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Government Bonds Yield In Indonesia: Econometric Analysis of Error Correction Model (ECM) Period 2010–2023

Agus Purnomo
Postgraduate Student of the Faculty of Economics and Business,Tanjungpura University
Corresponding author: aguspurnomo2010@gmail.com

Abstract

This study aims to determine the effect of Economic Growth Rate, BI Rate , Inflation, Exchange Rate and Oil Price on Bond Yields, especially Government Bonds of the Republic of Indonesia for the period 2010-2023. The method used is a quantitative method with econometric analysis of Error Correction Model (ECM) regression. The data used in this study were obtained from statistical reports on the website of the Financial Services Authority of the Republic of Indonesia (OJK-RI), Bank Indonesia, the Central Statistics Agency and several related agencies. The results of the study indicate that economic growth and oil prices are negatively correlated but do not significantly affect bond yields in the long run. The variables of BI Rate and Exchange Rate are positively correlated and significantly affect bond yields. The variable of Inflation is positively correlated but does not significantly affect Bond Yields. While for the short term, partially the variables of BI Rate and Exchange Rate are positively correlated and significantly affect Bond Yields. The variables of inflation and oil price are positively correlated but do not significantly affect bond yields. The Economic Growth Rate variable is negatively correlated but does not have a significant effect on bond yields. Together, the independent variables consisting of Economic Growth Rate, BI Rate, Inflation, Exchange Rate, and Oil Prices have an effect on bond yields, both in the long term and the short term.

Keywords: Bond Yield, Economic Growth, BI Rate , Inflation, Exchange Rate, Oil Price, ECM .

1. INTRODUCTION

The Indonesian government adopted a budget deficit policy because it wanted to maintain momentum and saw the potential to increase economic growth through the provision of fiscal stimulus. Financing for deficit spending by the government is covered by government loans (debt) both long-term and short-term, both from within and outside the country (Aulia TD and Miyasto, 2019). The development of the current capital market situation means bonds play an important role as an alternative source of financing. The securities market, both in developed and developing countries, is now experiencing rapid development. Government bonds are chosen because they are seen as having a lower investment risk (default risk-free) when compared to corporate bonds (Baihaqqy et al., 2023).

Bonds or debt securities are one of the investment instruments that will be repaid by the issuer at maturity along with interest yields that will be given periodically (Tandelilin, 2010). The capital market is a market where various long-term financial instruments can be traded, such as bonds and shares issued by both the private sector and the government. The capital market is very crucial and has a great influence on investors and companies. If a company wants to raise funds, it can go through the capital market by issuing debt securities (bonds) or issuing shares to the public (Grinaldo and Marpaung, 2022).

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According to the opinion expressed by Rahardjo (2007), investment in the form of bonds is being eyed by corporations and governments based on several things, including: issuance is easier than borrowing from a bank; The interest rate is set by the issuer so that it can be made more profitable. Financing using this method is called debt financing. Meanwhile, for investors, purchasing bonds can provide benefits in the form of interest rates (coupons) and income from the difference in bond sales on the secondary market or capital market. The income obtained can be adjusted to the desired period, therefore bonds are known as fixed-income securities. Halim (2018), stated that the bond market is an investment product that experiences an increase when the economy is declining. If interest in the economic system decreases, bond value increases. The growth occurs due to a decrease in interest rates on other investments. While in investments in the form of bonds, can be estimated well in advance so that investors have received compensation for the decrease in cash flow of the bonds they buy. Meanwhile, according to Tandelilin (2019), when economic conditions are declining, the opportunity to invest will decrease, so bonds are considered attractive and there is an increase in demand for bonds.

Bonds are basically of two types, namely corporate bonds and government bonds. For a country, bonds are an important financing alternative besides bank financing through loans. Bonds help a country increase development funds. Investors who invest in bonds will get benefits in the form of returns called yields (Paramita and Pangestuti, 2016). Government bonds are a type of financial instrument used by the government to absorb money from the domestic market (Rusdy and Sentosa, 2021).

Investment is one of the alternatives that can be done by a party to turn the funds they have so that the funds become productive in other words can provide benefits in the future. Investment can be done in several forms, such as bond investment. Investing in bonds is considered to provide quite high returns. A capital owner (investor) who will invest their funds in bond securities should pay attention to the bond yield or often referred to as yield. The characteristics of bonds can influence the amount of yield, the most influential characteristic on bond yield is the age of the bond or maturity (tenor). The age of the bond is the difference between the date a bond is issued (listing date) by the issuer to the maturity date of the bond (term to maturity). The longer the bond tenor, the greater the possibility of various investment risks. Therefore, investors tend to prefer bonds with short bond tenors because the issuer is considered to be more able to pay off the principal and bond coupons. A long period or tenor will be a consideration for investors in assessing an investment decision (Basci and Cibulka in Purwadi, 2017).

According to Sunariyah (2006), investment in financial assets including bonds has two possibilities that can be experienced by investors, namely risk and profit. The risks that may occur in bond investments include market interest rate risk, purchasing power level risk, default risk, liquidity risk, maturity period risk, currency exchange rate risk, call risk, political risk, and risk in the industrial sector. While the profit in the form of returns in bonds is called yield . One of the criteria that can be used by investors in monitoring the development of the government bond market is to pay attention to bond yields, high bond yields produce strong yields. Yield is the income received by bondholders. Terms related to the characteristics of a bond's income are bond yield and bond interest rate. Bond yield is a measure of the level of income from bonds that investors will receive and tends to be variable. Bond yield is variable as is the case with bond interest (coupon) because bond yield is closely related to the required return rate (Tandelilin, 2010).

Investors who choose to buy bonds do so in the hope of getting better returns or profits. Simply put, investors will take into account the bond price, maturity date, issuer, and coupon rate when buying bonds, whether they are corporate bonds or Indonesian retail bonds. To calculate the amount of investment income on the money earned, bond buyers will use a yield measuring tool (Dayanti and Janiman, 2019). Bond Yield is the rate of return received by investors from investing in debt securities issued by the Indonesian government. Yield is the main indicator for investors in assessing the benefits of investing in government bonds. The yield is calculated as a percentage of the interest income (coupon) received by investors each year compared to the purchase price of the bond. If the price of the bond rises, the yield will fall and vice versa, if the price of the bond falls, the yield will increase. Therefore, yield not only reflects the fixed interest received by investors, but also the dynamics of bond prices in the market (Louhenapessy et al., 2024).

Investors who buy or invest in government bonds or corporate bonds will get benefits in the form of returns or can also be called yields. Yield is the level of profit or also known as the return obtained by bond investors. Investors often use standards to determine whether the growth in the value of a bond portfolio is due to the movement of bond yields. Bond yields are inversely proportional to bond prices. If bond yields fall, bond prices will rise and demand for those bonds will also increase. Likewise, if bond yields are increasing, bond prices will fall and demand for those bonds will also decrease (Fikhriani et al., 2022).

The main objective of investors in choosing the type of bond investment is the rate of return. The yield obtained can provide information about the benefits of funds that have been invested through the purchase of bonds. An investment must be calculated for its rate of

return, including investments in the form of bonds. The measure in calculating the rate of return of an investment is the main source of income underlying it, in the case of bond investments, interest is the main source of income for bonds, so that the income or yield of bonds is called yield. The rate of return on bonds often changes over time.

2. REVIEW LIBRARY

Bond Yield

Government bonds are part of the government debt securities issued by the Government of the Republic of Indonesia. Government Debt Securities (SUN) are a form of securities in the form of debt acknowledgment letters in rupiah or foreign currency whose interest and principal payments are guaranteed by the Government of the Republic of Indonesia according to their validity period (Tandelilin, 2010). In the Law of the Republic of Indonesia Number 24 of 2002 Concerning Government Debt Securities, Chapter I General Provisions, Article 1 paragraph 1 states that Government Debt Securities are securities in the form of debt acknowledgment letters in rupiah or foreign currency whose interest and principal payments are guaranteed by the Government of the Republic of Indonesia according to their validity period. Referring to Chapter II Forms and Types of Government Debt Securities in Article 2 (1) Government Debt Securities can be issued in the form of documents or without documents. (2) Government Debt Securities as referred to in paragraph (1) are issued in a form that can be traded or in a form that cannot be traded on the Secondary Market. In Article 3 (1) Government Debt Securities can consist of: a. State Treasury Bills; b. Government Bonds. Chapter III Purpose of Issuance of Government Bonds Article 4 Government Bonds are issued for the following purposes: a. to finance the deficit/shortfall of the State Budget; b. to cover short-term cash shortages resulting from a mismatch between the cash flow of receipts and cash flow of expenditures from the State Treasury Account in one budget year; c. to manage the state debt portfolio.

The intrinsic value of a bond is equal to the present value of the expected cash flow from the bond, thus the intrinsic value of the bond can be determined by discounting all cash flows originating from bond coupon payments plus the redemption of the bond at par value to be received at maturity (Tandelilin, 2010). Income, or the return that will be obtained from bond investment, is stated as yield. This is the result that investors will obtain if they invest their funds in bonds. Before making a decision to invest in bonds, investors should consider the amount of bond yield as a measuring factor for the annual rate of return that will be received.

Yield is the level of profit or can also be said as the return obtained by bond investors (Fikhriani, 2022). Bond yield has a nature that is inversely proportional to the price of bonds, if the bond yield falls then the price of bonds rises and the demand for the bonds is increasing. Likewise, vice versa, if the bond yield increases then the price of bonds will fall and the demand for the bonds will also fall.

Bonds are debt instruments issued by companies or governments to investors who have excess funds with the consequence that interest and principal are paid at maturity. There are three types of bonds in Indonesia, including government bonds, corporate bonds, and municipal bonds. Based on the distribution of coupons, bonds consist of four types, including zero coupon bonds, coupon bonds, fixed coupons and floating coupons (Purwadi, 2017). What is most considered by many investors is the characteristics of the bond's age. The age of the bond is the maturity period of the bond or the end of the loan period. The maturity of bonds can vary greatly, some are 1 year, 5 years, 10 years and can even reach 30 years. The longer the life of the bond, the greater the risk that investors will face, in other words, investors will be more interested in short-term bonds. Short-term bonds will provide large profits and small risks, profits in bonds are often referred to as yields.

Yield is the return that investors will receive in bond investments. However, bond investors prefer yields to maturity, or holding income until the specified maturity date or commonly referred to as yield to maturity. Many long-term investors use the bond income calculation method based on yield to maturity in order to compare the level of income from one bond with another (Rahardjo, 2004). Yield to Maturity or the return that will be received at maturity can be formulated as follows:

$$P = \sum_{t=1}^{n} \frac{C}{(1+YTM)^t} + \frac{F}{(1+YTM)^n}$$

Where :

P = Current market price of the bond

C = Annual coupon (annual interest payment)

F = Nominal value or par value of the bond

n = Time to maturity (in years)

YTM = Yield to Maturity sought

can also be formulated as follows:

$$YTM = \frac{C + \frac{F-P}{N}}{\frac{F-P}{N}} \text{ X } 100\%$$

Economic Growth Rate

The economic growth rate is one of the indicators in determining the success of development in a country's economy. The progress of a country's economy is determined by the magnitude of the economic growth rate indicated by changes in the country's national output. Theories regarding the level of economic growth are divided into two, namely the classical economic growth theory and the modern economic growth theory. The classical economic growth theory emphasizes analysis based on trust and the effectiveness of free market mechanisms. The modern economic growth theory emphasizes the importance of investment formation for economic growth. The higher the level of investment, the better the level of the economy because investment not only has an influence on aggregate demand but also on aggregate supply through its influence on production capacity.

According to the opinion put forward by Adisasmita (2013), economic growth is an effort to increase production capacity in achieving additional output measured by Gross Domestic Product (GDP) or Gross Regional Domestic Product (GRDP) in a region. Economic growth is also interpreted as a process of increasing per capita output in the long term. The emphasis is on three aspects, namely; process, per capita output and long term. Economic growth is a process, not just a picture of the economy at a certain time. The dynamic aspect of an economy will be seen, namely how an economy develops or changes over time. The emphasis is on the change or development itself (Boediono, 1999).

According to Simon Kuznets in Todaro (2000), economic growth is an increase in the long-term capacity of a country concerned to provide various economic necessities to its population. The increase in long-term capacity is possible with the progress or adjustment of technology, institutions and ideology in various existing conditions. According to the opinion put forward by Julian PP (2010), in assessing the achievement of the economic growth rate, the real national income must first be calculated, namely GNP or GDP according to the prevailing price in the base year. The value obtained is called GNP or GDP at a fixed price, namely the price prevailing in the base year. The economic growth rate can be calculated from the increase in GNP or real GDP that applies from year to year. To find out the development of the economic growth rate for each period, it can be calculated using the following formula:

$$r(t-1) = \frac{PDBt - PDB\,(t-1)}{PDB\,(t-1)} x\ 100\%$$

Where :

r(t – 1) = Economic Growth Rate

GDP_t = Gross Domestic Product of the calculated year

GDP (t – 1) = Gross Domestic Product of the previous year

BI Rate

Investment in the form of bonds has a fundamental principle, namely the interest rate in the market and the price of bonds have opposite directions. When the interest rate conditions in the market rise, the price of bonds will tend to fall. Conversely, when the interest rate conditions in the market fall, the price of bonds will tend to rise (Sunariyah, 2006).

According to Bank Indonesia's explanation (2024), on August 19, 2016, Bank Indonesia (BI) strengthened the monetary operations framework by implementing a new benchmark interest rate, namely the BI-7 Day Reverse Repo Rate (BI7DRR). The BI-7 DRR instrument is a benchmark interest rate that has a stronger relationship to the interest rate in the money market, is transactional or traded in the market and encourages penetration in the money market, especially the use of repo instruments.

This strengthening is commonly done by various central banks in several countries and is recognized as international best practices in implementing monetary policy operations. Bank Indonesia continues to improve the monetary operations framework in order to strengthen the effectiveness of policies in achieving the inflation target that has been set. The use of the BI-7 DRR Instrument as a reference interest rate because of its ability to quickly influence the money market, banking and the real sector.

By using the BI-7 DRR instrument as the reference interest rate, there are three main impacts that are expected, namely: Strengthening signals of monetary policy direction with BI-7 DRR as the main reference in the money market. Increasing the effectiveness of the transmission of monetary policy direction through its influence on interest rate movements in the money market and interest rates in banking. Deeper money market, especially transactions and the formation of interest rate structures in the Interbank Money Market (PUAB) for tenors of 3 to 12 months.

Since December 21, 2023, Bank Indonesia has used the name BI- Rate as the reference interest rate replacing BI-7 DRR to strengthen monetary policy communication. This name change does not change the meaning and purpose of the BI- Rate as a monetary policy stance taken by Bank Indonesia, and its operations still refer to Bank Indonesia's 7

(seven) day reverse repo transaction.

Referring to Bank Indonesia's explanation, the BI Rate is a reference interest rate that reflects the attitude or stance of monetary policy set by Bank Indonesia and announced to the public. The BI Rate is announced monthly and implemented in monetary policy operations carried out by Bank Indonesia through liquidity management in the money market to achieve operational targets of monetary policy. The target of implementing the monetary policy is reflected in the development of the Overnight (O/N) PUAB interest rate. Movements in the PUAB interest rate are expected to be translated into deposit interest rates, and in turn bank credit interest rates and asset values, such as bonds, stocks, or property.

The Bank Indonesia benchmark interest rate (BI rate) has been implemented since 2005. Bank Indonesia has strengthened the monetary policy operating framework by implementing a new benchmark interest rate or policy interest rate, namely the BI 7-Day (Reverse) Repo Rate. Strengthening the monetary policy operating framework is commonly carried out by central banks in several countries and is an international best practice in implementing monetary policy operations. The monetary policy operating framework is regularly refined to strengthen the effectiveness of policies in achieving the set inflation targets. The BI 7-Day Repo Rate instrument has a stronger relationship to money market interest rates, because it is transactional or traded in the market and encourages the deepening of financial markets, especially the use of repo instruments (Suharna, 2020).

The benchmark interest rate or BI rate is the interest rate set by Bank Indonesia (BI) and is a benchmark for financial institutions in Indonesia in determining the interest rate that will be offered to customers, including loan and savings interest rates (Bank Indonesia, 2024). When Bank Indonesia announces an increase in the BI rate, banking institutions are expected to also increase bank interest rates, and vice versa. The increase or decrease in the interest rate will be followed by the banking interest rate gradually. The benchmark interest rate directly affects the interest rate at banking institutions. When the benchmark interest rate tends to rise, the deposit and credit interest rates at banking institutions also tend to rise. Conversely, when the BI rate tends to fall, the deposit and credit interest rates will tend to fall.

The Weighted Average calculation method is the interest rate calculated using the weighted average method by weighting the interest rate with the transaction volume at each interest rate that does not exceed the stop-out rate or SOR in each auction period. The Stop-out Rate (SOR) is the highest discount rate generated from the auction in order to achieve the quantity target to be issued by Bank Indonesia. The formula used to obtain the interest rate is

as follows:

$$\text{Interest Rate} = \frac{(\text{vol 1 x rate 1}) + (\text{vol 2 x rate 2}) + (\text{vol 3 x rate 3}) + (\text{vol N x rate N})}{\text{Total Volume}}$$

Inflation

Inflation can be interpreted as an economic condition with a situation of increasing prices and costs of necessities in general and within a certain period of time such as the price of basic necessities, fuel, labor, land and capital goods (Fatmawati, 2020). According to the definition put forward by Bank Indonesia (2024), inflation is a condition where there is an increase in the price of goods and services in general and continuously within a certain period of time. An increase in the price of one or two goods alone cannot be called inflation unless the increase results in an increase in the price of other goods. The opposite of inflation is called deflation. The inflation rate in the Indonesian context is carried out by the Central Statistics Agency (BPS). The Central Statistics Agency or BPS conducts a survey of data collection on the prices of various goods and services that represent public consumption spending. Then the data is used to calculate the inflation rate and predict the inflation rate by comparing current prices with prices in the previous period.

The inflation rate can be an important indicator in the economy. The rate of inflation growth is attempted to remain low and stable so as not to cause disruption to the macroeconomy which will ultimately have an impact on economic instability. Inflation has positive and negative impacts on the economy (Salim and Fadila, 2021). Inflation is also understood as a condition of general and continuous increase in the prices of goods and services. Meanwhile, economic growth reflects the expansion of economic activity in a country or region, economic growth is the long-term ability of a country to produce various goods for its increasing population (Simanungkalit, 2020).

Inflation basically reflects the imbalance between supply and demand in the national economy. There are several types of inflation that are considered normal in the economy, but excessive price increases can damage consumer purchasing power, disrupt resource allocation, and make economic planning uncertain (Fadilla and Purnamasari, 2021). Inflation is an economic phenomenon where prices generally experience a continuous increase in a country over a certain period. Inflation causes the purchasing power of the country's currency to decrease, so that people need to spend more money to buy goods and services. Factors causing inflation include excessive demand, rising production costs, rising wages, and international price fluctuations. While mild inflation can encourage consumption, high inflation can create economic uncertainty. Deflation, on the other hand, is a general decline in

prices that can hinder consumer spending and investment, and has the potential to trigger an economic slowdown. Efforts to control inflation involve appropriate monetary and fiscal policies (Pujadi, 2022).

Riyono et al. (2022), stated that inflation is a phenomenon that can be grouped based on the rate of increase in the prices of goods and services in the economy. The inflation rate is divided into several categories with the following criteria: "Mild" inflation occurs when the increase in prices of goods is below 10% per year. "Moderate" inflation occurs when price increases range from 10% to 30% per year. "High" inflation occurs when price increases are in the range of 30% to 100% per year. Inflation reaches "hyperinflation" levels when price increases exceed 100% per year.

This classification provides a framework for measuring and understanding the different economic impacts of different inflation rates, with larger implications for the monetary and fiscal policies needed to maintain economic and price stability.

According to Salam (2020), inflation is a complex and broad economic phenomenon in its impacts and causes in various countries. Inflation occurs when the value of a country's currency decreases in comparison to commodities such as gold or foreign currencies. This phenomenon requires supervision and control to ensure economic stability and sustainable growth. In the context of Indonesia, inflation has significant implications in various aspects of life. The general increase in the prices of goods and services is disturbing to society and economic decision-making. The effects of inflation on people's economic behavior can involve choices between current spending and long-term investment, which can affect the accumulation of wealth and overall economic growth. Inflation also has an impact on the business sector, with the potential to disrupt business planning, harm production efficiency, and increase capital costs. In addition, the social impact of inflation involves the income aspect, because the decreasing value of money can affect people's purchasing power and result in economic inequality. Efforts to control inflation involve monetary and fiscal policies to maintain a balance between economic growth and price stability.

Exchange Rate

Currency exchange rate as the amount of a country's currency that can be exchanged for one unit of another country's currency (Basyariah and Khairunnisa, 2016). According to Mankiw (2003), a country's currency exchange rate is divided into nominal exchange rate and real exchange rate. The nominal exchange rate is the relative exchange rate of currencies between two countries. While the real exchange rate is related to the relative exchange rate of goods between two countries. The real exchange rate is the rate at which economic actors

trade goods from one country for goods from another country. The real exchange rate between two currencies is calculated by multiplying the nominal exchange rate by the ratio of price levels in the two countries. In short, a country's real exchange rate will affect the macroeconomic conditions of a country, especially with net exports or the balance of trade. The relationship between the real exchange rate and the nominal exchange rate can be formulated as follows:

$$\text{REER} - \text{ER} \times \frac{\text{FP}}{\text{DP}}$$

Where :

REER = Real Effective Exchange Rate/ Real Exchange Rate

ER = Nominal exchange rate expressed in direct terms and indirect terms

FP = Foreign Price / Price index of foreign trading partners

DP = Domestic Price / Domestic price index

The exchange rate can also be interpreted as the cost of a unit of foreign currency in the public treasury or the cost of public money against foreign cash (Nopirin, 2013). The exchange rate is a useful means of payment for international transactions because it measures the value of one country's currency against another country's currency (Bolung et al., 2023). This shows that the exchange rate can be used to determine how expensive goods traded between countries are. When the value of a currency increases, it is called appreciation. While when the value of the currency decreases, it is called depreciation (Pardasia and Syafri, 2024).

Oil Price

Barrel is an official crude oil unit using the ISO 9001:2000 standard and the crude oil exchange rate to the Dollar because currently the US dollar/USD currency is known almost throughout the world. Logically, with the increase in world oil prices, the USD exchange rate will weaken. This is because the burden of American oil consumption will also increase followed by a negative trade balance, and vice versa. So when oil prices rise, it will result in an appreciation of the rupiah because the dollar value decreases. So the increase in oil prices will cause bond yields to fall (Purwadi, 2017).

According to Arifin (2016), oil and its price fluctuations have a very vital influence on almost all macroeconomic activities, because oil is one of the main energies used both directly and indirectly in producing goods and services. Fuel Oil (BBM) has become the main source of energy for its use in supporting production processes throughout the world so that oil price fluctuations are very sensitive to economic conditions or economic growth rates in

each country. And there is not a single country that does not depend on oil and is able to immediately reduce its consumption due to price increases, including Indonesia.

According to Ismanthono in Soesanto, et al (2024), the price of Indonesian crude oil or known as ICP (Indonesian Crude Price) is the price of crude oil determined by the Indonesian government. The price of crude oil traded in the international market is influenced by several fundamental and non-fundamental factors. Fundamental factors for changes in crude oil prices can be caused by demand and supply carried out by oil producing countries and oil consuming countries. The causes of oil price fluctuations are very complex and involve many interrelated factors. The main factors that influence fluctuations in oil price changes include: a. Demand and Supply b. Geopolitical Conditions c. Economic Factors d. Technical and Technological Factors.

According to Ningtyas and Hidayat in Yanti and Ratna (2019), the world oil price is the world crude oil price formed due to the demand and supply of world oil commodities. The world crude oil price is generally calculated in US dollars per barrel (1 barrel = 159 liters) using the average oil price adjusted to the rupiah exchange rate in effect for each year.

Currently, the commonly used crude oil price benchmark is West Texas Intermediate (WTI) or light sweet. The crude oil traded in WTI is high-quality crude oil (Abas and Putri, 2023).

3. METHOD STUDY

Types of research

The type of research is quantitative, namely by using data related to Government Securities or Government Bonds published by the Financial Services Authority of the Republic of Indonesia, Bank Indonesia, the Indonesia Stock Exchange and the Ministry of Finance, especially for Government Bond Yield data. Other quantitative data is obtained from Bank Indonesia and the Central Bureau of Statistics to obtain data on Economic Growth Rate, BI Rate, Inflation and Exchange Rate. Meanwhile, to obtain World Oil Prices, it can be obtained from Bloomberg or Reuters. The study uses data for 9 years on a quarterly basis starting from the first quarter of 2010 to the fourth quarter of 2023 (56 quarters).

Data Types and Sources

Data Types and Sources The data studied are secondary data. Secondary data is data that has been processed by other parties including information from electronic media (internet), literature from libraries and previous research results (Sekaran and Bougie, 2017). This study uses secondary data obtained through printed books, e-books, articles, journals

and official websites such as the Central Statistics Agency, Bank Indonesia, Financial Services Authority and other official sources.

Sample selection was carried out based on the purposive sampling method, namely the selection of samples of Bond Yields, Economic Growth Rates, BI Rates, Inflation, Exchange Rates and Oil Prices during the research period based on certain considerations or criteria.

Data Analysis

The analysis tool used is econometric analysis of the regression method with the Error Correction Model (ECM) approach. The purpose of this study is to assess and analyze the long-term and short-term effects of each independent variable, namely Economic Growth Rate, BI Rate, Inflation, Exchange Rate and Oil Price on the dependent variable, namely Bond Yield with the help of the Eviews application . The cointegration regression model in this study uses the least squares method (Ordinary Least Square) which can be formulated as follows:

$$\mathbf{Y = \beta 0 + \beta 1X1 + \beta 2X2 + \beta 3X3 + \beta 4X4 + \beta 5X5 + e}$$

Where :

Y = Bond Yield

β0 = Constant

β= Regression coefficient

X1 = Economic Growth Rate

X2 = BI Rate

X3 = Inflation

X4 = Exchange Rate

X5 = World Oil Price

e = nuisance variable

Meanwhile, the Error Correction Model (ECM) equation is formulated as follows:

$$\mathbf{\Delta Y = \beta 0 + \Delta \beta 1X1 + \Delta \beta 2X2 + \Delta \beta 3X3 + \Delta \beta 4X4 + \Delta \beta 5X5 + ect}$$

Where :

ΔY = Bond Yield Delta

β0 = Constant

β= Regression coefficient

ΔX1 = Delta of Economic Growth Rate

ΔX2 = Delta BI Rate

ΔX3 = Inflation Delta

ΔX4 = Exchange Rate Delta

ΔX5 = World Oil Price Delta

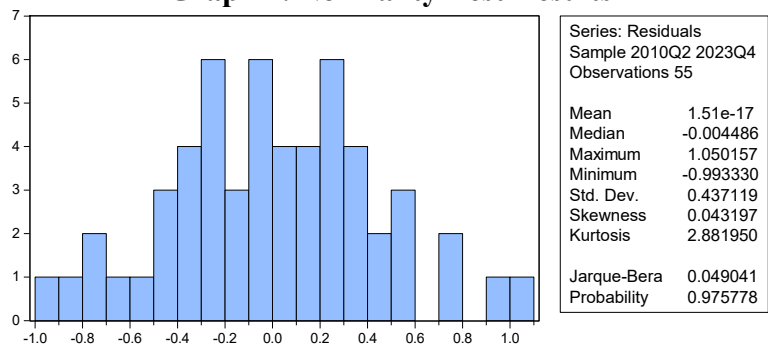
ect = Error Correction Term

4. RESULTS AND DISCUSSION

1) Classical Assumption Test

The first classical assumption test carried out was the data normality test using the JB (Jarque-Bera) statistical test with the following results:

Graph 1. Normality Test Results



Source: Processed data

From the test results, the Jarque-Bera statistical value is 0.049041 with a Probability value of 0.975778. The calculated JB probability value of 0.975778 is greater than the alpha level of 0.05 (5%), so it can be concluded that the residual data is normally distributed.

Next, an autocorrelation test was carried out using the Bruesch-Godfrey LM (Lagrange Multiplier) test with the following results:

Table 1. Autocorrelation Test Results

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	2.756298	Prob. F(2,46)	0.0740
Obs*R-squared	5.885798	Chi-Square Prob.(2)	0.0527

Source: Processed data

F-statistic probability value of 0.0740 and the calculated Obs*R-squared value of 0.0527 are greater than the alpha level of 0.05 (5%), so it can be concluded that there is no autocorrelation.

The next classical assumption test is the multicollinearity test using Variance Inflation Factors (VIF) with the following results:

Table 2. Multicollinearity Test Results

Variance Inflation Factors
Sample: 2010Q1 2023Q4
Included observations: 55

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
D(X1)	0.001582	1.056708	1.056650
D(X2)	0.024552	1.185017	1.184498
D(X3)	0.003825	1.171311	1.171104
D(X4)	3.059255	1.709311	1.637881
D(X5)	0.095158	1.415407	1.415211
ECT(-1)	0.010542	1.238972	1.238038
C	0.004225	1.081040	NA

Source: Processed data

From the test results, the Centered VIF values were all less than 10.00, so it can be concluded that there is no multicollinearity.

The last classical assumption test is the heteroscedasticity test using the Breusch-Pagan-Godfrey test with the following results:

Table 3. Heteroscedasticity Test Results

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.149789	Prob. F(6,48)	0.3487
Obs*R-squared	6.911459	Chi-Square Prob.(6)	0.3291
Scaled explained SS	4.953416	Chi-Square Prob.(6)	0.5498

Source: Processed data

The test results show the calculated F-statistic probability value of 0.3487 and the calculated Obs*R-squared of 0.3291, which is greater than the alpha level of 0.05 (5%), so it can be concluded that there is no heteroscedasticity.

2) Stationary Data Test

The stationary data test or unit root test is conducted to determine whether the data stationarity occurs in the form of levels, first derivatives (1st difference) or second derivatives (2nd difference). The test is conducted using the DF (Dickey-Fuller) or ADF (Augmented Dickey-Fuller) value with criteria greater than its critical value. If the data is not stationary at the Level level, it is continued to the first derivative test (first difference) and continued to the second derivative test (second difference) if the data is not stationary at the first derivative. After testing with a critical value level of 5%, all research variables have been stationary at the first derivative (first difference) with the following results:

Tabel 4. Unit Root Test (1st Difference)
Intermediate ADF test results D(UNTITLED)

Series	Prob.	Lag	Max Lag	Obs
D(Y)	0.0000	2	10	52
D(X1)	0.0000	0	10	54
D(X2)	0.0004	0	10	54
D(X3)	0.0000	0	10	54
D(X4)	0.0000	0	10	54
D(X5)	0.0000	0	10	54

Source: Processed data

3) Cointegration Test

The cointegration test is conducted to find out whether the regression residuals are cointegrated or not. If the regression residuals are cointegrated, it means that there is a stable relationship in the long term. And vice versa. The results of the cointegration test using the Durbin-Watson Statistic are as follows:

Table 5. Cointegration Test Results

R-squared	0.287400	Mean dependent variable	-0.037888
Adjusted R-squared	0.259454	S.D. dependent var	0.577102
S.E. of regression	0.496624	Akaike info criterion	1.491987
Sum squared resid	12.57843	Schwarz criterion	1.602487
Log likelihood	-37.28366	Hannan-Quinn criter.	1.534603
F-statistic	10.28443	Durbin-Watson stat	1.798292
Prob(F-statistic)	0.000177		

Source: Processed data

The test results show that the calculated Durbin-Watson statistic value is 1.798292. While the critical value of Cointegrating-Durbin Watson at a 5% confidence level is 1.729. Thus, the calculated Durbin-Watson Statistic value is greater than the Cointegrating Durwin-Watson table, which means that there has been cointegration of the regression residuals.

4) Error Correction Model (ECM)

Econometric analysis The error correction model is a testing method that can be used to determine the short-term and long-term equilibrium models. In order for the Error Correction Model (ECM) used to be valid, the error correction term (ECT) coefficient must be significant. The following is the error correction term (ECT) coefficient of the residual value of the regression model:

Table 6. Results of ECT Unit Root Test

Null Hypothesis: ECT has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=10)

			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistics	-4.492066	0.0006		
Test critical values:	1% level		-3.557472	
	5% level		-2.916566	
	10% level		-2.596116	

*MacKinnon (1996) one-sided p-values.
Augmented Dickey-Fuller Test Equation
Dependent Variable: D(ECT)
Method: Least Squares
Sample (adjusted): 2010Q3 2023Q4
Included observations: 54 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ECT(-1)	-0.529059	0.117776	-4.492066	0.0000

Source: Processed data

From the results of making residual series and unit root tests on the error correction term (ECT) shows the Augmented Dickey-Fuller t-Statistic value of -4.492066 with a probability value of 0.0006 and the ECT variable (-1) with a coefficient value of -0.529059 and a probability value of 0.0000. Thus it can be concluded that the error correction term (ECT) value is smaller than 0.05 (5%) and significant.

a. Long Run Regression Equation

The following is a long-term regression equation model:

Table 7. Long-Term Regression Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
X1	-0.015044	0.053604	-0.280652	0.7801
X2	0.416222	0.120252	3.461247	0.0011
X3	0.086256	0.081640	1.056542	0.2958
X4	1.357515	0.645281	2.103759	0.0405
X5	-0.416253	0.368736	-1.128865	0.2643
C	-6.459270	7.100602	-0.909679	0.3674

Source: Processed data

From this table, we can write the long-term regression model estimate, as follows:

Y = -6.459270 – 0.015044(X1) + 0.416222(X2) + 0.086256(X3) + 1.357515(X4) – 0.416253(X5)

b. Short Term Regression Equation (Error Correction Model)

The following is the ECM model used in the research, the results of data processing carried out using the Error Correction Model (ECM) linear regression

model:

Table 8. Short-Term Regression Results (ECM)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(X1)	-0.021208	0.039771	-0.533245	0.5963
D(X2)	0.325986	0.156691	2.080438	0.0428
D(X3)	0.036714	0.061849	0.593611	0.5556
D(X4)	7.861772	1.749073	4.494823	0.0000
D(X5)	0.489058	0.308476	1.585399	0.1194
ECT(-1)	-0.292362	0.102674	-2.847482	0.0065
C	-0.114464	0.065000	-1.760969	0.0846

Source: Processed data

From the table above, the short-term dynamic model estimation of the Error Correction Model (ECM) can be obtained using the Ordinary Least Square (OLS) regression function as follows:

Y = -0.114464 – 0.021208(X1) + 0.325986(X2) + 0.036714(X3) + 7.861772(X4) + 0.489058(X5) – 0.292362(ECT(-1)

5) F Test (Simultaneous)

The F test or simultaneous test is basically carried out to find out whether all the independent variables included in the model have a joint influence on the dependent variable. The method used is to look at the magnitude of the significant probability value. According to Ghozali (2018), if the significant probability value is <5% then the independent variables or independent variables will jointly have a significant effect on the dependent variable. The criteria for drawing conclusions on the F test are as follows:

a. If the calculated $F_{value} < F_{table}$ and if the probability (significance) > 0.05(α), then the independent variables simultaneously or together do not significantly affect the dependent variable.
b. If the calculated $F_{value} > F_{table}$ and if the probability (significance) is less than 0.05(α), then the independent variables simultaneously influence the dependent variable significantly .

Table 9. F Test (Simultaneous)

R-squared	0.439169
Adjusted R-squared	0.383086
SE of regression	0.725420
Sum squared residual	26.31173
Log likelihood	-58.31112
F-statistic	7.830686
Prob(F-statistic)	0.000017

Source: Processed data

Based on the results of the F test, it shows that the independent variables consisting of

Economic Growth Rate, BI Rate , Inflation, Exchange Rate and Oil Price have a joint and significant effect on Bond Yields both in the long term and the short term.

6) T-Test (Partial)

The t-test or partial test is conducted to determine how far an independent variable is partially related to the variation of the dependent variable. The basis for drawing conclusions in the t-test is as follows, Ghozali (2018):

a. If the calculated $t_{value} < t_{table}$ and if the probability (significance) > 0.05 (α), then the independent variable partially (individually) does not significantly affect the dependent variable.
b. If the calculated $t_{value} > t_{table}$ and if the probability (significance) <0.05(α), then the independent variable partially (individually) influences the dependent variable significantly.

Based on the t-test, the influence of the independent variable on the dependent variable is as follows:

a. Long Term Relationship

Table 10. Long-Term t-Test (Partial) Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
X1	-0.015044	0.053604	-0.280652	0.7801
X2	0.416222	0.120252	3.461247	0.0011
X3	0.086256	0.081640	1.056542	0.2958
X4	1.357515	0.645281	2.103759	0.0405
X5	-0.416253	0.368736	-1.128865	0.2643
C	-6.459270	7.100602	-0.909679	0.3674

Source: Processed data

- Economic Growth Rate has a negative but insignificant correlation with Bond Yields.
- BI Rate has a positive correlation and significant effect on Bond Yields.
- Inflation has a positive but insignificant correlation with bond yields
- Exchange Rates are positively correlated and have a significant effect on Bond Yields
- Oil prices are negatively correlated but do not significantly affect bond yields

b. Short Term Relationship

Table 11. Short-Term t-Test (Partial) Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(X1)	-0.021208	0.039771	-0.533245	0.5963
D(X2)	0.325986	0.156691	2.080438	0.0428
D(X3)	0.036714	0.061849	0.593611	0.5556
D(X4)	7.861772	1.749073	4.494823	0.0000
D(X5)	0.489058	0.308476	1.585399	0.1194
ECT(-1)	-0.292362	0.102674	-2.847482	0.0065

C	-0.114464	0.065000	-1.760969	0.0846

Source: processed data

- Economic Growth Rate has a negative but insignificant correlation with Bond Yields.
- BI Rate has a positive correlation and significant effect on Bond Yields.
- Inflation has a positive but insignificant correlation with bond yields.
- Exchange Rates are positively correlated and have a significant effect on Bond Yields.
- Oil prices are positively correlated but do not significantly affect bond yields.

7) Test the Coefficient of Determination (R^2)

The coefficient of determination (R^2) is a coefficient that shows the percentage (%) of the influence of all independent variables on the dependent variable. The percentage (%) shows how much the independent variables can explain the dependent variable. The greater the coefficient of determination, the better the independent variables are in explaining the dependent variable. The value of R^2 is between 0 -1 ($0 < R^2 < 1$) this determination coefficient is used to determine how much the independent variables affect the dependent variable. The R-Square value is said to be good if its value is > 0.5 because the value of R^2 is close to 1, then most of the independent variables explain the dependent variable, while if the coefficient of determination is 0, then the independent variables have no effect on the dependent variable.

Table 12. Results of the Long-Term Determinant Coefficient (R^2) Test

R-squared	0.439169
Adjusted R-squared	0.383086
SE of regression	0.725420
Sum squared residual	26.31173
Log likelihood	-58.31112
F-statistic	7.830686
Prob(F-statistic)	0.000017

Source: Processed data

The coefficient of determination (R^2) value shows that in the long term the independent variable is able to influence the dependent variable by 38.3086% and the remaining 61.6914% is influenced by variables outside this study.

Table 13. Results of the Short-Term Determinant Coefficient (R2) Test

R-squared	0.535001
Adjusted R-squared	0.476877
SE of regression	0.463635
Sum squared residual	10.31796
Log likelihood	-32.02183
F-statistic	9.204354
Prob(F-statistic)	0.000001

Source: Processed data

Meanwhile, in the short term, the independent variable is able to influence the dependent variable by 47.6877% and the remaining 52.3123% is influenced by other variables outside this study.

5. CONCLUSION

Based on the research results and discussion in the previous section, the following conclusions can be drawn:

1. Together, the independent variables consisting of Economic Growth Rate, BI Rate , Inflation, Exchange Rate and Oil Prices have an effect on Bond Yields, both in the long term and the short term.
2. In the long term, partially the variables of Economic Growth Rate and Oil Price are negatively correlated but do not significantly affect Bond Yields. While the variables of BI Rate and Exchange Rate are positively correlated and significantly affect Bond Yields. The Inflation variable is positively correlated but does not significantly affect Bond Yields.
3. In the short term, partially the BI Rate and Exchange Rate variables are positively correlated and significantly affect Bond Yields. The Inflation and Oil Price variables are positively correlated but do not significantly affect Bond Yields. While the Economic Growth Rate variable is negatively correlated but does not significantly affect Bond Yields.

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