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GOVERNMENT BONDS YIELD (SBN-DOMESTIC), IDX COMPOSITE (IHSG), US-TREASURY BONDS YIELD 10 YEARS, AND SP500 LINKAGES: A VAR MODEL APPROACH

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ABSTRACT

The US is the country with the largest economy in the world. With the largest GDP among the G20 countries, the US power in influencing the world economy is also large. All economic, social, and political shocks that occur in the United States will be transmitted to emerging market countries such as Indonesia. This transmission will affect the performance of government bonds and the Indonesian stock market. This paper describes the type of relationship (response) that occurs between the yield of SBN Domestic variables (SBN20Y, SBN15Y, SBN10Y, SBN5Y, and SBN3Y), market index return volatility (IHSG) to the sources of shocks, and transmitting from yield variables T-Bond10Y, and SP500. The empirical model used to measure the type of relationship that occurs is by implementing a VAR (Vector Autoregression) model. The findings prove that there are dynamic linkages between the variables yield of SBN20Y, yieldSBN15Y, and yield SBN10Y on shocks originating from the yield of T-Bond10Y. The yield of SBN3Y has dynamic linkages to shock originating from the volatility of the SP500, and others have a contemporaneous relationship. The results of this study are expected to be able to add to the literature in the field of finance and investment, provide input for investors in investment decisions in determining which assets will be included in their portfolio, and last the findings of this paper in hoping contributes to the policy makers (government) in how they keep the domestic economic stability.

Keywords: *SBN, yield, VAR, Dynamic linkages and Contemporaneous*

1. Introduction

The United States of America (USA) is a country with the largest number of Gross Domestic Products (GDP) in the world; therefore, this country is called the country with the largest number and economic strength in the world. With this predicate, almost every policy change, especially in the economic and financial markets, will directly affect the economy of other countries in the world, including Indonesia, which is called external sentiment. The Federal Reserve (The Fed), which is the central bank of the United States of America, is one of the most important institutions in the world, where every policy of the Fed in setting the Fed Funds Rate (FFR) reference rate through a meeting of the Federal Open Market Committee (FOMC) will be responded to by the financial market. In various countries of the world, this is due to the integration of the world's financial markets. Figure 1.1 below will illustrate the position of the Gross Domestic Product (GDP) of the US and other countries that are members of the G-20 country group in 2020, while Figure 1.2 illustrates the volatility of the Fed Fund Rate (FFR) movement in 2000-2021. The graph proves that the position of the US GDP occupies the highest position of all the countries that are members of the G20, which is 20,936.6 (US$ billion), while Indonesia's GDP occupies the 16th position with a total GDP of 1,058.42 (US$ billion) (world bank, 2022). Meanwhile, the volatility of the Fed Funds Rate (FFR) during 2020-2021 appears to be held at around 0% to 0.25%.

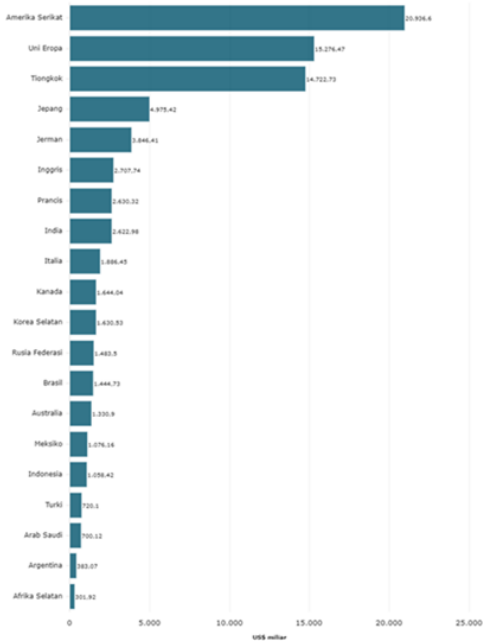

Figure1.1 GDP at G20 Countries Year of 2020 (source: worldbank, 2022)

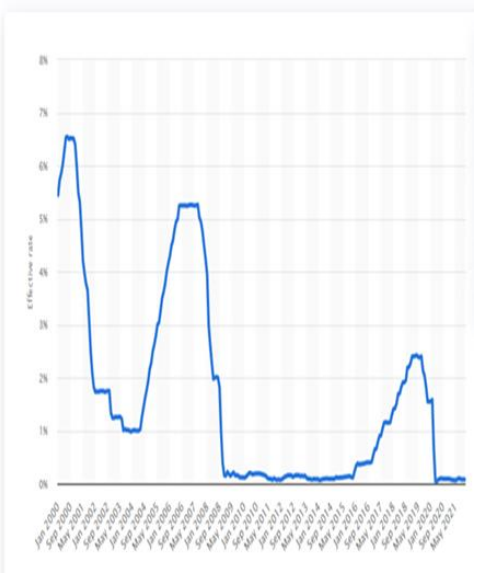

Figure1.2 Fed Fund Rate (FFR) Year of 2000 to 2021 (source: statista, 2022)

Research on the effect of domestic macroeconomic variables (bank credit, house prices, and GDP) and financial cycles on the monetary policy of the Fed (Fed's monetary policy) in Taiwan has been carried out by Han Liang Cheng et al. (2020). The research findings say that Taiwan is closely related to other countries such as China in the fields of trade and finance, and empirical results prove that there are spillover effects from the Fed's monetary policy. Domestically, research conducted by Rio Putri Paramita and Irene Rini Demi Pangastuti (2016) says that interest rates have a positive and significant effect on the yields of Indonesian and Thai government bonds but have no effect on the yields of Malaysian and Philippine government bonds. SBN is an investment product in the form of government bonds (SUN) issued by the government. The purpose of the issuance of SBN is to cover the government's budget deficit through loans originating from within the country; then, these loans are used to finance the APBN (State Revenue and Expenditure Budget) and open opportunities for the public as investors to be able to contribute in financing the country's development (OCBC NISP, 2021). Foreign ownership in SBN will affect the volatility of the SBN yield. If the portion of foreign ownership is still above 30% or close to 40%, the price will surely fall while the yield will rise (Sri Mulyani). Figure1.3 below illustrates the composition of government debt as of November 21, 2021. From the graph below, it can be concluded that the ownership of domestic investors in SBN has dominated. By the end of 2021, foreign investors' ownership of SBN was already below 20% (Sri Mulyani & APBN KiTA, 2022).

US Treasury Bonds (T-Bond10Y) is a type of United States government bond which is considered an alternative type of fixed income asset investment that is a safe haven and is usually in demand by investors when economic conditions are considered unfavorable and temporary. Fundamental conditions and the influence of global factors affect bond yields (Belke, Dubova & Volz, 2018). Satria Sambijantoro (2021), in his report published on the marketbisnis.com website on January 7, 2021, said that the increase in the yield on the 10-year US Treasury account (T-Bond10Y) had a positive impact on the Indonesian debt market. In line with this statement, the findings of research conducted by Sandoval Paucar G (2020). In the conclusions, he said that there was a dominance of the US Bond Market in spillover effects, and he also concluded that by using the VAR model, it was proven that US markets significantly influenced the Columbian Stock Market. Different results were found in the results of Sum V (2017) research which conducted research on stock market performance in ASEAN countries against uncertainty in US economic policies. This conclusion is in line with the findings of an empirical study by Pijak.V., Swinkels. L (2015), in his research, said that there is a correlation between US investment grade corporate bonds, US corporate high yield bonds, and US dollar-denominated in emerging market countries. In this study, the variables tested were yields on corporate bonds and not yields on government bonds.

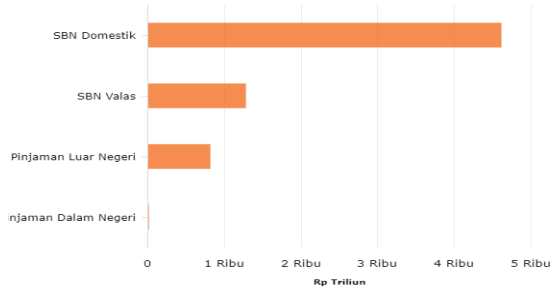

Figure 1.3 Composition of Government Debt 2021
(source: Ministry of Finance Indonesia, 2021)

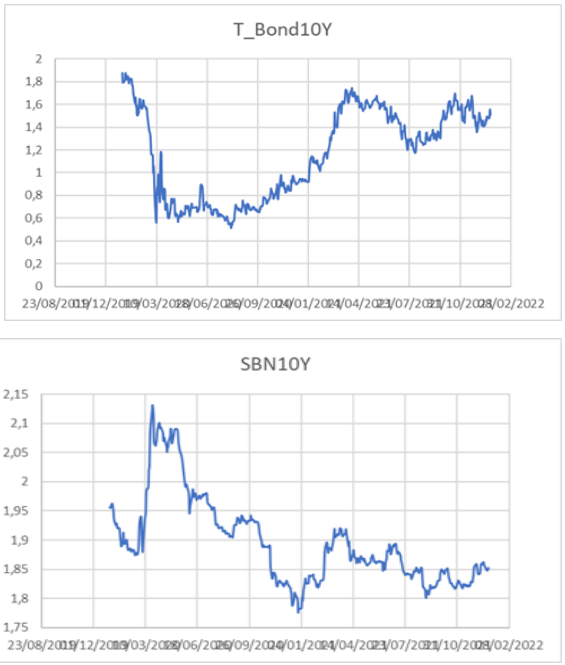

Figure1.4 Yield Volatility T-Bond10Y and SBN10Y
(source: investing.com, 2022)

In the period 2020 to 2021, research that measures the dynamics linkages between shocks that occur in one country and several indicators of macroeconomic variables in other countries has been carried out. Dhingra V.S, Patel P (2021), who researched Financial Linkages and Interdependencies in the BRICS group of countries (Brazil, Russia, India, China and South Africa) using the Government 10year bond yield variable. Sandoval Paucar G, 2020). Eleftheria Kostika and Nikiforos T. Laopodis (2019) using the vector autoregressive (VAR) model say that there is no short-term and long-term relationship between cryptocurrencies on currency exchange rates and global equity markets returns. Based on the results of several studies that have been described above, what has attracted attention in Indonesia is the lack of research that measures the dynamics linkages between shocks that occur in the US as the largest economic power in the world, which is reflected in changes in (volatility) yields on the US government benchmark bonds (T-Bond10Y), and the SP500 index price with market yields for domestic government bonds (SBN) in various tenors and IHSG.

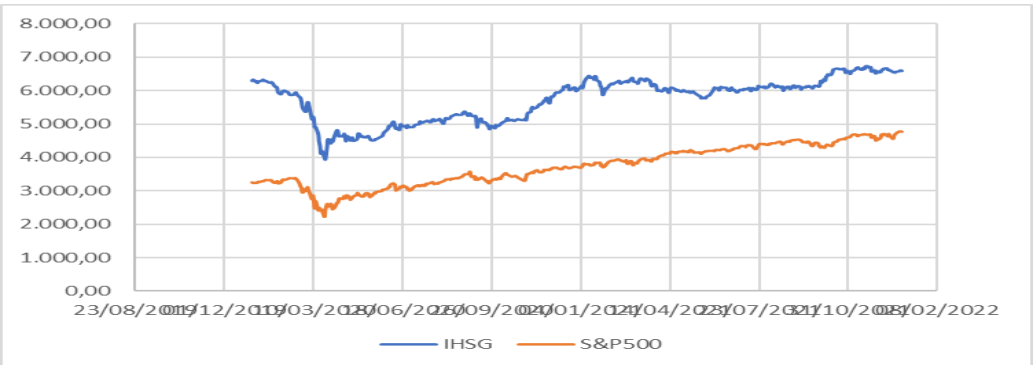

Figure 1.5 Volatility of S&P 500 and IHSG
(source: investing.com, 2022)

2. Literature Review

Integration in the capital market has become a very important thing to know, especially when there are economic, trade and investment relations between countries. Eitmen (2007) said that market integration is a condition where stock prices in various capital markets in the world have a very close relationship (closely correlated) between each capital market in the world. From this definition, it can be said that the higher the correlation between capital

markets around the world, the higher the international stock price will be and this of course will also provide unlimited means for all investors from various countries in the world to form an international investment portfolio. Another definition of market integration is described by Click and Plummer (2003), who say that from the point of view of investors who have portfolios, market integration shows that two different markets have the same direction of movement and are correlated. The integration of financial markets at one time will lead to smaller portfolio diversification opportunities. Simultaneous market movements (comovement) will lead to contagion and ultimately a higher level of correlation, thereby reducing opportunities for diversification (Hyde, Bredin & Nguyen; 2010). This reduced opportunity to diversify is due to the high correlation, so that when a shock occurs in the financial market of a country, it will transmit (contagion) quickly to the financial markets of other countries in the world. Greene (2008), Gujarati (2008) and Hamilton (2001) explain that the response as a concept of the combined impact of various parameters that come directly, indirectly and dynamically (not instantaneously). Dynamic linkages occur because of the indirect impact, interdependence between variables and over time on the shock of other transmitting variables (Wen et al., 2014). Referring to a research article conducted by Eleftheria Koskita and Nikiforos T. Laopodis (2019) which explains that dynamic linkages in time series data are divided into two types, namely short and long run dynamic linkages or better known as the cointegration test, these dynamic linkages were obtained by building a vector autoregressive (VAR) model. Chen et.al (2018) conducted research on dynamic linkages in the bitcoin market using the VAR model to determine bitcoin's dynamic interdependence, this analysis was carried out by cointegration test. Research conducted by Jaramillo and Weber (2012) said that the yield level of domestic long-term government bonds in 26 countries including Indonesia was strongly influenced by investors' expectations of other macroeconomic indicators, in line with these findings, previous research from Belke, Dubova and Volz (2018) stated that fundamental conditions and the influence of global factors affect bond yields. Miyajima Mohanty and Chan (2012) in their research conclude that the yield rate of US Treasury Bonds is the dominant indicator in determining the yield of domestic government bonds in developing countries. Research conducted by Bianconi.M, Yoshino.J. A, and Machado De Sousa M.O. (2012) who conducted research on Behavior stocks and bonds in the BRIC countries against US Financial Stress in the period January 2003 – July 2010. The results of the study reveal that in the long term the deviations that occur in the BRIC stock and bond markets are more influenced by US financial stress than the deviations originating from the BRIC countries. Lihong Wang (2013) has investigated dynamic linkages in the stock market in East Asian countries during the 2007-2009 global financial crisis using the Vector Autoregression (VAR) model approach. global financial crisis financial markets in east asia have very strong dynamic linkages, the capital markets of South Korea and Japan have a strong response to shocks originating from the US. The latest research from Dhingra V.S, Patel P (2021), which examines Financial Linkages and Interdependences in BRICS countries using the Government 10-year bond yield variable and the results of the study reveal that based on the results of the Johansen cointegration analysis there is a long-term relationship between BRICS countries while the relationship between short term is not significant. the hypothesis developed by the author is to test whether there are dynamic linkages between domestic SBN yields in various tenors and IHSG with a T-Bond10Y yield in 2020-2021 is as follows:

H1: There is a dynamic linkage between the yield of SBN domestic (SBN20Y, SBN15Y, SBN10Y, SBN5Y and SBN3Y) and the IHSG and the yield of treasury bonds (T-Bond10Y) in 2020-2021.

Vo and Tran (2020) say that the volatility that occurs in the US capital market will be responded significantly by the ASEAN capital market, in their research proving that there is cointegration in the ASEAN equity market and the influence of external parties such as the US on the stock market in the ASEAN region. In line with that, Aimprasittichai et. Al. (2015) said that the shock that occurred in the American stock market would be quickly transmitted to the stock markets of other countries in an easily identifiable manner, but that no foreign stock market could significantly influence the movements and behavior of the US stock market. the hypothesis developed by the author is to test whether there are dynamic linkages between domestic SBN yields in various tenors and The IHSG with the volatility of the S&P 500 index in 2020-2021 is as follows:

*H2: there is a dynamic linkage between the yield of domestic SBN (SBN20Y, SBN15Y, SBN10Y, SBN5Y and SBN3Y) and the IHSG and the volatility of the S&P 500 index in 2020-2021***.**

3. Research Method

3.1 Descriptive Analysis

The characteristics of the data used in this study are time series data with high frequency, namely yield and volatility of Government Securities (SBN domestic) with a tenor of 20 years (SBN20Y), 15 years (SBN15Y), 10 years (SBN10Y), 5 years (SBN5Y) and 3 years (SBN3Y), IHAG returns and volatility, 10year US Treasury Bond

yields and volatility (T-Bond10Y), SP500 index returns and volatility and returns. Daily data was chosen by researchers because daily data has the ability to capture more information when compared to weekly or monthly data (Lie & Giles, 2013), while another reason is in accordance with Nelson (1991) who said that the greater the frequency of data, the higher the frequency of data. the persistence of volatility is getting bigger too. Daily data on SBN and T-Bond10Y yields were downloaded from worldgovernmentbonds, while daily data for IHSG, SP500 was downloaded from investing.com. and the calculation of yield and return is calculated based on the closing price. Data population is starting from january-02-2020 up to 12-30-2021, and after the selection the relevant data that included to the sample is 481 observations. Data in the form of returns is obtained by using the normal return log of each variable in this study, with the following formulation:

$Rt = Ln (Pt/(Pt-1)$ (3.1)

Where: Rt = Return at time t, Pt = Asset price at time t, Pt-1 = asset price at time t-1

3.2. StationarityTest

Stationary tests must be carried out on all variable data used in the study before further modeling is carried out. The formal stationary test can be tested using the Augmented Dickey Fuller (ADF) test at a confidence level of alpha = 5% (α = 5%). The hypotheses used in the stationary test are:

Ho: Data contains unit root (not stationary)

H1: Data does not contain unit root (stationary)

3.3 Impulse Response Functions (IRF) Cholesky

The Cholesky model is used because it is able to test the response behavior of each variable over time (dynamic) with the assumption that there is transmission of the variable that causes shock. Greene (2008), Gujarati (2008) and Hamilton (2001) say that the response as a concept of the combined impact of various parameters that come directly, indirectly and dynamically (not instantaneously). The following are the assumptions applied to Cholesky's IRF interpretation:

1. In the VAR model using the Cholesky method, the response at t=1 can be said to be an instantaneous relationship (immediate impact from various directions) (contemporaneous). The response at t>1 is said to be a response because of the dynamic and interdependent relationships of different unit variables.

2. Contemporaneous impact records the transmission between variables at the same time. This impact can be used to prove that the transmission between variables occurs according to the theory through:
   a) The form of a positive or negative response is in accordance with the theory.
   b) The form of the response that is close to zero indicates that propagation on the transmission line does not occur.

3) Dynamic response when t>1 records indirect and intertemporal (dynamic) impacts. The following responses can be used to prove that the dynamic impact between variables is in accordance with the theory through:

   a. The form of a positive or negative response is in accordance with the theory.
   b. The form of the response that is close to zero indicates that propagation on the transmission line does not occur.
   c. The form of the response that is getting more convergent (the more disappears close to zero) shows the variable response due to the shock is getting smaller because all the time there are interactions between other variables.
   d. The form of a persistent response (holding on a certain pole) shows that the variable response due to the shock persists even though there is interaction between other variables all the time.

The basic VAR model equation developed by Sims (1980) is as follows:

$$Yt = a + \sum_{i=1}^{k} bi\, Yt - i + et \quad (3.2)$$

The equations of VAR at lag 1 are:

$$Yt = \alpha_{1i} + \Sigma\, \beta_{1i}\, Y_{t-1} + \Sigma Y_{1i} X_{t-1} + et \quad (3.3)$$

$$Xt = \alpha_{2i} + \Sigma\, \beta_{2i}\, Y_{t-1} + \Sigma Y_{2i} X_{t-1} + et \quad (3.4)$$

The equation of the VAR model with a number of endogenous variables at lag 1 used to estimate the dynamic linkages in this study are:

$$\textit{Yield}SBN_t = \alpha_{10} + \beta_{11}\textit{Yield}SBN_{t-1} + \beta_{12}\, IHSG_{t-1} + \beta_{13}\textit{Yield}T\text{-}Bond10Y_{t-1Y} + \beta_{14}SP500_{t-1} + e_{1t} \quad (3.5)$$

$$IHSGt = \alpha_{20} + \beta_{21}\textit{Yield}SBN_{t-1} + \beta_{22}\, IHSG_{t-1} + \beta_{23}\textit{Yield}T\text{-}Bond10Y_{t-1} + \beta_{24}SP500_{t-1} + \beta + e_{2t} \quad (3.6)$$

$$\textit{Yield}T\text{-}Bond10Y_t = \alpha_{30} + \beta_{31}\textit{Yield}SBN_{t-1} + \beta_{32}\, IHSG_{t-1} + \beta_{33}\textit{Yield}T\text{-}Bond10Y_{t-1} +$$

$$\beta_{34}SP500_{t-1} + e_{3t} \quad (3.7)$$

$$SP500_t = \alpha_{40} + \beta_{41}Yield\text{SBN}_{t-1} + \beta_{42}\,IHSG_{t-1} + \beta_{43}Yield\text{T-Bond10Y}_{t-1} + \beta_{44}SP500_{t-1} + e_{4t} \quad (3.8)$$

Where: *Yield*SBN = *yield* (SBN-Domestic), IHSG= *return* on IDX Composite (IHSG), *Yield*T-Bond10= *yield US Treasury Bonds* (T-Bond10Y), SP500= *return* on SP500, t-1= optimum lag (lag 1), *e*t = residual error

4. Results and Discussion

4.1 Descriptive Statistic Analysis

Table 4.1 Summary of Statistic Deskriptive

(source: data processed by eviews)

	SBN20Y	**SBN15Y**	**SBN10Y**	**SBN5Y**	**SBN3Y**	**IHSG**	**T-Bond10Y**	**SP500**
Mean	-0,0001	-0,0003	-0,0002	-0,0004	-0,0006	0,0002	0,0011	0,0009
Median	-0,0003	-0,0001	-0,0002	-0,0012	-0,0011	0,0004	0,0000	0,0014
Maximum	0,0468	0,0672	0,0437	0,0586	0,0969	0,1020	0,4446	0,0980
Minimum	-0,0432	-0,0358	-0,0451	-0,0444	-0,0805	-0,0658	-0,2768	-0,1038
Std.Dev.	0,0061	0,0073	0,0085	0,0104	0,0140	0,0134	0,0560	0,0165
Skewness	0,9138	2,2002	-0,0334	1,0466	0,7132	0,2796	1,3736	-0,6671
Kurtosis	17,9926	28,6714	9,9840	10,2026	13,2053	12,3635	20,3397	15,9965
J-B	4619,41	13737,33	987,82	1139.24	2150,23	1781,76	6241,27	3456,48
Probability	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Observations	486	486	486	486	486	486	486	486

4.2 Correlation Test

Table 4.2 Summary fo Correlations Test (source: data processed by eviews)

	SBN20Y	***SBN15Y***	***SBN10Y***	***SBN5Y***	***SBN3Y***	***IHSG***	***T_BOND10Y***	***SP500***
SBN20Y	1							
SBN15Y	0,563917	1						
SBN10Y	0,577165	0,636092	1					
SBN5Y	0,521464	0,581653	0,75948	1				
SBN3Y	0,147487	0,146773	0,101618	0,072664	1			
IHSG	**-0,22396**	**-0,27038**	**-0,37243**	**-0,37148**	**-0,03612**	1		
T_BOND10Y	**-0,01327**	**-0,14355**	**-0,01147**	**-0,1545**	0,100349	0,108011	1	
SP500	**-0,02239**	**-0,04138**	**-0,12486**	**-0,20686**	0,029391	0,379084	0,471144	1

4.3 Stationarity Test

Based on the results of the ADF test, it is concluded that the data variables are stationary at the level

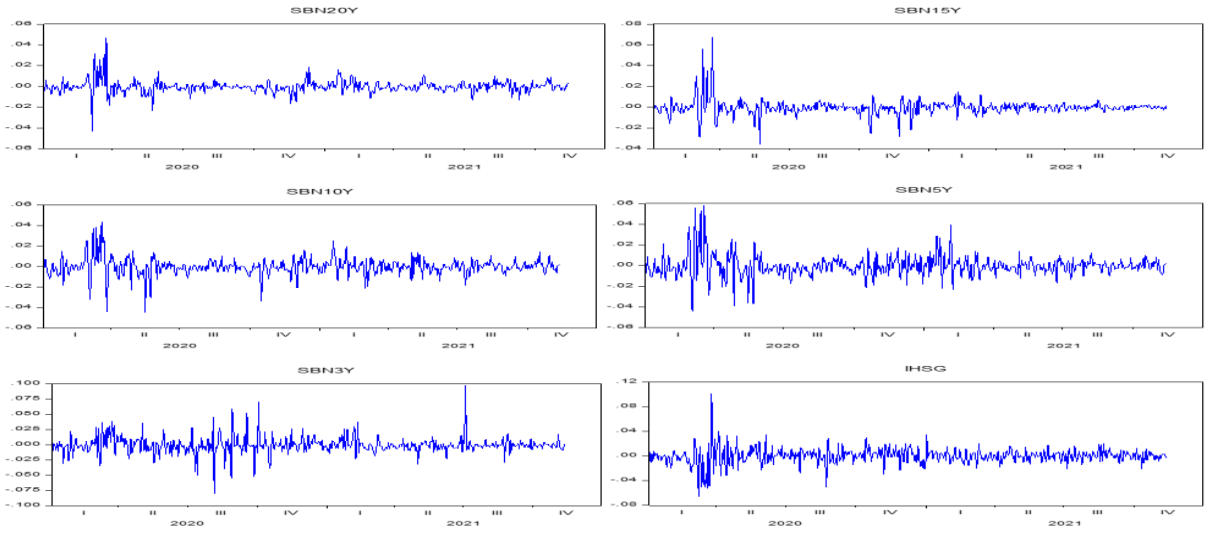

Figure 4.1 Stationary test data variabels in level

4.4 VAR Model Estimation

Based on the lag- length criterion test, the maximum lag chosen based on the Schwarz Information Criterion (SC) is lag-1 in the research period. The second step of the estimation of the VAR model is the optimum lag length stability test (1 1). The stability test of the VAR model is tested before conducting a more in-depth analysis, this is done because if the VAR estimation model combined with error correction is unstable, then the Impulse Responses Function (IRF) analysis is invalid. The modulus value below one (<1) indicates that the VAR estimation model used is free from stability problems (stable). Based on the stability test in this paper, the modulus value has below 1 (<1) it means that the VAR estimation model used is stable and valid for use in the Impulse Response Function (IRF) analysis stage.

4.4 Impulse Response Function (IRF) Vector Autoregression (VAR) Analysis

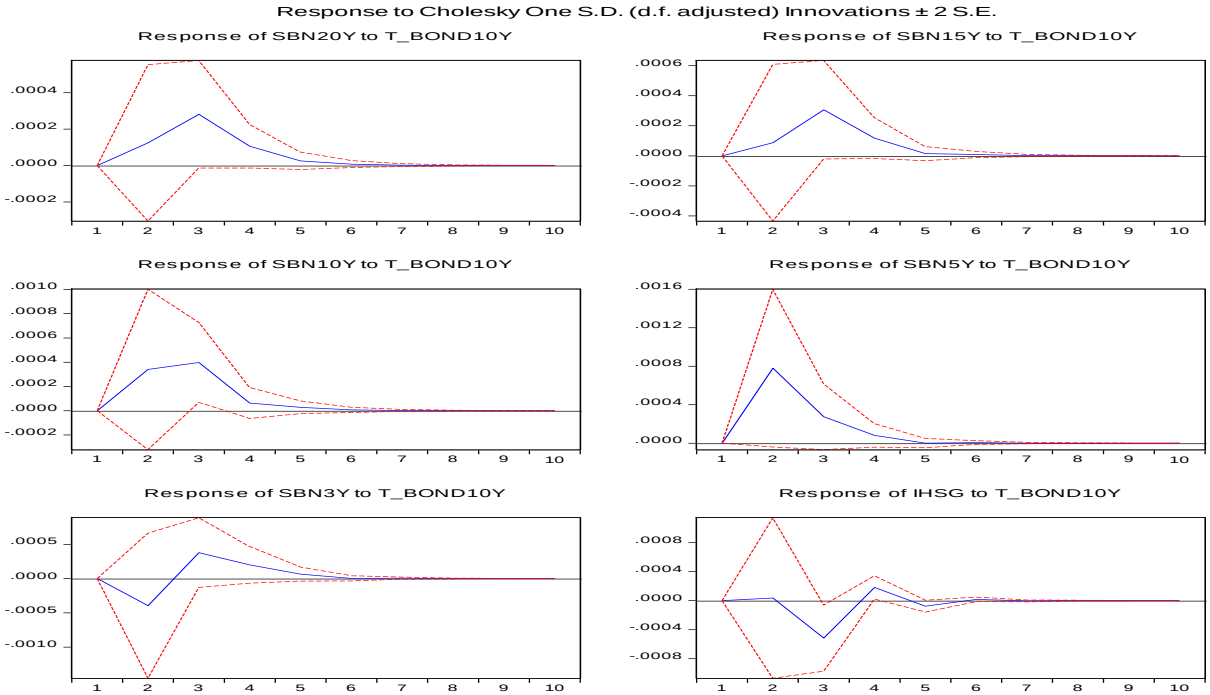

Figure 4.2 Impulse Response Functions (IRF) Yields of each SBN-Domestic (SBN20Y, SBN15Y, SBN10Y, SBN5Y and SBN3Y) and the IHSG to T-Bond10Y Shock

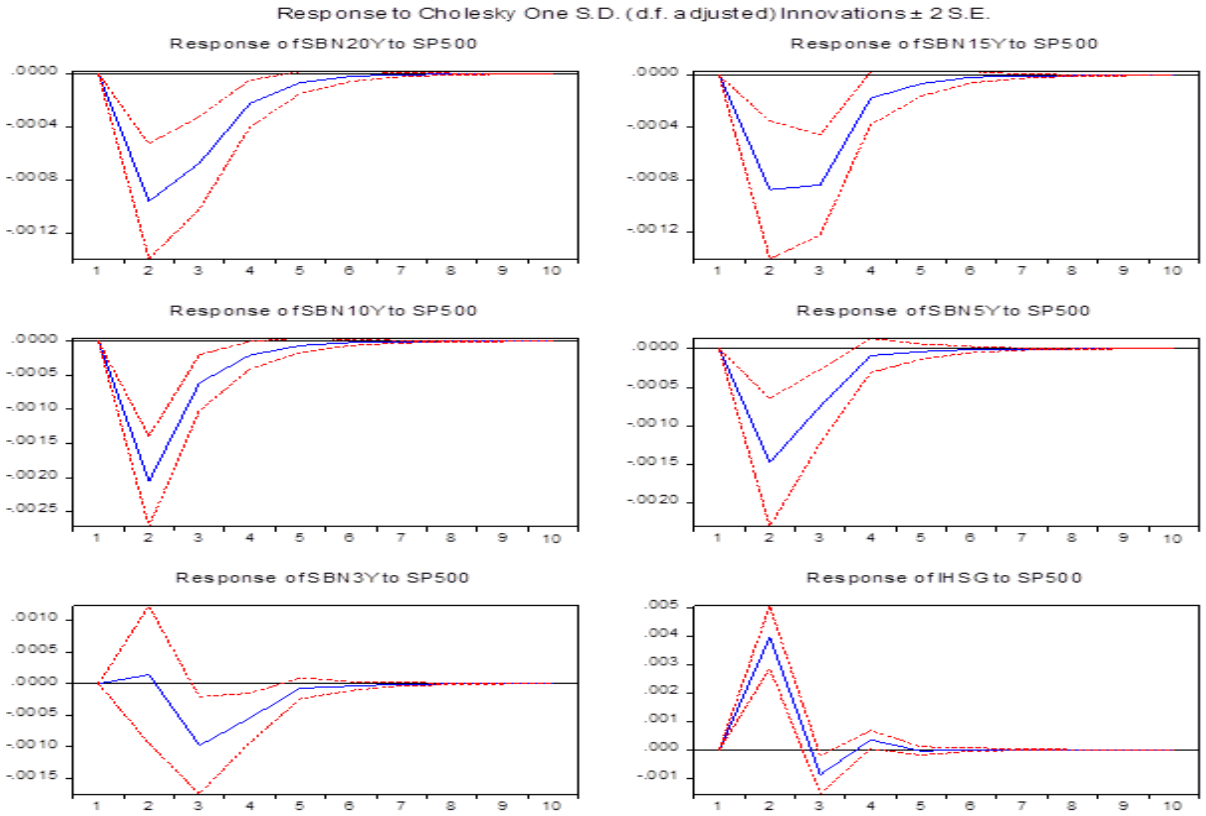

Figure 4.3 *Impulse Response Functions (IRF) yield*s of each SBN Domestic (SBN20Y, SBN15Y, SBN10Y, SBN5Y dan SBN3Y) and IHSG to SP500 Shock

4.5 Impulse Response Function (IRF) Vector Autoregression (VAR) Summary

Source of shock in VAR model	Endogenous Variabel VAR	Response time period	Convergent period	Conclusion
yield T-Bond10Y	*yield* SBN20Y	t=2	t=6	There is a *dynamic linkage*
	yield SBN15Y	t=2	t=6	There is a *dynamic linkage*
	yield SBN10Y	t=2	t=5	There is a *dynamic linkage*
	yield SBN5Y	t=1	t=6	There is no *dynamic linkage (contemporaneous)*
	yield SBN3Y	t=1	t=6	There is no *dynamic linkage (contemporaneous)*
	return IHSG	t=2	t=7	There is a *dynamic linkage*

Source of shock in VAR model	Endogenous Variabel VAR	Response time period	Convergent period	Conclusion
return SP500	*yield* SBN20Y	t=1	t=7	There is no *dynamic linkage (contemporaneous*
	yield SBN15Y	t=1	t=6	There is no *dynamic linkage (contemporaneous*
	yield SBN10Y	t=1	t=6	There is no *dynamic linkage (contemporaneous*
	yield SBN5Y	t=1	t=7	There is no *dynamic linkage (contemporaneous*
	yield SBN3Y	t=2	t=7	There is a *dynamic linkage*
	return IHSG	t=1	t=5	There is no *dynamic linkage (contemporaneous*

4.6 Robustness Check

In this study, a robustness check was carried out to test the persistence of the model used. The robustness test is carried out by changing the length of the lag length criterion and a different sequence of variables, a similar method has been used by Diebold, and Yilmaz (2012). the optimum lag chosen based on the Akaike Information Criterion (AIC) is lag-2 in the research period. the optimum lag stability test showed that the modulus value below one (<1) indicates that the VAR estimation model used is free from stability problems (stable).

4.6.1 Sensitivity to Impulse response function (IRF) cholesky method

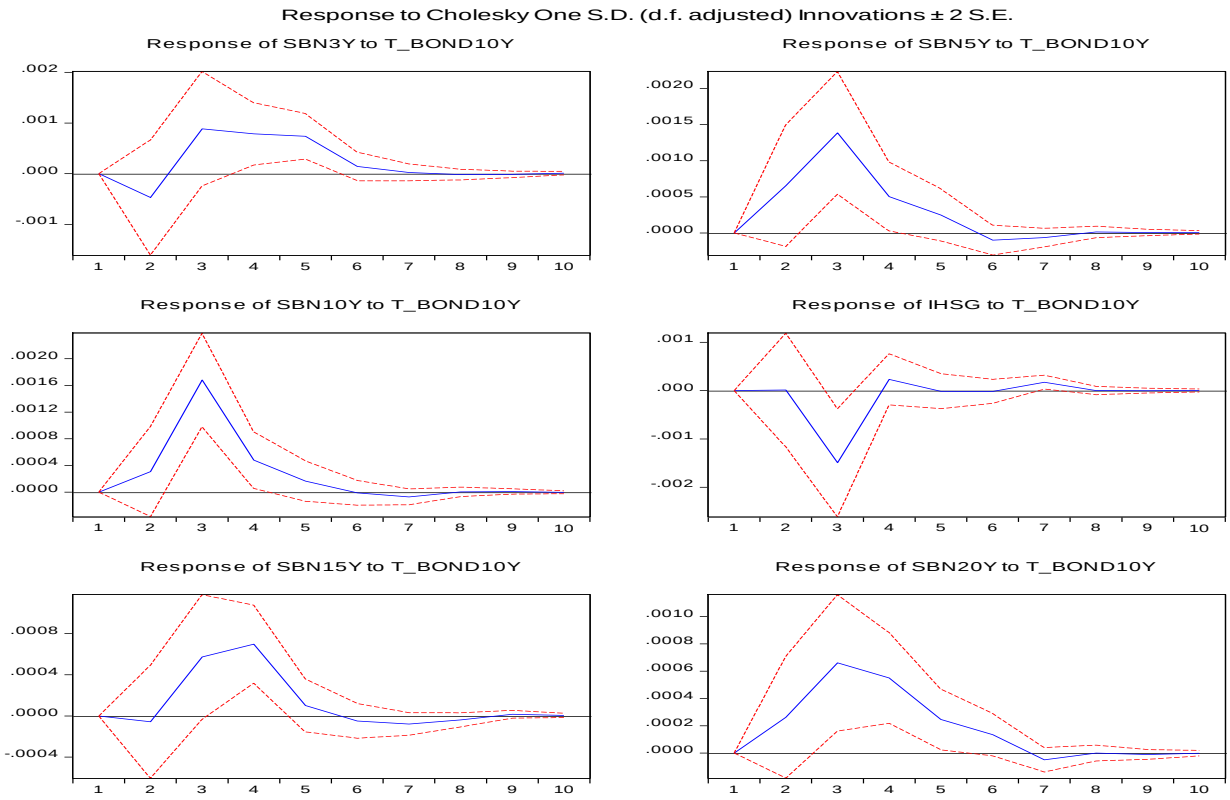

Figure 4.4 Impulse Response Functions (IRF) Yields of each SBN-Domestic (SBN20Y, SBN15Y, SBN10Y, SBN5Y and SBN3Y) and the IHSG to T-Bond10Y Shock

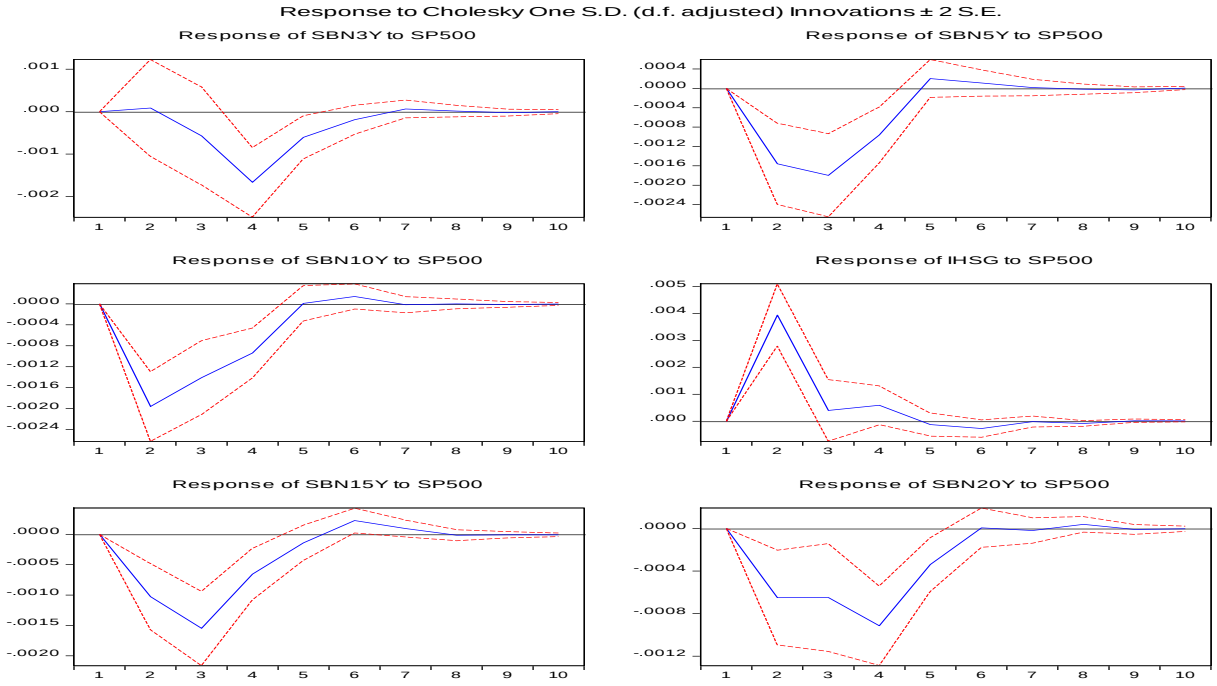

Figure 4.5 *Impulse Response Functions (IRF) yield*s of each SBN Domestic (SBN20Y, SBN15Y, SBN10Y, SBN5Y dan SBN3Y) and IHSG to SP500 Shock

4.6.2 Impulse Response Function (IRF) Vector Autoregression (VAR) Summary (Robustness Check)

Source of shock in VAR model	Endogenous Variabel VAR	Response time period	Convergent period	Conclusion
yield T-Bond10Y	*yield* SBN20Y	t=2	t=8	There is a *dynamic linkage*
	yield SBN15Y	t=2	t=9	There is a *dynamic linkage*
	yield SBN10Y	t=2	t=8	There is a *dynamic linkage*
	yield SBN5Y	t=1	t=8	There is no *dynamic linkage (contemporaneous)*
	yield SBN3Y	t=1	t=7	There is no *dynamic linkage (contemporaneous)*
	return IHSG	t=2	t=8	There is a *dynamic linkage*

Source of shock in VAR model	Endogenous Variabel VAR	Response time period	Convergent period	Conclusion
return SP500	*yield* SBN20Y	t=1	t=8	There is no *dynamic linkage (contemporaneous*
	yield SBN15Y	t=1	t=8	There is no *dynamic linkage (contemporaneous*
	yield SBN10Y	t=1	t=7	There is no *dynamic linkage (contemporaneous*
	yield SBN5Y	t=1	t=7	There is no *dynamic linkage (contemporaneous*
	yield SBN3Y	t=2	t=7	There is a *dynamic linkage*
	return IHSG	t=1	t=7	There is no *dynamic linkage (contemporaneous*

From the summary results above the IRF analysis of the Cholesky method between endogenous variables in the VAR model on the robustness check above, it can be seen that based on the results of the rubustness check there is no difference in the results of the analysis that can change the conclusions of the analysis results, the difference that not as significant as in the convergent period caused by the addition of lag.

5. Conclusion and Implications

5.1 Conclusion

The response of yields of each SBN Domestic (SBN20Y, SBN15Y, SBN10Y, SBN5Y dan SBN3Y) and IHSG to T- Bond10Y Shocks:

1) There is a dynamic linkage between the yield of SBN20Y and yield of T-Bond10Y.
2) There is a dynamic linkage between SBN15Y yield and T-Bond10Y yield.
3) There is a dynamic linkage between SBN10Y yield and T-Bond10Y yield.
4) There is no dynamic linkage between SBN5Y yield and T-Bond10Y yield.
5) There is no dynamic linkage between SBN3Y yield and T-Bond10Y yield.
6) There is a dynamic linkage between the IHSG and the yield on T-Bond10Y.

The response of yields of each SBN Domestic (SBN20Y, SBN15Y, SBN10Y, SBN5Y dan SBN3Y) and IHSG to SP500 Shocks:

1) There is no dynamic linkage between SBN20Y yield and SP500 index return.
2) There is no dynamic linkage between SBN15Y yield and SP500 index return.
3) There is no dynamic linkage between SBN10Y yield and SP500 index return.
4) There is no dynamic linkage between SBN5Y yield and SP500 index return.
5) There is a dynamic linkage between the yield of SBN3Y and the return on the SP500 index.
6) There is a dynamic linkage between IHSG returns and SP500 index returns.

5.2 Implications

Information about the type of response given by the variables in the study to shocks from other variables in volatility data (dynamic linkages or contemporaneous) has provided an overview of the risks contained in each asset, this information can be used by investors as input in determining policies. investment is like reconstructing the assets of an investment portfolio according to each investor's preference for risk. Investors who do not like risk (risk averse) should choose assets that have a dynamic response (dynamic linkages) to shocks in their portfolio, on the other hand, investors who like risk (risk takers) can choose assets that have a temporary response (contemporaneous) to shocks in its portfolio or even a combination of both.

From the analysis results, this study concludes that the majority of Domestic SBN in various tenors and the IHSG have a contemporaneous response, t = 1, meaning that Indonesia's interdependence on shocks from the US is still weak, or in other words, Indonesia's capital and financial markets are very weak. integrated with the US. Therefore, the government as a policy maker is expected to be able to strengthen the domestic macro economy so that it can reduce this integration and Indonesia's interdependence on shocks from the US is more dynamic.

For academics, the period after the COVID-19 pandemic has become a new chapter for the world economy, especially the United States. The US reached its highest peak of inflation in May 2022, forcing the Fed to raise the benchmark fed funds rate (FFR), the energy crisis in some countries in the world made commodity prices rise. These economic phenomena certainly brought many changes to the world economy, including Indonesia, such as the JCI performance in May slumped quite significantly due to the increase in the Fed's interest rate, thus further research may provide different directions and types of response patterns in different countries.

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