia (BI) implemented monetary policies aimed at macroeconomic stability, including controlling exchange rate and inflation. The structural change in the Q4 2004 was initiated by Indonesia becoming the last country in Asia to be free from the impacts of the 1997-1998 crisis. However, the government's attention was diverted to the presidential election since early 2004. Meidawati (2004) stated that the election influenced stock transaction volumes, leading to price fluctuations that were unpredictable beforehand.

In the Q3 2018, the structural change in Indonesia's economy began with the increase in the Federal Funds Rate (FFR) by The Fed in December 2017. However, prior to that, The Fed maintained the benchmark interest rate and reduced its balance sheet by $4.5 trillion. Setiawan (2017) stated that investors were actually expecting a three-fold increase in the benchmark interest rate in 2018. Subsequently, the productivity of the tertiary sector (labor force) in the Eastern Indonesia Region (KTI) decreased by 0.03 percent compared to the previous year, resulting in an imbalance in labor share in economic growth (Kusuma & Yuniasih, 2021).

Lastly, the structural change in Indonesia's economic growth in the Q2 2021 began with the COVID-19 pandemic that swept the world. According to Warsito (2021), the COVID-19 pandemic resulted in a decrease in economic activity among the population. At that time, investments dropped by 1.94 percent, causing a greater impact on economic contraction than job availability (Pratiwi, 2022). In response to this situation, the government intervened by

launching the Electronic Trading Platform (ETP) and promoting investments through the use of Local Currency Settlement (LCS) in the Indonesian stock market.

Kangaroo Market Effect on Indonesia's Economic Growth

When monetary authorities intervene to maintain JCI volatility within rational limits, the Gross Domestic Product (GDP) that must be generated by all companies becomes high for economic growth stabilization. The existence of the kangaroo market phenomenon is a concern for monetary authorities in maintaining economic growth. Therefore, the third objective of this research is to analyze the impact of the kangaroo market on economic growth using dynamic regression.

Table 3. Stationarity Test

Variable	Level		First Difference	
	Prob.	Trend Prob.	Prob.	Trend Prob.
EG	0.10	0.49	0.00*	0.72
R	0.00*	0.74		
$DKangaroo_{ov}$				
$DKangaroo_{uv}$				

Note: *sig 0.05
Source: EViews 12, processed

With the ADF test, it was found that the JCI return has a p_{value} below the 5 percent significance level, indicating evidence that the variable is stationary at the level. Meanwhile, economic growth has a p_{value} above the 5 percent significance level, indicating evidence that the variable is not stationary at the level. Next, a first-order difference was performed for economic growth. The ADF test results showed that the variable has a p_{value} below the 5 percent significance level, indicating evidence that the variable is stationary at the first difference.

Table 4. Classical Assumptions Test

Assumption	Test	Test Stat.	Prob.
Normality	Jarque Berra	358.25	0.00*
Homoskedasticity	Breusch-Pagan Godfrey	7.83	0.25
Non-autocorrelation	Breusch Godfrey	3.00	0.05
Non-multicolinearity	VIF	<10	

Note: *sig 0.05
Source: EViews 12, processed

Based on Table 4, the Jarque Bera test resulted in a p_{value} of 0.00, which is smaller than the 5 percent significance level, indicating a violation of the normality assumption. Subsequently, an ADF test was conducted on the residuals from the regression equation estimation. The ADF test results showed a p_{value} of 0.00, which is smaller than the 5 percent significance level, indicating that the residuals exhibit white noise characteristics. Therefore, the residuals generated have a mean value equal to zero and constant variance, fulfilling the normality assumption (Gujarati, 2004).

The Breusch-Pagan Godfrey test resulted in a p_{value} of 0.25, which is larger than the 5 percent significance level, indicating no violation of the homoscedasticity assumption (Baltagi, 2008). Furthermore, the Breusch Godfrey test yielded a p_{value} of 0.05, which is larger than the 5 percent significance level, indicating no violation of the non-autocorrelation assumption (Gujarati, 2004). Lastly, the detection of non-multicollinearity assumptions was performed using the VIF. The VIF values for all research variables were below 10, indicating no violation of the non-multicollinearity assumption (Gujarati, 2004). From the results of these four classic assumption tests, it can be concluded that the model is a Best Linear Unbiased Estimator (BLUE).

Table 5. Dynamic Regression Estimation Results

Variable	Coefficient	Std. Error	t-statistic	Prob.
$DKangaroo_{ov_t}$	-3.1953	1.1914	-2.6819	0.0085*
$DKangaroo_{uv_t}$	0.1735	0.4888	0.3549	0.7234
R_t	0.0759	0.0225	3.3771	0.0010*
ΔEG_{t-1}	0.1340	0.0978	1.3703	0.1736
ΔEG_{t-2}	0.0905	0.0919	0.9845	0.3272
ΔEG_{t-3}	-0.1795	0.0892	-2.0124	0.0468*
C	-0.1712	0.2730	-0.6273	0.5319
Model Spesification Test				
F-statistics	4.7414			
Prob.	0.0003*			

Note: *sig 0.05
Source: EViews 12, processed

Based on the estimation results in table 5, the following equation can be written.

$$\widehat{\Delta EG_t} = -0.1712 - 3.1953DKangaroo_{ov_t} + 0.1735DKangaroo_{uv_t} + 0.0759R_t + 0.1340\Delta PE_{t-1} + 0.0905\Delta PE_{t-2} - 0.1795\Delta PE_{t-3} \quad (13)$$

Equation (13) shows the influence of each independent variable on changes in Indonesia's economic growth. The dummy variable for kangaroo overvaluation has a coefficient of -3.1953. A negative coefficient signifies that during a period of kangaroo market overvaluation, the change in Indonesia's economic growth will decrease by 3.1953 percent compared to a period without a kangaroo market. This result is consistent with research conducted by Babatunde. Babatunde (2013) observed that investors tend to prioritize short-term gains while neglecting long-term investment prospects, leading to increased stock price volatility. Consequently, share prices in Nigeria have become unstable, and company performance no longer accurately reflects economic competence.

The dummy variable for kangaroo undervaluation has a coefficient of 0.1735. A positive coefficient signifies that during a period of kangaroo market undervaluation, the change in Indonesia's economic growth will increase by 0.1735 percent compared to a period without a kangaroo market. The positive sign on the regression coefficient is consistent with research conducted by Krieken. According to Krieken (2018), high volatility leads to an increase in economic growth (credit-to-GDP ratio) both in the U.S. and Germany. The return of JCI produces a regression coefficient of 0.0759, which means that when the JCI return increases by one percent, economic growth will change by 0.0759 percent assuming other variables remain constant. This result is consistent with research conducted by Dabwor et al. (2020). They stated that stock returns can enhance economic growth in Nigeria because most investments and investor confidence are driven by return stability in the stock market.

The positive sign on the regression coefficient of changes in economic growth in the previous one and two quarters is in line with research conducted by Nizar (2011). This means that every one percent increase in economic growth changes in the previous one and two quarters will increase the change in economic growth in the following period by 0.1340 and 0.0905 percent, assuming other variables remain constant. The insignificance of economic growth in the previous one or two quarters is due to the existence of a short-term economic cycle that rebalances the capital market every two quarters. Additionally, this is indicated by five structural changes in Indonesia's economic growth.

Meanwhile, the negative regression coefficient of -0.1795 on the variable of changes in economic growth in the previous three quarters indicates that every one percent increase in economic growth changes in the previous three quarters will decrease the change in economic growth in the following period by 0.1795 percent, assuming other variables remain constant.

The economic growth of the previous three quarters had a significant effect because, after rebalancing, investor speculation gradually caused the capital market to correct again. Since the capital market is a leading economic indicator, the market correction impacted the decline in economic growth (Chikwira & Mohammed, 2023).

5. Conclusion

Based on the analysis and discussion in this study, from the Q3 1995 to the Q4 2023, the kangaroo market phenomenon in the JCI mostly occurred when the return was undervalued. The structural changes in Indonesia's economic growth suggest intervention by monetary authorities after the JCI experienced the kangaroo market phenomenon. The effects of this phenomenon on Indonesia's economic growth are varied. A kangaroo market that happens during overvaluation negatively impacts economic growth managed by the monetary authorities, while one that occurs during undervaluation has no effect on Indonesia's economic growth.

The suggestions that can be drawn from this research are that, in managing JCI fluctuations, monetary authorities should pay attention to the kangaroo market phenomenon. Movements in JCI returns that fall outside the bounds of rational high volatility will prompt intervention by the monetary authorities. Particular attention should be given to the kangaroo market overvaluation phenomenon, as it can reduce economic growth and contribute to economic instability when used to manage periodic fluctuations in the JCI. There is a need for more in-depth policies and studies by monetary authorities to enable early detection of the kangaroo market phenomenon and mitigate its impact on Indonesia's economic growth.

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