Error Correction Model on Determinants of LQ-45 Index

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Abstract. The JCI and the forces influencing it are examples of long-term economic phenomena, and the ECM model is the ideal model to evaluate these economic variables. The Combined Portfolio Price Index (JCI), which measures the success of the Indonesian portfolio market, performs well [1]. All portfolio price performances listed on the development board of the Indonesia Stock Exchange are measured by the Composite Stock Price Index [2]. In addition to the Composite Portfolio Price Index (JCI), there are various more types of portfolio price indices available on the Indonesia Stock Exchange (IDX). The LQ45 Index was used as an observed sample in this investigation. The market capitalization value of 45 issuers is measured by the LQ45 index, which also includes the most liquid and largest market capitalization portfolio. LQ45 is regarded as a tool for evaluating the success of investments made via capital markets [3]. The LQ45 Index movement is employed as a statistic of portfolio movements with high liquidity so that the average value is shown, which is essentially representative of the state of the major portfolios in the national capital market. In order to correct the imbalance of the movement of the LQ-45 Index in the short term towards a long-term equilibrium and to be able to explain the relationship between bonded changers and free changers in the present and past, this research will: Add to the body of knowledge; Examine and analyze whether related macroeconomic variables affect the performance of the portfolio market in the short and long terms; View investment with the movement of the market.

Keywords: LQ-45 index · ECM · macroeconomic variables

1 Introduction

The JCI and the factors that affect it are long-term economic phenomena, and the ECM model is the ideal model to help study these economic variables. The Combined Portfolio Price Index (JCI), which measures the success of the Indonesian portfolio market, performs well [1]. All portfolio price performances listed on the development board of the Indonesia Stock Exchange are measured by the Composite Stock Price Index (Indonesia Stock Exchange, 2020).

In addition to the Composite Portfolio Price Index (JCI), there are various more types of portfolio price indices available on the Indonesia Stock Exchange (IDX). The LQ45 Index was used as an observed sample in this investigation. The market capitalization value of 45 issuers is measured by the LQ45 index, which also includes the most liquid and largest market capitalization portfolio. LQ45 is regarded as a tool for evaluating the success of investments made via capital markets [3].

If you pay close attention, the LQ-45 Index always performs in accordance with the JCI performance pattern. This implies that changes in the JCI will likewise affect the LQ-45 Index, whether they are positive or negative. This phenomenon shows that the performance of the LQ-45 Index and the portfolios listed in it are able to present market performance to make it easier for investors to screen selected portfolios, and can be used by other market participants such as investment managers as a reference to make investment products such as mutual funds. Therefore, the LQ45 index can be used as a reference to assess portfolio trading performance activities in the Indonesian capital market, in this case the Indonesia Stock Exchange [4].

Macroeconomic aspects used in the study include GDP, inflation, exchange rates and interest rates. Gross Domestic Product is the best indicator for assessing the economic well-being of a country. This calculation on national income is a measurement of the economic condition of a country [5]. People's purchasing power will rise if economic growth in a nation improves. This presents an opportunity for the business to boost sales, and if a company's sales rise, the likelihood that it will turn a profit also rises. The price of the company's portfolio will rise as a result of the increase in profits, which will also have an effect on how the LQ45 Portfolio Price Index moves [6].

We'll then examine how the price of things is impacted by inflation, which further reduces people's purchasing power, when we talk about the LQ45 portfolio index and the inflation rate. According to study, inflation will lower people's real purchasing power because their income levels will also decline [7]. The economic climate won't be favorable in a nation with a high rate of inflation. If a group or individual has a lot of money, inflation will be advantageous since it can be invested in the form of a house or other assets that can be distributed in the money market [5].

The exchange rate is the following macroeconomic factor that may have an impact on the LQ45 portfolio pricing index. When the rupiah is declining, investors do not want to invest since the company's profits have fallen because they can no longer afford to service their debt (the value of debt will tend to be high when the rupiah depreciates). The two factors are adversely correlated. Investors will feel uneasy about the capital market as a result [8]. However, export-oriented businesses benefit from the declining value of the currency since their earnings are made in foreign currency and have a high exchange value when converted to rupiah. As a result, their profits will be higher and they will be able to pay dividends to investors [8].

The interest rate is thought to be the fourth aspect that will have an impact on how well the LQ45 portfolio index performs. The cost of borrowing money is represented by the interest rate [9]. A financial instrument known as the Bank Indonesia Certificate (SBI) or BI Rate was directly issued by the Central Bank of Indonesia, known as Bank Indonesia (BI), to regulate the public's access to money by utilizing the BI benchmark interest rate (www.bi.go.id).

Many investors in the capital markets have changed their portfolios as a result of the rise in interest rates, which increases the value of deposits and bonds [10]. Since there is less risk involved when the interest rate on deposits is higher, investors are more likely to invest in deposits. If this occurs, the investor will choose to deposit rather than sell his portfolio, which will result in a decline in the portfolio's value. And the opposite [11]. However, based on the previously described studies, it is still unclear if macroeconomic factors have a long-term impact on the success of the portfolio market. Error Correction Model on Determinants of the LQ-45 Index is the study that the author is most interested in conducting as a result.

2   Literature Review

Macroeconomic factors have a direct and indirect impact on the rise and fall of an issuer's performance [12]. This study will consider four macroeconomic variables, including GDP, inflation rate, exchange rate, and interest rate, based on prior research. Additionally, it is based on earlier studies that make use of comparable macroeconomic factors and models. The results of a related study utilizing the ECM model claim that there is a relationship between the exchange rate for the rupiah. Another study using comparable factors discovered that the LQ-45 index was significantly negatively impacted by interest rates, at least in part. The LQ-45 index is significantly and positively impacted by the exchange rate. The LQ-45 index is significantly positively impacted by foreign exchange reserves. The most recent tests in the study's findings revealed that the LQ-45 index was significantly impacted by interest rates, currency rates, foreign exchange reserves, and gold prices [13]. The economic growth rate and the variable SBI interest rate are said to have a negative impact on the LQ45 portfolio price in both the short and long terms, according to another study that supports the theoretical foundation and state of the art in this study. Both the short-term and long-term prices of the LQ45 portfolio are positively impacted by inflation variables. Conversely, the LQ45 portfolio price is impacted by the exchange rate variable both negatively and favorably over the long run [7]. Therefore, the purpose of this study is to examine how factors affecting macroeconomic variables like GDP, inflation, exchange rates, and interest rates affect the LQ-45 Index.

2.1   LQ-45 Index

The Indonesia Stock Exchange's LQ45 portfolio index consists of 45 issuers that have satisfied specified requirements for transaction activities and market capitalization imposed by the Exchange (Darmadji et al., 2012). LQ45, which can be interpreted as "liquid 45," refers to an index of the 45 most liquid portfolios on the Indonesia Stock Exchange (IDX). 45 is the portfolio's amount, while LQ stands for liquid (which is included in the LQ45 index). In English, the word "liquid" is a synonym for "diluted" or "arbitrary." But when it comes to portfolios, liquid means "packed to be traded" or "simple to trade." The argument is that because there is such high demand for liquid portfolios, selling them will always be simple [14]. 45 companies with very high portfolio liquidity are included in the LQ45 index. Investors can use this index to estimate the size of the 45 issuers' market capitalization-based portfolio fluctuations. The 45 issuers in LQ45 are just one example

of the portfolio values that may decline in value as well as gain. Investors can gain from the LQ45 index by using it as a benchmark for portfolio performance for investors or investment managers. As a method of stock selection while creating a portfolio, it has additional advantages [5].

2.2   Theory of Gross Domestic Product

The market value of all final (final) products and services produced in a nation over a specific time period is known as the gross domestic product (GDP) [15]. According to the explanation provided above, scholars can conclude that a nation's GDP represents the value of the goods and services it generated over a specific time period. All nations in the world, including Indonesia, use GDP to measure a nation's economic growth. As long as the place of production is in Indonesia, the added value to be obtained is Indonesia's GDP, which is computed based on all economic activity without determining whether an Indonesian citizen or a foreign resident is the owner [16].

2.3   Theory of Inflation

Inflation serves as the second macroeconomic variable in our analysis. Inflation, according to Bank Indonesia, is the practice of consistently raising average prices over an extended period of time. Unless the price increase has an effect on the price increase of the majority of other commodities, an increase in the price of one or two specific goods cannot be considered inflation on its own [7]. A decline in purchasing power might result from inflation that is too high or even unchecked [7]. In business terms, growing inflation might result in a decline in a company's income level. The rise in product prices, which directly contributed to the rise in operating costs, was one of the causes that contributed to the reduction in revenue. Inflation will thereby decrease a company's profits, making securities on the stock market unattractive commodities and causing investors to be wary about investing money in them [10]. The consumer price index [7], which represents the cost of goods and services that the general public purchases, and the GDP deflator, which is the ratio of nominal (applicable) GDP to constant (real) GDP, are two ways to quantify inflation.

2.4   Exchange Rate

The exchange rate can be used as a method to assess a nation's economic health. The exchange rate's consistent growth indicates that the two nations' economies are doing rather well [15]. In the meantime, the exchange rate, or exchange rate, as defined by [10], is the exchange rate of a currency in relation to current or upcoming payments between their respective currencies. The middle rate was employed by the authors of this study as a factor influencing the LQ45 portfolio price index. According the middle rate is the average of the selling rate and the foreign exchange purchase rate determined by the central bank at a specific period against the national currency. The LQ45 portfolio price index can be affected by the exchange rate, and the middle rate can be used as an indicator of that impact. The demand and supply of the currency in question, along with

the price of the commodities, can influence how much one currency is worth in relation to another. If there is a greater demand for rupiah than there is a supply, this likewise holds true for the exchange rate. As a result, the value of the rupiah will decrease.

2.5 SBI Interest Rate Theory

Interest rates are a significant economic indicator for the nation, and they also have a significant impact on the capital market. The revenue or costs paid by creditors or debtors are known as interest rates. Bonds and bank loans are examples of debt products that are subject to interest rates, which are payments made by creditors to debtors [17]. The policy of determining the benchmark interest rate, which Bank Indonesia directly controls through the BI rate, is the interest rate under consideration in this study. At the Board of Governors' Meeting, the Bank Indonesia Board of Governors determines the BI rate (RDG). Portfolio changes on the IDX are triggered by the BI rate determination (Indonesia Stock Exchange). The interest rate on loans and deposits will reduce if Bank Indonesia lowers the BI rate. When a nation's economy is in a slump, Bank Indonesia can boost its economic activity by implementing an expansive monetary strategy that lowers interest rates [18].

3   Methodology

3.1 Method of Data Analysis

A regression model with numerous independent variables is referred to as a multiple regression model. The least squares method (OLS) can be used to generate a suitable regression line if its projected value is as close as feasible to its real data or if the values of 0 and 1 that result in the shortest residual as possible (Ordinary Least Square). The least squares method can only be applied if all of the data used inside the model are stationary; otherwise, an error correcting model is used (Error Correction Model). A model that inserts changes to address imbalances is called the Error Correction Model (ECM). Sarga was the first to introduce the ECM model, which Hendry later improved upon before Engle-Granger finally made it popular. The ECM model can be used in a variety of ways, but its main applications are for solving the continuous regression and non-stationary time series data problems.

3.2 Model of ECM

If both variables are cointegrated, or in other words, have a long-term relationship or balance, and the data is stationary at the differential level but not at the level level. There can be a short-term imbalance. That is, what economic actors desire may not always match what really occurs. Adjustments are required because there is a disconnect between

what economic actors intend and what actually occurs. The Error Correction Model (ECM) is the name of the model that includes modifications to rectify the imbalance. To ascertain how free variables affect bound variables, ECM analysis is utilized. Using the Error Correction Model (ECM) approach, an economic model. ECM analysis is used to determine the effect of free variables on bound variables. Econometric model with Error Correction Model (ECM) technique as follows:

$$D(LQ45)t = \beta0 + \beta1\,D(PDB)t + \beta2 D(NT)t + \beta3 D(IR)t + \beta4 D(INF)t + ect(-1)$$

With the description as follows:
LQ45 = 45th Composite Stock Index
GDP = Gross Domestic Product
NT = Exchange Rate
IR = Interest Rate
INF = Inflation Rate
$\beta1, \beta2, \beta3$ = Regression coefficient of each variable
t = Time/period to t
et = Error term.

3.3   Data Types and Sources

The type of data used in this study is secondary data in the form of secondary data obtained from monthly data for 12 months with a time series from the 2010–2020 period. The data in this study is sourced from the bank Indonesia website, Word Bank, International Financial Statistics (IFS) and various other sites related to this research (Table 1).

Table 1. Variables

No.	Variable	Variable Symbols	Units of Measurement	Information
1	LQ45	LQ45	Percent	The stocks are ranked at the top by market capitalization for the past 12 months. The stock indices of these 45 stocks are adjusted every six months. The data was used in 12 months in 2010–2020 in Indonesia.

Table 1. (*continued*)

No.	Variable	Variable Symbols	Units of Measurement	Information
2	GDP	GDP	Million USD	The amount of added value to goods and services produced by various units of production on the territory of a country in a certain period of time. The data was used in 12 months in 2010–2020 in Indonesia.
3	Exchange rate	Nt	Percent	Exchange rate is the amount of one currency that can be exchanged per unit of another currency, or the price of one currency in another. The data was used in 12 months in 2010–2020 in Indonesia.
4	Interest	Ir	Percent	Repayment or value provided by the borrowing party to the one who lends the funds or money. Usually, interest rates are expressed in percentage terms. The data was used in 12 months in 2010–2020 in Indonesia.
5	Inflation	IF	Percent	An increase in the price of one or two goods alone cannot be called inflation unless the increase extends (or results in an increase in prices) on other goods. The data was used in 12 months in 2010–2020 in Indonesia.

4   Discussion and Implication

The short term equation is:

$$D(LQ45)_t = 0.003783 + D(0.002738)PDB_t + D(-0.015375)INF_t$$
$$+ D(0.071408)IR_t + D(0.054331)NT_t + -0.072687ECT(-1)$$

$$(3.899037)\ (0.137534)(-1.727112)(1.730581)\ (1.848886)(-2.541695)$$

$$R^2 = 0.895599$$
$$F\text{-stat} = 2.459221$$
$$Prob\ (F\text{-stat}) = 0.036653$$

The equation means (Table 2);

- In other words, on the short-term model, GDP has a positive association and has no significant impact on LQ45 shares. The variable gross domestic product has a coefficient value that has a positive value of 0.002738 and has a probability value of 0.8908 bigger than the signification rate of 0.05.
- The Inflation Variable has a negative coefficient value of −0.015375 and a probability value of 0.0866 less than the signification rate of 0.10, indicating that it significantly affects LQ45 shares and has a negative relationship with them in the short term model, assuming other variables remain constant.
- Short Interest rates have a positive relationship and a significant impact on LQ45 shares in the term model. If the interest rate increases by 1%, it will increase LQ45 shares by 0.071%, assuming other variables are in a constant state. The variable the interest rate has a coefficient value that is positively valued at 0.071408 and has a probability value of 0.0860 less than the signification rate of 0.10.
- The exchange rate variable has a coefficient value of 0.054331, which is positive, and a probability value of 0.0668, which is less than the signification rate of 0.10, which means that in the short-term model, interest rates have a relationship that is favorable and significantly affect LQ45 shares; for example, if the exchange rate increases by 1%, LQ45 shares will increase by 0.054%, assuming that other variables remain constant.

Table 2. The Result of Short Term of ECM

Variable	Coefficient	Std. Error	t-Statsitic	Prob
C	0.003783	0.000970	3.899037	0.0002
D(GDP)	0.002738	0.019908	0.137534	0.8908
D(INF)	−0.015375	0.008902	−1.727112	0.0866
D(IR)	0.071408	0.041262	1.730581	0.0860
D(NT)	0.054331	0.029386	1.848886	0.0668
ECT(−1)	−0.072687	0.028598	−2.541695	0.0123**

[a]Sources; Eviews 9 data processed

From Table the explanation above, we can discuss some of the result as below;

- GDP's Impact on LQ45 Shares

The results of long-term estimates (OLS) of GDP had a positive and significant impact on LQ45 shares over the course of the 11-year study, from January 2010 to December 2020, with a coefficient value of 0.245985, indicating that at the time any increase in GDP of 1% would increase LQ45 shares by 0.245%, assuming other variables were held constant or fixed. The gross domestic product has no effect on LQ45 shares in Indonesia in the short term forecast with (ECM).

The long-term coefficient of economic growth is negative and insignificant [19]. This is a result of the country's circumstances; riots, tragic bombings, political issues (government wisdom, tax changes, etc.), and soon are some examples. When these circumstances and circumstances occur, investors are hesitant to make investments in the form of shares. In addition, investors would pick other types of investment due to the significant risk associated with equities

- Inflation Effect on LQ45 Shares

With a coefficient value of -0.060220, inflation has a negative and significant impact on LQ45 stocks over the course of the 11-year study, which runs from January 2010 to December 2020. This means that, under the assumption that other variables are constant or fixed, for every 1% increase in inflation, LQ45 shares will decline by 0.060%. With a coefficient value of 0.015375 in short-term estimates with the (ECM), inflation has a negative and significant impact on LQ45 stocks. This means that at the time of vulnerability in the short-term model, every 1% increase in inflation will decrease LQ45 shares by 0.015%, assuming other variables are thought of as constant or fixed.

Stock prices are negatively impacted by inflation; when it rises, stock prices will often start to fall. Instead, rising inflation will improve the environment for investment and point to an improvement in Indonesia's growth rate [20].

- Interest Rates Effect on LQ45 Shares

With a coefficient value of 0.506471, interest rates have a positive and significant impact on LQ45 shares over the course of the 11-year research period, beginning in January 2010 and ending in December 2020. This means that, under the assumption that other variables are constant or fixed, any increase in 1% in the interest rate will increase LQ45 shares by 0.506% at that time. With a coefficient value of 0.071408, interest rates have a positive and significant impact on LQ45 shares in short-term estimates using (ECM). This means that at the time when LQ45 shares are most vulnerable, any 1% increase in interest rates will increase LQ45 shares by 0.071%, assuming other variables are fixed or considered constant.

The price of the LQ45 share on the Indonesia Stock Exchange (Bei) Indonesia is significantly and positively impacted by interest rates [2]. According to Isnaini Nur Fadila, the exchange rate has a negative impact on the price of the LQ-45 premier stock in both the short and long terms, while the interest rate has a positive impact on the price

of the LQ-45 premier stock in the short term. The statement is predicated on factors, and the variables themselves have an impact on Indonesia's capital market and foreign exchange market. Macro policies that are helpful to a more stable economic condition can be made via authoritarian monetary finance.

- Effect of Exchange Rate on LQ45 Shares

With a coefficient value of -0.066448, the Exchange Rate has a negative and significant influence on LQ45 shares over the course of the 11-year study, starting in January 2010 and ending in December 2020. This means that at that time in the long-term model, any increase in 1% of the exchange rate will decrease LQ45 shares by 0.066% assuming other variables are considered constant or fixed. With a coefficient value of 0.054331 in short-term estimates with (ECM), the value of the lever has a positive and significant impact on LQ45 shares. This means that at that time, any increase of 1% in the exchange rate will increase the LQ45 stock by 0.054%, assuming other variables are thought of as constant or fixed.

The price of a currency relative to another foreign country is known as the exchange rate. What is obvious is that when it comes to price, it normally refers to a certain sum of money, and the currency's exchange rate is stable but can occasionally be erratic or excessively up or down.

5   Conclusion

According to the study's findings, only the rupiah exchange rate against the dollar has a volatile impact on the LQ45 stock price index in the short term, while all domestic factors, such as interest rates, exchange rates, and inflation, as well as foreign factors, such as those represented by STI and KLSE, have an impact on the shock on the LQ45 stock price index over the long term.

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