HOW IS THE SHOCK OF THE MACRO ECONOMICS VARIABLES AND WORLD OIL PRICE EFFECTED THE YIELD OF INDONESIA GOVERNMENT BOND INDEX (INDOBEXGB)?

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ABSTRACT

Purpose: This study aims to measure how is the shock of the macro economics variables and world oil price effected the yield of indonesia government bond index (INDOBEXGB).

Design/Methodology/Approach: The research methodology used is quantitative method uses time series data. The source of the data derived with monthly data and secondary data from Bank Indonesia (BI), Central Bureau of Statistics (BPS), Indonesia Bond Pricing Agency (IBPA) and Bloomberg. This research is analyzed by using Vector Error Correction Model (VECM) since there is cointegrated variables which could be seen in Trace Statistic and Max-Eigenvalues Statistic is greater than Critical Value.

Findings: The result of the analysis shows that the shock of macro economics variables money supply and forex reserves give a negative and significant effect to yield on Indonesia Government Bond Index (INDOBEXGB). Whereas the shock of macro economics variables consumer price index, BI rate, exchange rate, and world oil prices each give a positive and significant effect to Indonesia Government Bond Index (INDOBEXGB).

Keywords: Macro Economics, World Oil Prices, Yield on Government Bond Index, Vector Error Correction Model (VECM)

JEL Classification: E44, E51, F31.

INTRODUCTION

One of the main objectives of investment activities is the hope of obtaining additional funds in the future from the current investment activities. There are many other objectives for investment, as revealed by Keynes (2007), namely that there are three things that underlie a person needs to make an investment, namely the existence of future needs that must be met but have not been able to, so the investment of these funds needs to be done first at this time to obtain a return or yield in the future, the desire to develop assets, and or protect assets owned from inflation. Tandelilin (2010) groups investment forms into two types, namely in the form of real assets and securities. Bonds as one type of investment in the
Form of securities have their own markets that provide an important role as a means of funding sources in today's economic development. Even the world economic crisis that occurred in 1997 has pushed the role of the development of the domestic bond market as a reduction in vulnerability due to exchange rate volatility and bond age (Piesse, Israsena, & Thirtle, 2007). According to (Goswami & Sharma, 2011) an integrated regional market and deepen in the local debt markets provide greater scale, efficiency, and access to catalyzed economic growth through broader capital market development and increase financial market integration. Moreover, the fact that Asian corporations, which have historically been reliant on bank financing, were able to turn to local corporate bond markets when banks reduced lending during the global crisis, augurs well for market development (IMF, 2010). The bond market is able to help the government to reduce dependence on foreign debt (shown in figure 1), strengthen financial system stability against global volatility, reduce the cost of financial services, and improve the financial services network, and provide long-term funding in infrastructure sector development, education, health, and corporate business.

![Image of Government Debt Development and Structure](source: DJPPR (Ministry of Finance), data processed, 2017)

**Figure 1**

**Government Debt Development and Structure**

Therefore, the Government through the Directorate General of Debt Management and Financial Services Authority (OJK), is always trying to prepare the rule of law and infrastructure supporting the bond market gradually such as the formation of the INDOBexGB state bond index on August 10, 2009. In general, the bond index is a global parameter in assessing the performance of the bond market which is ideally calculated using methodologies and data sources that are transparent and objectively reliable. The existence of the bond index in Indonesia can be said to be still very little both in terms of variation, existence and use. The form of OTC (traded bond market over the counter), where price transparency and market liquidity are relatively low, makes it difficult to calculate performance and trend of bond market movements. The existence of bond indices such as INDOBeX, INDOBexCB, and INDOBexGB greatly facilitates market players in assessing the performance of a reliable, credible and objective bond market that reflects the actual state of the Indonesian bond market and strengthens the growth of the bond market in Indonesia.
The INDOBexGB yield as the only bond index yield representing the state bond market in Indonesia is interesting to study further, especially to see how the characteristic pattern of the movement of the state bond index to its determinant factors. INDOBexGB yields in the last seven years since its launch show a stable and dynamic movement pattern as shown in Figure 2.

![INDOBexGB Yield Development Period August 2009-December 2016](source: IBPA, data processed, 2017)

As we know that variables such as world oil prices, money supply, foreign exchange reserves, consumer price indexes, bi rates up to the rupiah exchange rate against foreign currencies continue to move dynamically and correlate in each time span so that, it is indicated to affect investment activities in the capital market to the economic conditions of a country. Empirically these factors have been proven to influence the state of the capital market in several countries as revealed by Tandelilin (2010: 213), namely the development of gross domestic product (GDP), interest rates, inflation rates, and exchange rates are macroeconomic indicators that can affect the yield or bond yield.

The first macro variable that is thought to affect bond yields is the consumer price index. Changes in the consumer price index (CPI) which tend to increase from year to year have an impact on investment in securities because it causes market uncertainty from general price increases or inflation so that bond instruments will be felt riskier. Therefore, investors will ask for higheryieldson their investments. Thus, the rate of consumer price index will affect the size of bond yields expected by investors. Research related to the effect of the consumer price index reflected by inflation on yields was conducted by (Lestari, 2018), (Rahman & Sam’ani, 2013), (Oktavian, Haryetti, & Sjahruddin, 2015), (Purwanti & Purwidianti, 2017), (Sari & Abundanti, 2015) and (Lumbantobing, 2014) said that inflation had no significant effect on bond yields.

The next macro variable that is thought to affect bond yields is interest rates and the money supply. High general interest rates can be used when the supply of money supply is too excessive in the market and vice versa, so that the amount of supply and demand in the
market remains in balance. Low interest rates will cause an increase in profits generated by companies and countries due to low capital costs from decreasing corporate and state interest expenses that must be issued so that it encourages company performance and can also attract investors to invest by issuing more attractive bonds from companies or the government. Thus, this will affect the movement of state and corporate bond indexes. This is reflected in Figure 3. Research related to the influence of the money supply (M2) on bond yields by Cherif and Kamoun (2007), Diebold et al. (2006) and Hordahl et al. (2006) and Fah (2008) stated that an increase in money supply would increase liquidity, resulting in a decrease in short-term bond yields and long-term bond yields. So an increase in the money supply will reduce the yield curve. While research related to the influence of interest rates on bond yields was revealed by (Rahman & Sam’ani, 2013), (Lumbantobing, 2014), and research by Surya and Nasher (2011) also (Purwanti & Purwidianti, 2017) which stated that interest rates had a significant positive effect on bond yields.

**Figure 3**

Development of yields INDOBexGB, JUB, BIR, and CPI Period August 2009 - December 2016

Foreign exchange reserve factors and world oil prices are considered to have an influence on bond yield variables. (Akbari & Sentosa, 2019) in his research proved that government bond yields were significantly negatively affected by foreign exchange reserves. Reinforced by the research of (Bramantio & Danarti, 2019) which explains that yields global sovereign bond is negatively affected by the percentage of movements foreign reserve. An explanation of the relationship between the movement of the yield of the state bond index (INDOBexGB) with foreign exchange reserves, world oil prices and the exchange rate of the rupiah against the US dollar is reflected in figure 4. Research related to the effect of foreign exchange reserves on bond yields conducted by (Sihombing & Sundoro, 2017), (Akbari & Sentosa, 2019), and (Bramantio & Danarti, 2019), prove that there is a significant negative effect between foreign exchange reserves on government bond yields, but (Ayatullah, 2019) find that there is no significant effect between foreign
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Exchange reserves on government bond yields. However, different results are shown by the study of Idham (2014) where an increase in foreign exchange reserves will be responded positively by bond yields. Whereas previous research related to the effect of world oil prices on bond yields, among others, was carried out by Paramita, RP and Pangestuti, IRD (2016), Muharam (2011), and Nizar (2012) who explained that there was a significant positive effect between global oil price variables which was proxied by West Texas Intermediate Crude Oil on government bond yields in the four countries studied (Indonesia, Malaysia, Thailand and the Philippines).

Source: IBPA, BPS, Bloomberg, BI, data processed, 2017

Figure 4
Development of yields INDOBexGB, CD, OIL, and EXCHANGE Period August 2009 - December 2016

Based on the above explanation, differences in research results from various previous studies (research gap) were found in various periods, combinations of variables and research methods used. Thus, this study will further analyze the Analysis of the Effect of Macroeconomic Variables and World Oil Prices on Yield of Government Bond Index (INDOBexGB) with macroeconomic variables consisting of the Amount of Money Supply (JUB), Consumer Price Index (CPI), BI Rate (BIR), Exchange Rate USD (KURS), Foreign Exchange Reserves (CD), and World Oil Prices (OIL). The purpose of this study is to examine the impact of yield on government bond index (INDOBexGB) by using macro economics variables and world oil prices. The hypotesis in this study are formulated as follows: Does the Amount of Money Supply and Foreign Reserves have a negative effect on the movement of the Government Bond Index Yield (INDOBexGB)?, as well as Does the Consumer Price Index, BI Ree, Exchange Rate USD, World Oil Prices have a positive effect on the movement of Yield Government Bond Index (INDOBexGB)?
Thought Framework, Types and Sources of Data

| Macroeconomic Variable: |
|-------------------------|
| 1. Money Supply (M2-JUB) |
| 2. Consumer Price Index (CPI) |
| 3. BI Rate (BIR) |
| 4. Exchange Rate USD (Kurs) |
| 5. Foreign Reserves (CD) |
| 6. World Oil Price (OIL) |

Yield of Government Bond Index (INDOBexGB)

Figure 4
Thought Framework

The hypothesis in this study is presented as follows:
Hypothesis 1: It is suspected that there is a negative influence of the money supply (JUB) on the INDOBexGB yield
Hypothesis 2: It is suspected that there is a positive influence of the consumer price index on the INDOBexGB yield
Hypothesis 3: It is suspected that there is a positive effect of the BI rate on the INDOBexGB yield
Hypothesis 4: It is suspected that there is a positive influence of the exchange rate USD on the INDOBexGB yield
Hypothesis 5: It is suspected that there is a negative influence of foreign exchange reserves (CD) on the INDOBexGB yield

RESEARCH METHOD

The types of data that used in this study are all of monthly secondary data form obtained from Bank Indonesia (BI), Central Bureau of Statistics (BPS), Indonesia Bond Pricing Agency (IBPA) and Bloomberg. The data used are monthly timeseries data from August 2009 to December 2016.

| No. | Variable Type                          | Symbol | Unit     | Data Source           |
|-----|----------------------------------------|--------|----------|-----------------------|
| 1.  | Consumer Price Index (CPI)             | IHK    | Nominal  | BPS                   |
| 2.  | BI rate                                | BIR    | Percent  | Bank Indonesia        |
| 3.  | Exchange Rate USD                      | KURS   | Rupiah   | Bank Indonesia        |
| 4.  | Total Money Supply (M2)                | JUB-M2 | Billion Rp. | Bank Indonesia   |
| 5.  | Foreign Exchange Reserves              | CD     | US$      | Bank Indonesia        |
| 6.  | World Oil Prices                       | OIL    | Billion US$ | Bloomberg          |
| 7.  | Indonesia Goverment Bond Index         | INDOBexGB | Percent | IBPA                  |

Table 1
Data Types, Symbols, Units and Sources of Data

Source: Data processed from various sources, 2017
This study uses 6 (five) independent variables (i.e. total blood money (M2), inflation, BI rate, exchange rate USD, foreign exchange reserves, and world oil prices and 1 (one) dependent variable, which is the yield of the Indonesian Government Bond Index (INDOBexGB) taken at the end of each month.

The research contain a long-term data so a choice of VAR (Vector Auto Regression) analysis tool is used if the data result is stationary and there is no cointegration. While the Vector Error Correction Model (VECM) used if the data found to be not stationary but has the cointegration. Diagnostic test is performed using the impulse response method, variance decomposition to see the response of the Indonesian Government Bond Index (INDOBexGB) to the shock of other variables. Researchers will also do cointegration and causality tests to see the relationship between variables.

Stationarity Test
Stationary tests are used to test unit roots, otherwise stationary data has no unit roots. The method that can be applied to determine the stationarity of the data is unit root testing by the Dickey-Fuller (DF) method. The hypothesis tested in this test is whether $H_0: \delta = 0$. If the ADF statistical value is smaller than MacKinnon Critical Value, then the alternative hypothesis is zero or in other words if it rejects $H_0$ then the data is stationary.

Determination of Optimal Lag
In determining the optimal lag it is necessary to carry out three forms of testing in stages in order to obtain the appropriate length of the lag. At the initial stage, the maximum lag length of a stable VAR system will be seen. The stability of the VAR system can be assessed from the inverse roots value of its polynomial AR characteristics. The VAR system is said to be stable if all its roots are located in a unit circle and have a modulus smaller than one (Lutkepohl, 1991).

Selected lag candidates are the interval according to the Schwarz Information Criterion (SC), Akaike Information Criterion (AIC) and Hannan-Quinn Information Criterion (HQ) criteria which are marked with the most asterisks in the numbers that appear in each lag. If the information criteria only lead to a lag candidate, then that candidate is optimal. If more than one candidate lag is found, then the criteria chosen give the shortest lag. It aims to simplify the model used in research. Optimal lag selection can also be done by selecting the biggest Adj-R$^2$ (Juanda & Junaidi, 2012).

VAR Model Stability Test
The method that will be used to perform INDOBexGB determinant yield analysis is Impulse Response Functions (IRF) analysis and error variance decomposition forecasting analysis (FEVD). VAR stability test is done by calculating the roots of polynomial functions or known as roots of characteristic polynomials. If the absolute value <1 reflected by all the roots of the polynomial function is inside the unit circle, then the VAR model is declared stable, so the IRF and FEVD test obtained can be considered valid.

Cointegration Test
Cointegration is a long-term relationship between variables in research that although not individually stationary, but the linear combination between these variables can be
stationary. There are several methods used to perform cointegration tests, such as the Engle-Granger Cointegration Test, Johansen Cointegration Test, and Cointegration Regression Durbin-Watson Test. While determining the deterministic assumptions underlying the formation of the cointegration equation is seen in the value of the information criteria of AIC and SC. Based on these assumptions, information about the number of cointegration relationships between variables is obtained based on the Trace and Max methods.

**Impulse Response Function (IRF)**

IRF describes how the response of each endogenous variable at all times to the shock (shock) of other variables and or the variable itself to endogenous variables. The IRF can also identify a surprise at one endogenous variable so that it can illustrate how an unexpected change in the variable affects the other variable over the selected time. Thus, IRF is used to see the contemporary effect of an independent variable if it gets a shock or innovation to the dependent variable of one standard deviation and to know how long the effect of the shock occurs on one variable against another variable.

**Forecast Error Variance Decomposition (FEVD)**

Forecast Error Variance Decomposition (FEVD) is a method used to see how changes in a variable are reflected by changes in variance error due to the influence of other variables. This method divides variations on one endogenous variable into shock components from endogenous variables in VAR.

**RESULT AND DISCUSSION**

As an index measuring performance and trends in the market movement of state bonds in Indonesia, INDOBexGB basically contains a collection of Government Securities (SBN) with fixed rate coupons and Government Sharia Securities (SBSN) Ijarah contracts contained in Indonesia during the last six years from 2009 to 2016. The type of INDOBexGB index calculation used in this study is the Effective Yield (EY) which describes the movement of the yield rate of all bonds, which is calculated based on the increase or decrease in bond yield levels and has been take into account accumulated accrued interest (accrued interest). All variables used in this study are expressed in the form of natural logarithms (log) except variables in percent (%).

| Table 2 | Description of Research Variables |
|---------|-----------------------------------|
|         | INDOBEXGB | LJUB     | LIHK    | BIR     | LKURS   | LCD     | LOIL     |
| Mean    | 7.749142  | 15.02438 | 4.667798| 6.633929| 9.281616| 4.639338| 4.318688|
| Median  | 7.961100  | 15.05798 | 4.668046| 6.625000| 9.208038| 4.677937| 4.458813|
| Maximum | 9.960500  | 15.42594 | 4.844187| 7.750000| 9.574713| 4.825109| 4.735584|
| Minimum | 5.697400  | 14.54136 | 4.477337| 4.750000| 9.051579| 4.242190| 3.513335|
| Std. Dev.| 1.106184  | 0.260280 | 0.113586| 0.790042| 0.170991| 0.126041| 0.337884|
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| Variable       | Skewness  | Kurtosis  | Jarque-Bera | Probability | Sum Sq. Dev. | Observations |
|----------------|-----------|-----------|-------------|-------------|--------------|--------------|
| INDOBEXGB      | -0.212243 | 2.234440  | 2.681948    | 0.261591    | 101,5625     | 84           |
| LJUB           | -0.285268 | 1.843192  | 5.823012    | 0.054394    | 5622902      | 84           |
| LIHK           | 0.001732  | 1.632481  | 6.545420    | 0.037904    | 1070844      | 84           |
| BIR            | -0.467034 | 2.407121  | 4.283957    | 0.117422    | 5180580      | 84           |
| LKURS          | 0.189394  | 1.397687  | 9.488110    | 0.008703    | 2426737      | 84           |
| LCD            | -1.617948 | 5.22952   | 53.94387    | 0.000000    | 1318558      | 84           |
| LOIL           | -0.841905 | 2.295110  | 11.66231    | 0.002935    | 9475768      | 84           |

**Source:** *Eviews 9, data processed, 2017.*

**Unit or Stationary Root Test Stationary**

The Stationary test results in Table 4.2 show that all variables are not stationary at the level. This is indicated by the results of the Augmented Dickey-Fuller (ADF) test which are all not significant at conventional real levels or Mc Kinnon's critical values (1%, 5%, and 10%). In other words the null hypothesis which states that there is a unit root (or data is not stationary) is accepted.

**Table 3**

| Variable       | ADF Value | Description | ADF Value | Description |
|----------------|-----------|-------------|-----------|-------------|
| INDOBEXGB      | -2.404447 | Not Stationary | -8.784532 | Stationary |
| LJUB           | -2.245604 | Not Stationary | -11.24142 | Stationary |
| BIR            | -0.107247 | Not Stationary | -7.435113 | Stationary |
| LIHK           | -0.814287 | Not Stationary | -7.961111 | Stationary |
| LKURS          | -0.230788 | Not Stationary | -6.629362 | Stationary |
| LCD            | -3.460388 | Not Stationary | -7.357591 | Stationary |
| LOIL           | -0.971858 | Not Stationary | -7.565098 | Stationary |

**Source:** *Eviews 9, data processed, 2017*

**Determination of Optimal Lag**

The criteria for optimal lag selection are carried out in several stages, namely by first selecting the maximum number of lags from the VAR / VECM model that still provides stable model results. The stability of this model is determined by the modulus value that is entirely smaller than one (see Table 4) and there is no inverse root value of the AR characteristic polynomial coming out of the unit circle (Lutkepohl, 1991). This stability test can be fulfilled until the 2nd lag, so the maximum lag of the VAR model is 2.
Table 4
Polynomial Stationary Stability Test Results

| Robot | Modulus |
|-------|---------|
| 0.995693 | 0.995693 |
| 0.956208 – 0.02609li | 0.956564 |
| 0.956208 + 0.02609li | 0.956564 |
| 0.837853 - 0.079907li | 0.841655 |
| 0.837853 + 0.079907li | 0.841655 |
| 0.472807 – 031726i | 0.569391 |
| 0.472807 + 031726i | 0.569391 |
| 0.526128 | 0.526128 |
| 0.437448 | 0.437448 |
| -0.217072 – 0.271517i | 0.347622 |
| -0.217072 + 0.271517i | 0.347622 |
| -0.277830 | 0.277830 |
| 0.093676 – 0.147154i | 0.174440 |
| 0.093676 + 0.147154i | 0.174440 |

Source: Eviews 9, data processed, 2017.

The optimal lag test results from these criteria are presented in Table 5. From the results of this test it can be seen that the recommended number of optimal lags is 1 (based on FPE, AIC, SC, HQ criteria) and 2 (based on LR criteria). Furthermore, based on the results of the optimal lag selection, a VAR / VECM model of order 1 will be chosen.

Table 5
Optimal Lag Test Results

| Lag | LogL   | LR     | FPE    | AIC    | SC     | HQ     |
|-----|--------|--------|--------|--------|--------|--------|
| 0   | 366.8293 | NA     | 3.64e-13 | -8.776324 | -8.570872 | -8.693838 |
| 1   | 1062.367 | 1255.361 | 5.18e-20* | -24.54554* | -22.90193* | -23.88565* |
| 2   | 1104.689 | 69.15945* | 6.25e-20 | -24.38265 | -21.30087 | -23.14526 |

Source: Eviews 9, data processed, 2017

Cointegration Test
An equation is said to be cointegrated if its Trace Statistics value is more greater than the critical value used. From the test results it can be seen that there is a cointegration relationship shown by the existence of a cointegration equation based on the Trace-statistical value at 5% real level with a Trace Statistics value greater than the Critical Value. Thus the VAR model can be developed into a VECM model.
Table 6

Johansen's Cointegration Test Results

| Hypothesized | Trace | 0.05 |
|--------------|-------|------|
| No. of CE(s) | Eigenvalue | Statistic | Critical Value | Prob.** |
| None *       | 0.431023 | 130.8455 | 125.6154 | 0.0231 |
| At most 1    | 0.317265 | 84.60442 | 95.75366 | 0.2279 |
| At most 2    | 0.266920 | 53.30920 | 69.81889 | 0.4916 |
| At most 3    | 0.150822 | 27.84815 | 47.85613 | 0.8202 |
| At most 4    | 0.098382 | 14.44222 | 29.79707 | 0.8149 |
| At most 5    | 0.069822 | 5.949911 | 15.49471 | 0.7015 |
| At most 6    | 0.000180 | 0.014800 | 3.841466 | 0.9030 |

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

| Hypothesized | Max-Eigen | 0.05 |
|--------------|-----------|------|
| No. of CE(s) | Eigenvalue | Statistic | Critical Value | Prob.** |
| None *       | 0.431023 | 46.24106 | 46.23142 | 0.0499 |
| At most 1    | 0.317265 | 31.29522 | 40.07757 | 0.3430 |
| At most 2    | 0.266920 | 25.46105 | 33.87687 | 0.3545 |
| At most 3    | 0.150822 | 13.40593 | 27.58434 | 0.8613 |
| At most 4    | 0.098382 | 8.492309 | 21.13162 | 0.8711 |
| At most 5    | 0.069822 | 5.935111 | 14.26460 | 0.6216 |
| At most 6    | 0.000180 | 0.014800 | 3.841466 | 0.9030 |

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Source: Eview9 (processed), 2017

VECM Estimation Results

From the VECM estimation results (Table 7), the short and long term estimation coefficients are obtained for the INDOBeXGB yield equation. Estimation results show that in the short term there are five variables and one error correction variable that has a significant effect on the yield of the Government Bond Index (INDOBeXGB). The presumption of significant error correction parameters proves that there is an adjustment
mechanism from the short run to the long run. The value of the adjustment from short-term to long-term is 0.488104. Meanwhile, in the long run there are four variables that have a significant effect on the yield of the Government Bond Index (INDOBeXGB). This happens because a variable reacts to other variables takes time (lag) and in general the reaction of a variable to other variables occurs in the long run.

Table 7
VECM Estimation Results

| Variable       | Coefficient | T-statistik | Description  |
|----------------|-------------|-------------|--------------|
| Short Term     |             |             |              |
| D(INDOBEXGB(-1)) | 0.326338    | [1.92200]   | Significant  |
| D(LJUB(-2))    | 7.005804    | [1.63348]   | Significant  |
| D(LIHK(-1))    | -14.41769   | [-1.40534]  | Significant  |
| D(BIR(-2))     | 0.327601    | [1.21798]   | Not Significant |
| D(LKURS(-1))   | -4.609822   | [-1.20802]  | Not Significant |
| D(LCD(-1))     | -2.557894   | [-1.41021]  | Significant  |
| D(LOIL(-2))    | -0.900905   | [-1.39811]  | Significant  |
| C              | 0.073141    | [0.75563]   | Not Significant |
| CointEq1       | -0.488104   | [-3.38991]  | Significant  |
| Long Term      |             |             |              |
| INDOBEXGB(-1)  | 1.000000    | -           | -            |
| LJUB(-1)       | 26.72265    | [8.87892]   | Significant  |
| LIHK(-1)       | -58.06015   | [-7.56507]  | Significant  |
| BIR(-1)        | 0.112424    | [0.66548]   | Not Significant |
| LKURS(-1)      | -5.101890   | [-1.59608]  | Significant  |
| LCD(-1)        | 1.385925    | [1.15987]   | Not Significant |
| LOIL(-1)       | -1.864218   | [-4.50478]  | Significant  |
| C              | -89.99250   | -           | -            |

Source: Eviews 9, data processed, 2017

Variable money supply in the second lag significantly positive significant effect in the short term and the long term, when there is an increase in the amount of cash in circulation ar by one percent in the previous two years, it will increase INDOBeXGB yield by 7.005804 percent in the current year and increase in the long term by 26.72265 percent. Specifically the money supply that increases over a long period of time can create inflation. In this condition, people who hold more money than usual, will be more likely to use it for consumption. This is reflected in the largest contribution from GDP formation to household consumption expenditure, which is an average of 55% over the past seven years.
How is the Shock of the Macro Economics Variables and World Oil Price Effected the Yield of Indonesia Government Bond Index (Indobexgb)?

The consumer price index variable in the first lag has a negative and significant effect in the short and long term, namely when an increase in the consumer price index by one percent in the previous year, there will be a decrease in INDOBeXGB yield of 14.41769 percent in the current year and a decrease in the long term by 58.06015 percent. If the current inflation is classified as mild inflation (inflation below 10 percent a year), then it has a positive effect by encouraging a better economy, which is to increase people's purchasing power at a reasonable level, increase national income to be able to encourage economic growth in a country and make people passionate about working, saving, and investing both in securities and the real sector. Thus, an increase in inflation in the mild category can cause yield on government bonds to fall due to rising prices from increased demand for securities in the market.

The BI Rate variable in the second lag has a positive and insignificant effect in the short and long term, when there is an increase in the BI Rate of one percent in the previous two years, there will be an increase in INDOBeXGB yield of 0.327601 percent in the current year and in the long run by 0.112424 percent. These results are in line with research conducted by Bodie et. al (2009), namely an increase in interest rates will affect short-term bond yields compared to long-term bond yields. Thus, an increase in interest rates will increase the yield curve.

The exchange rate variable in the first lag has a negative and insignificant effect in the short term, ie when the exchange rate increases by one percent in the previous year, INDOBeXGB yields will decrease by 4.609822 percent in the current year. While in the long run, the variable exchange rate has a negative and significant effect that is equal to 5.101890 percent. Strengthening the exchange rate of the rupiah that occurs continuously without any weakening at all (meaning in this study is the USD exchange rate decreases), can have an impact on export values that are lower than the value of imports in a country (deficit in the trade balance) which then has an impact on increased risk premium for the country. Thus, investors will ask for a higher rate of return on the State securities instruments that they will own.

The foreign exchange reserve variable in the first lag has a negative and significant effect in the short term, that is when an increase in foreign exchange reserves by one percent in the previous year, there will be a decrease in INDOBeXGB yield of 2.557894 percent in the current year. While in the long run, foreign exchange reserves have a positive and insignificant effect of 1.385925 percent. These results are in line with research conducted by (Bramantio & Danarti, 2019) stating that a factor that can increase the risk of default on government bonds is the liquidity crisis, and foreign exchange reserves is one measure of the level of government liquidity.

The variable world oil price in the second lag has a significant negative effect in the short and long term, that is when an increase in world oil prices by one percent in the previous two years, there will be a decrease in INDOBeXGB yield of 0.900905 percent in the current year and in the long run amounted to 1.864218 percent. This is in line with Idham's research (2014) which shows the results that external pressure on an economy due to changes in world oil prices will be responded negatively by bond yields.
**Impulse Response Function (IRF)**

RF analysis will explain the impact of shock (shock) on one variable on another variable, where in this analysis not only in a short time but can analyze for several horizons (monthly) as long-term information. Based on Figure 4.1, it appears that the shock of all independent variables of one standard deviation has not had a major effect on the yield of the state bond index (INDOBeXGB), except for the yield on the index of state bonds (INDOBeXGB) itself. Statistically, the yield bond index shocks of one standard deviation with a positive value will cause an increase in the yield of the state bond index by 0.42 percent in the first month. In the long term, the yield on the state bond index will increase in equilibrium by 0.25 percent starting in the 13th month.

This means that both public expectations on bond yields in each tenor and the series itself be a considerable factor in influencing the yield of government bonds index positive. Meanwhile, statistically shocks to the money supply by one standard deviation were responded negatively by the yield on the state bond index. An increase in the money supply will reduce the yield growth of the state bond index in the second month by 0.10 percent and the fifth month by 0.15 percent. The decline began to achieve long-term stability of 0.11 percent in the 10th month. Increasing the money supply will increase liquidity which will further increase the purchasing power and bond prices. Rising bond prices cause a decrease in short-term bond yields and long-term bond yields.

**Figure 6**  
*Country Bond Index Response (INDOBeXGB) due to Shocks (JUB, CPI, BIR, EXCHANGE CD and OIL)*

Source: Eviews 9, data processed, 2017
Statistically, the CPI shock of one standard deviation caused the yield of the state bond index to increase by 0.05 percent in the 2nd month and 0.17 percent in the 6th month. This increase reached a balance in the long term in the 10th month by 0.13 percent. The rising CPI also indicates that the prices of the majority of goods or services consumed by the public tend to increase (inflation occurs). An increase in CPI will reduce consumption expenditure due to falling real consumption value and in turn will slow the economy. The economic slowdown will increase the risk which results in an increase in yield required by investors.

While the BI rate shock of one standard deviation caused the yield of the state bond index to increase by 0.07 percent in the 3rd month. The increase began to decrease in the following month until it approached the zero point in the 7th month which was 0.002 percent and was at a negative value in the 8th, 9th, and 10th months respectively by 0.004 percent and 0.002 percent. But returned to respond positively and began to reach a point of balance in the long term in the 12th month by 0.001 percent. This is due to the increase in the BI rate which is a sign of an increase in the money supply which is followed by an increase in demand for state bonds, thereby reducing the yield of the state bonds in the medium term. However, in the long run the increase in the BI rate will distort asset prices and reduce investment in bonds. This is what then makes the country's bond yields increase.

Furthermore, statistically the exchange rate shock of the rupiah against the US dollar by one standard deviation also contributed to the decline in the yield index of the country's bonds in the third month by 0.005 percent. However, in the 4th month there was a positive response by the yield on the state bond index and began to achieve long-term stability of 0.075 percent in the 14th month. The increase in the exchange rate in this study means that the rupiah has weakened against the dollar (depreciation). This will certainly have an impact on a country's exports and imports. Rupiah depreciation in the short term will stimulate an increase in export activities because the competitiveness of domestic products becomes more competitive in the international market and at the same time decreases import activities due to the high prices of imported goods, so that the trade balance becomes a surplus and decreases the yield of state bonds. But in the long run, the depreciation of the rupiah will result in an increase in the cost of imports of raw materials, equipment needed by companies and an increase in the cost of funds for companies and countries that have foreign debt in dollars, so that economic stability is disrupted and a country's risk increase which in turn will cause the country's bond yields to rise.

Meanwhile, statistically foreign exchange reserve shocks of one standard deviation were responded negatively by the yield on the state bond index. The increase in foreign exchange reserves will reduce the yield growth of the state bond index in the 5th month by 0.11 percent and the 9th month by 0.16 percent. The decline began to achieve long-term stability of 0.15 percent in the 13th month. This yield response occurs because an increase in foreign exchange reserves (which is a proxy for a country's foreign exchange liquidity) will increase capital flows from abroad, thereby increasing bond purchases and lowering government bond yields.
In addition, statistically the world oil price shock of one standard deviation caused the yield of the state bond index to increase by 0.07 percent in the 3rd month and 0.15 percent in the 6th month. This increase reached a balance in the long term in the 11th month by 0.11 percent. The increase in world oil prices can have an impact on a country's economy, where an increase in world oil prices will stimulate an increase in production costs due to the absence of substitute goods input between these factors of production. High oil prices also triggered inflation which will have an impact on rising interest rates, especially for oil importing countries. Rising world oil prices also have a negative effect on investment through increased company costs. Therefore, the bond market will respond to the impact of rising world oil prices by lowering bond prices and increasing government bond yields.

**Forecast Error Variance Decomposition (FEDV)**

Based on Table 8, if the variables that give the largest to smallest contribution to the yield of the state bond index are INDOBexGB itself, CD, CPI, OIL, JUB, EXCHANGE, and BIR. The biggest influence comes from foreign exchange reserves is caused by foreign exchange reserves is a direct proxy that describes the level of government liquidity in a country to meet its obligations in the form of state debt (bonds) or direct debt in cash. When foreign exchange reserves increase, the risk of default on government bonds decreases, so investors will tend to shift their investment to buy more government bonds and eventually cause prices to rise and yields of government bonds to fall.

**Table 8**

| Period | S.E. | INDOBEXGB | LJUB | LADJ_IHK | BIR | LKURS | LCD | LOIL |
|--------|------|-----------|------|----------|-----|-------|-----|------|
| 1      | 0.425137 | 100,0000 | 0,000000 | 0,000000 | 0,000000 | 0,000000 | 0,000000 |
| 2      | 0.612261 | 92,74194 | 3,032519 | 0,950048  | 0,295111  | 0,072745  | 1,423445  | 1,484192  |
| 3      | 0.746874 | 89,83310 | 3,282905 | 0,920745  | 1,243362  | 0,053839  | 2,696183  | 1,969865  |
| 4      | 0.852130 | 84,15051 | 5,131310 | 2,208515  | 1,113513  | 0,241361  | 3,553623  | 3,601166  |
| 5      | 0.949308 | 77,62579 | 6,864268 | 4,463132  | 1,075514  | 0,529338  | 4,264601  | 5,177355  |
| 6      | 1,032952 | 71,83472 | 7,673151 | 6,682313  | 0,924648  | 0,835171  | 5,449066  | 6,600935  |
| 7      | 1,10471 | 67,67852 | 7,931368 | 8,150684  | 0,800522  | 1,217935  | 6,760069  | 7,460903  |
| 8      | 1,178941 | 64,70039 | 8,046753 | 8,964997  | 0,712776  | 1,571361  | 8,055972  | 7,947752  |
| 9      | 1,238134 | 62,65534 | 8,096670 | 9,404737  | 0,645618  | 1,880940  | 9,158729  | 8,157970  |
| 10     | 1,293590 | 61,11144 | 8,170982 | 9,741214  | 0,591762  | 2,130744  | 9,992616  | 8,261241  |
| 11     | 1,346331 | 59,93323 | 8,238873 | 10,02281  | 0,546317  | 2,318951  | 10,61747  | 8,322350  |
| 12     | 1,397273 | 58,99653 | 8,287642 | 10,25733  | 0,507288  | 2,459799  | 11,11584  | 8,375563  |
| 13     | 1,446908 | 58,24137 | 8,323233 | 10,44257  | 0,473412  | 2,570150  | 11,52723  | 8,422031  |
| 14     | 1,495106 | 57,59843 | 8,357568 | 10,59397  | 0,443911  | 2,660468  | 11,87797  | 8,467681  |
| 15     | 1,541944 | 57,02991 | 8,393661 | 10,72769  | 0,418054  | 2,738402  | 12,17952  | 8,512769  |
| 16     | 1,587520 | 56,50920 | 8,431704 | 10,85541  | 0,395072  | 2,807460  | 12,44218  | 8,558982  |
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| Period | S.E. | INDOBEXGB | LJUB | LADJ_IHK | BIR | LKURS | LCD | LOIL |
|--------|------|------------|------|----------|-----|-------|-----|------|
| 17     | 1.631923 | 56,02994  | 8,467408 | 10,97734 | 0,374475 | 2,869665 | 12,67637 | 8,604804 |
| 18     | 1.675202 | 55,58994  | 8,498806 | 11,09066 | 0,355876 | 2,926448 | 12,88978 | 8,648485 |
| 19     | 1.717398 | 55,18861  | 8,526039 | 11,19329 | 0,339031 | 2,978734 | 13,08602 | 8,688276 |
| 20     | 1.758551 | 54,82292  | 8,550224 | 11,28568 | 0,323730 | 3,026966 | 13,26665 | 8,723834 |
| 21     | 1.798728 | 54,48950  | 8,572157 | 11,36936 | 0,307140 | 3,071401 | 13,43234 | 8,755467 |
| 22     | 1.838005 | 54,18467  | 8,592253 | 11,44583 | 0,297019 | 3,112221 | 13,58412 | 8,783888 |
| 23     | 1.876449 | 53,90533  | 8,610615 | 11,51599 | 0,285295 | 3,149685 | 13,72341 | 8,809677 |
| 24     | 1.914119 | 53,64857  | 8,627408 | 11,58047 | 0,274487 | 3,184125 | 13,85166 | 8,833281 |
| 25     | 1.951062 | 53,41174  | 8,642868 | 11,63985 | 0,264494 | 3,215888 | 13,97015 | 8,855013 |
| 26     | 1.987320 | 53,19241  | 8,657225 | 11,69478 | 0,255225 | 3,245287 | 14,07993 | 8,875146 |
| 27     | 2.022929 | 52,98850  | 8,670635 | 11,74586 | 0,246606 | 3,272594 | 14,18191 | 8,893895 |
| 28     | 2.057923 | 52,79831  | 8,683188 | 11,79355 | 0,238568 | 3,298036 | 14,27693 | 8,911429 |
| 29     | 2.092334 | 52,62044  | 8,694941 | 11,83818 | 0,231054 | 3,321810 | 14,36571 | 8,927867 |
| 30     | 2,126190 | 52,45373  | 8,705952 | 11,88003 | 0,224015 | 3,344084 | 14,44889 | 8,943298 |

Cholesky Ordering: INDOBEXGB LJUB LADJ_IHK BIR LKURS LCD LOIL

Source: Eviews 9, data processed, 2017.

CONCLUSION AND SUGGESTION

From the results of tests that have been carried out, the following research results as follows:

Shocks that occur in the money supply (M2) have a statistically significant negative effect on the yield on the state bond index (INDOBexGB). In this study it is indicated that an increase in the money supply in the community will increase the liquidity of the people who tend to allocate their money to invest in government bonds. Thus, this will increase the purchasing power and price of bonds. Rising bond prices cause a decrease in bond yields in the short and long term.

Shocks occurring on consumer prices (CPI) have a statistically significant positive effect on the yield of the state bond index (INDOBexGB). An increase in CPI will make the production costs and selling prices of the company's goods or services higher. The high price increase of the company's products will make most people reduce their purchases of these products, which will reduce consumption expenditure due to falling real consumption value and will in turn slow the economy. An economic slowdown will increase a country's risk which results in an increase in yield required by investors as compensation for the increased risk that must be borne.

Shocks that occur in the BI rate (BIR) have a statistically insignificant positive effect on the yield of the state bond index (INDOBexGB) statistically. If interest rates increase, it will relatively reduce the level of yields that have been owned by investors as a result investors will expect higher yield compensation in subsequent investments. In addition,
high interest rates will cause the cost of loans or funding (cost of funds) for companies to become large so that the price of raw materials and prices of goods or services will increase, causing high inflation due to cost push inflation and hampering investment. Thus, in the long run the increase in the BI rate will distort asset prices and reduce the value of investments in bonds. This is what then makes the country's bond yields increase.

Shocks that occur on the exchange rate of the rupiah against the dollar (KURS) have a significant positive effect on the yield of the state bond index (INDOBexGB) statistically. Rupiah depreciation in the short term will stimulate an increase in export activities because the competitiveness of domestic products becomes more competitive in the international market and at the same time decreases import activities due to the high prices of imported goods, so that the trade balance becomes a surplus and decreases the yield of state bonds. But in the long run, the depreciation of the rupiah will result in an increase in the cost of importing raw materials, equipment needed by the company and an increase in the cost of funds for companies and countries that have foreign debt in dollars, so that economic stability is disrupted and a country's risk increase which in turn will cause the yield of state bonds to increase.

Shocks that occur in foreign exchange reserves (CD) have a significant negative effect on the yield of the state bond index (INDOBexGB) statistically. This yield response occurs because an increase in foreign exchange reserves (which is a proxy for a country's foreign exchange liquidity), illustrates the risk of default on government bonds in a country to be smaller. Thus, it will increase capital inflows from abroad which have an impact on increasing purchases and prices of state bonds while reducing the yield of the state bonds. The shocks that occurred on world oil prices (OIL) had a statistically significant positive effect on the yield of the state bond index (INDOBexGB). An increase in world oil prices can have an impact on a country's economy such as an increase in inflation and an increase in interest rates. Rising world oil prices also have a negative effect on investment through increased company costs. Therefore, the bond market will respond to the impact of rising world oil prices by lowering bond prices and increasing state bond yields.

For the government as the economic authority, the issuance of government bonds (SUN) must be carried out with due regard to economic needs to achieve healthy and sustainable growth. The high coupon bonds issued will increase yields and reduce bond prices. Increased yields also have an impact on the high cost of funds (cost of funds) borne by the government and companies that use government bond yields as a benchmark. The issuance of government bonds is suggested to consider the inflation rate reflected through the consumer price index, Bank Indonesia interest rates, the rupiah exchange rate, money supply, foreign exchange reserves from internal factors and world oil prices from external factors in order to get a low cost of funds. So that the efficiency of the issuance of government bonds can be achieved.

POLICY IMPLICATIONS

On the monetary policy side, Bank Indonesia must be careful in determining interest rates. Because the BI rate is very effective in affecting investment and economic growth through changes in the money supply and inflation directly. Bank Indonesia's intervention in managing foreign exchange reserves due to the volatility of world oil prices has, in turn,
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been very effective in affecting the rupiah exchange rate. The effect of the rupiah exchange rate on long-term interest rates only until a certain period is possible for intervention by Bank Indonesia. However, continued intervention will reduce foreign exchange reserves and will affect other macroeconomics.

On the fiscal policy side, the results of the study found that the exchange rate of the rupiah and foreign exchange reserves greatly influenced the yield on the state bond index. Therefore a government policy is needed to balance the budget in order to increase foreign exchange earnings, so that it does not hamper investment growth due to high interest rates. Liability management policies and the use of hedging transactions can reduce the risk of fluctuations in the yield of SUN and other state bonds. In addition, it can be done is to deepen the domestic SBN market as a provider of low-risk financing compared to financing from the international market.

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