THE CHARACTERISTICS OF GOVERNMENT SUKUK RETURN VOLATILITY BEFORE AND DURING COVID-19, AND AFTER IMPLEMENTATION OF PRIMARY DEALER SYSTEM

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Abstract: Government Sukuk (SBSN) has been launched since 2008, but it assumed illiquid. Therefore, the Ministry of Finance in 2020 regulates primary dealer for SBSN. At the same time, the restrictions on mobility due to the Covid-19 Pandemic in 2020 triggered negative sentiment. It increased volatility in the capital market. Asymmetric volatility occurs when market crash. The purpose of this study is to identify characteristics of government sukuk return volatility before and during the Covid-19 pandemic and after the implementation primary dealer system using EGARCH. The results show that SBSN responds to shocks more quickly during the pandemic. The benchmark series responds to shocks faster than non-benchmark. Moreover, during the pandemic, PBS04, PBS05, PBS07 and PBS22 were categorized high risk-high return. PBS02, PBS11, PBS14, PBS19, and SR10 were categorized low risk-low return. PBS17, PBS12, PBS15 and PBS21 were catogerized high risk-low return. PBS02, PBS14, PBS19, PBS17, PBS12 and SR10 have negative asymmetric return volatility. Furthermore, SBSN benchmark series PBS05 and PBS25 were categorized high risk-high return, PBS02 were categorized low risk-low return, and PBS026 were categorized high risk-low return. Most of the benchmark series have negative asymmetric return volatility.

Keywords: Asymmetric volatility return, Covid-19, EGARCH, government sukuk, primary dealer

Abstrak: *Sukuk Pemerintah (SBSN) sudah diterbitkan sejak tahun 2008 namun keberadaannya masih dianggap tidak likuid. Oleh karena itu, Kementerian Keuangan pada Tahun 2020 mengatur mengenai perdagangan SBSN melalui dealer utama. Bersamaan dengan itu, adanya pembatasan mobilitas akibat pandemi Covid-19 pada tahun 2020 telah memicu sentimen negatif yang menyebabkan peningkatan volatilitas pasar modal. Pada saat terjadi market crash, terjadi volatilitas asimetri. Tujuan dari penelitian ini yaitu mengidentifikasi karakteristiknya sebelum dan selama pandemi Covid-19 serta pasca penerapan sistem dealer utama menggunakan EGARCH. Hasilnya menunjukkan bahwa guncangan lebih cepat direspon oleh SBSN pada periode pandemi Covid-19. SBSN seri benchmark lebih cepat merespon guncangan dibandingkan dengan seri non benchmark. Selain itu, selama terjadi pandemi Covid-19, seri SBSN yang masuk kategori high risk-high return adalah PBS04, PBS05, PBS07 dan PBS22. Karakteristik low risk-low return adalah PBS02, PBS11, PBS14, PBS19, dan SR10. Karakteristik high risk-low return adalah PBS17, PBS12, PBS15 dan PBS21. Selama pandemi Covid-19, PBS02, PBS14, PBS19, PBS17, PBS12 dan SR10 memiliki karakteristik volatilitas return asimetris negatif. Terakhir, SBSN seri benchmark PBS05 dan PBS25 memiliki memiliki karakteristik high risk-high return, PBS02 memiliki karakteristik low risk-low return. PBS026 memiliki karakteristik high risk-low return. Sebagian besar series benchmark memiliki karakteristik volatilitas return asimetris negatif.*

Kata kunci: *Covid-19, dealer utama, EGARCH, sukuk pemerintah, volatilitas return asimetri*

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INTRODUCTION

Government Bond (SUN) and Government Sukuk (SBSN) are sources of government financing. Although they look the same at first glance, there are fundamental differences between SUN and SBSN. Law number 24 of 2002 is the legal basis for SUN, while SBSN has a legal basis for law number 19 of 2008. SBSN is a sharia security as evidence of asset ownership, while SUN is an acknowledgment of debt securities. SBSN, in addition to financing the APBN is used for project development. In the issuance of SBSN, it must have underlying assets.

The issuance of SBSN requires a sharia fatwa and an opinion from the sharia board. Each type of SBSN issued has a different contract depending on the purpose and underlying. SBSN is issued through a Special Purpose Vehicle (SPV) while SUN is not. The yield on SUN is in the form of interest, while for SBSN, it is yield (Kementerian Keuangan, 2019a).

Although SBSN has been issued in the primary market since 2009, it still faces many challenges. SBSN is perceived as having illiquid characteristics, causing the yield on SBSN to be relatively higher than the yield on SUN with the same tenor. Foreign ownership of SBSN is also still low. In March 2021, foreign ownership of SBSN was only 2.8% (Rp21.43 trillion), lower than the ownership of SUN, which reached 27.43% (Rp929 trillion).

In order to answer the SBSN market challenges, the Ministry of Finance, through the Minister of Finance Regulation number 213/PMK.08/2019, regulates the SBSN trading process through primary dealers which implemented in 2020. The purpose of regulating the SBSN trading process through primary dealers is to improve SBSN market activities and deepen. Primary dealer of SBSN is expected to maintain and develop stability in demand for government sukuk, encourage efficiency in price formation, reduce costs of financing, create a transparent price discovery mechanism, increase liquidity in the sukuk market, maintain price stability as a mark to market reference, and provide market information that can be trusted. They can help the government formulate and adopt the right strategy to develop SBSN products and markets (Olivia, 2020).

Primary dealer of government sukuk is the bank or securities company appointed by the Minister of Finance to carry out certain obligations in both the domestic SBSN primary market and the domestic SBSN secondary market in rupiah currency with certain rights (Kementerian Keuangan, 2019b).

Reference series SBSN (benchmark series) are the SBSN series used as the basis for calculation in order to fulfill the obligations of the SBSN primary dealer. Benchmark series determined by the government every year after considering the results of the analysis on liquidity, outstanding amount, and coupon rate for each SBSN series (Minister of Finance Regulation, 2019). Along with implementing the primary dealer system, 2020 will also be a year full of challenges in the health sector and the financial sector. The existence of restrictions on social mobility has impacted expectations of a slowdown in global economy that triggers negative sentiment on financial markets. Khatatbeh et al. (2020) found negative abnormal returns in several countries such as Belgium, China, Italy, the Netherlands, and the UK after announcing the first Covid-19 case, this causes investors to shift their portfolios from risky assets to safer assets.

In June 2020, the gold price reached its highest level at $2063.54/oz (Bloomberg) due to a counter-cyclical investment vehicle (Sumner et al. 2010). Gold became global during the 2008 global financial crisis when stock prices fell, gold prices persisted and even rose (Agyei-Ampomah et al. 2013). The yield of 10-year US treasury government bonds fell to the level of 0.5% (Bloomberg). Zhou (2014) suggested that investors turn to bonds during financial turmoil to secure their investments. Baur and McDermott (2012) found that bonds behaved as a safe haven during periods of uncertainty. Senior bonds also act as a safe haven when there is high volatility in the stock market (Bianconi et al. 2013).

The rupiah weakened to reach Rp. 16,550 in March 2020, the weakest since the 1998 Asian crisis. Indonesia's risk level, represented by Credit Default Swap (CDS) with a five-year tenor, rose to 239 from the December 2020 position at level 61. Higher CDS indicates an increase in a country's credit risk (IMF, 2013). Indonesia's capital market slumped in line with the fall of the American stock market. Sari and Achsani (2017) revealed that the degree of interdependence of the Indonesian capital market on foreign stock markets experienced a significant increase after the 2007 crisis where the United State and United Kingdom had a

significant influence on the volatility of Indonesia's capital market returns. An outflow of capital out of foreign investors in SBN amounted to Rp135 trillion (ytd). This increased the yield of Indonesian government bonds, where the yield on the benchmark 10-year SUN rose to a level of 7.87 percent. This increase in yield means a decrease in the price of securities where SUN and SBSN fall by 6 percent to 10 percent within 1.5 months.

During 2020, there was an increase in the share of banking ownership of SUN and SBSN, which is inseparable from the high liquidity of the banking system. The sluggish credit distribution caused banks to invest in SBN to maintain the bank's income. This increase in the share of SBN ownership causes an increase in market risk.

Risk cannot separate from what is called volatility. The volatility in the market will create risk and uncertainty for market participants. In their research, Hamilton and Lin (1996) stated that recession is a factor that causes an increase in fluctuations in return volatility. When a market crash occurs, asymmetric volatility appears with a significant decline in security prices (Wu, 2001).

Black (1976) was the first to suggest asymmetric behavior in the volatility of financial data. Black found that information in financial markets can cause asymmetric behavior in volatility. The impact of asymmetric return volatility for the capital market is that bad news has a greater effect than the increase due to good news. Therefore, knowing the volatility asymmetry can be useful in portfolio selection, asset management, and pricing of primary and derivative assets (Engle and Ng, 1993). Sari and Achsani (2017) find that the volatility of the Indonesian stock market is asymmetric. These studies on return volatility generally use models from the GARCH family as conducted by Rahma (2016), Covarrubias et al. (2006), Sari and Achsani (2017), Muharam (2013), and Paramita and Pangestuti (2016).

Rahma (2016) in her research did not find a negative return volatility asymmetry in all SBSN tenors with data from 2013 to 2016 and with the Islamic Fixed Rate (IFR) sukuk series which are currently unpublished. Therefore, this research was made to develop research with the latest and ongoing series published by the government. This research is developing research was made by Rahma (2016) because the current Islamic financial market continues to grow. The Ministry of Finance is getting serious about developing the SBSN market, one of which is by creating a primary dealer system. Outstanding of government sukuk is getting bigger. Therefore, the researcher wants to see the characteristics of the current SBSN volatility along with the progress of the SBSN market. It is important for stakeholders to know the symmetry shape of SBSN return volatility and the characteristics of SBSN return volatility during economic turmoil such as the Covid-19 pandemic and after the implementation of the primary dealer system for government sukuk. Is the existence of the primary dealer system making a difference in the pattern of return volatility between the benchmark series and the non-benchmark series?

The purpose of this study is to provide alternative reference related to information on the characteristics of SBSN return volatility and the form of symmetry of SBSN volatility in typical situations as well as during the crisis and after the implementation of the primary dealer system using EGARCH. Furthermore, it is a reference for SBSN investors and potential investors to consider when investing in the SBSN market with a measurable level of risk. Finally, it can address the Ministry of Finance's concern about deepening the SBSN market.

METHODS

Financial data has a unique characteristic which in general has a volatility that varies over time. This issue overcome by Engle (1982) and Bollerslev (1986) who introduced the Autoregressive Conditional Heteroskedasticity (ARCH) and Generalized Autoregressive Conditional Heteroskedasticity (GARCH) models. The ARCH model has the advantage of modeling residual volatility in financial data so that heteroscedasticity and serial correlation can be overcome at the same time. In the ordinary least square method, the residual is assumed to be homoscedastic, i.e. the residual variance is constant.

The analytical method used in this study is descriptive and quantitative. Quantitative analysis used descriptive statistics and the GARCH asymmetric model, namely Exponential Generalized Autoregressive Conditional Heteroskedasticity (EGARCH) to observe the presence of volatility in the SBSN series. EGARCH refers to the model developed by Nelson in Engle and Ng (1993)

and several other studies such as Ajireswara (2014), Sari (2017), Rahma (2016), and Muharam (2013), and Bakhtiar (2020). The first stage before doing the modeling is calculating the SBSN return by converting the SBSN end-day closing price data into SBSN return. Firdaus (2011) defines return with the following formulation:

$$r_{it} = ln \frac{CPt}{CPt-1}$$

where: r_{it} (the return of SBSN series *i* on period); CP_t (the daily closing price in period *t*); CP_{t-1}(the daily closing price in period *t-1*).

The results of the transformation of SBSN closing price data into returns are then carried out with descriptive statistical analysis to analyze the volatility characteristics of SBSN return.

SBSN return is also an input variable for the EGARCH asymmetric model to observe the volatility of the SBSN series. Nelson (1991) introduced one of several asymmetric models of GARCH, namely EGARCH, by constructing the exponential ARCH. The EGARCH model can be formulated in the following equation (Sari 2017):

$$log\ \sigma_t^2 = \omega + \sum_{i=1}^{k} \beta_i \log \sigma_{t-i}^2 + \sum_{j=1}^{l} \left\{ \alpha_j \frac{e_{t-j}}{\alpha_{t-j}} + \gamma_j \left(\left| \frac{e_{t-j}}{\sigma_{t-j}} \right| - E \left| \frac{e_{t-j}}{\sigma_{t-j}} \right| \right) \right\}$$

where: γ_j (the effect of asymmetric when $\gamma_j \neq 0 \left(\frac{e_{t-j}}{\alpha_{t-j}}\right)$: sign effect); $\left(\left|\frac{e_{t-j}}{\sigma_{t-j}}\right|\right)$ (magnitude effect).

The asymmetric effect can be seen from the value of γ_j, is that when $\gamma_j \neq 0$ (γ significant) then there is an asymmetric effect, while when $\gamma_j = 0$ then there is no asymmetric effect. The ARCH parameter value consists of two parts, namely the sign effect and the magnitude effect. Sign effect $\left(\frac{e_{t-j}}{\alpha_{t-j}}\right)$ shows a difference in the effect of positive shocks with negative shocks in period *t-j* on current variance. Magnitude effect $\left(\left|\frac{e_{t-j}}{\sigma_{t-j}}\right|\right)$ shows the magnitude of the volatility in period *t-j* on current variance.

The data used in this study is secondary time series data. The data source comes from the Indonesia Bond Price Agency (PHEI) on the official website www.phei.co.id was taken in 2021. The data is closing price of government sukuk.

The samples in this study were 15 SBSN series with purposive sampling methods that included short, medium, and long term tenors (SR010, PBS014, PBS002, PBS011, PBS019, PBS017, PBS021, PBS012, PBS022, PBS004, PBS007, PBS005, PBS015, PBS026, and PBS025). The observation period is divided into three periods, namely the pre-Covid-19 pandemic period (January 2019-February 2020), during the Covid-19 period (February 2020-March 2021), and during implementation of the primary dealer system (January 2020-December 2020). Short-term tenors are SBSNs with maturities up to 2025, medium-term tenors are SBSNs with maturities up to 2030, while long-term tenors are SBSNs with maturities over 2030.

This study aims to examine the characteristics of the volatility of SBSN returns, both when financial market is in the normal condition without turmoil compared to financial market when volatility is high. Secondly, this research wants to see the characteristics of SBSN return volatility after the implementation of trading through the main dealer system. There is an overlapping period due to the implementation of the main dealer system which began to be implemented in 2020 to coincide with the occurrence of the Covid-19 pandemic. This is indeed in accordance with the objectives of the researcher who really wants to see the two objectives.

The existence of volatility in the market will create risk and uncertainty for market participants. Knowing the existence and form of volatility well will help investors in managing their investment portfolio. Hamilton and Lin (1996) found that recession is a factor that causes an increase in fluctuations in return volatility. When a market crash occurs, there appears to be asymmetric volatility (Wu, 2001). Asymmetric return volatility in the capital market will cause bad news to have a greater decreasing effect than the increase due to good news. Sari and Achsani (2017) find that the volatility of the Indonesian stock market is asymmetric.

Therefore, this study wants to see the impact of internal and external shocks on the volatility of SBSN market returns. The focus of this research is to examine the existence of SBSN return volatility, determine the form of symmetry of SBSN return volatility, and determine the characteristics of SBSN return volatility in the period before and during the Covid-19 pandemic as well as differences in the characteristics of SBSN return volatility after the implementation of the primary dealer system implemented by the Ministry of Finance in 2020.

Following are the hypotheses in this study: (1) the SBSN market is suspected to contain an asymmetric effect which refers to the fact that bad news increases volatility more than when there is good news; (2) the Indonesian SBSN market is suspected of experiencing changes in the characteristics of return volatility when a shock occurs; and the Indonesian SBSN market is suspected of experiencing changes in the characteristics of return volatility after the implementation of the main dealer system by the Ministry of Finance in 2020.

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RESULTS

Descriptive Analysis of SBSN Return

The results of descriptive statistics of daily SBSN returns are summarized in Tables 1 until Table 3, where the standard deviation indicates the volatility of SBSN returns or risk, while the mean indicates SBSN returns. Table 1 and Table 2 show the results of descriptive statistics on SBSN returns before and during the Covid-19 pandemic. The results show an increase in the standard deviation during the Covid-19 pandemic period. Before Covid-19 pandemic, the average standard deviation value of the sample SBSN return is 0.00240, while during Covid-19, it increase to 0.00336. The results show the Covid-19 pandemic has caused an increase in the volatility of SBSN returns, which means an increase in risk on SBSN.

Along with the increase in standard deviation or return volatility, there will also be a decrease in SBSN daily returns, which can be seen from the mean value of descriptive statistics. Before pandemic, the average daily SBSN return is 0.00037 decreased to 0.00007 after the pandemic. During the Pandemic period, there are two SBSN series with negative price returns, namely PBS014 and SR010.

In Tables 1 and Table 2 return-to-risk ratio analysis can be carried out where before the pandemic, short-term SBSN (PBS002, SR010, PBS014, PBS017, and PBS011) had a return-to-risk ratio higher than the long tenor. During the pandemic period, there was a slight shift where SBSN series with long tenors having a higher return-to-risk ratio, namely PBS004, PBS005, and PBS015 for the short-term series are PBS017 and PBS002.

Table 1. Descriptive statistics of SBSN return before pandemic

Series	Std. Dev.	Series	Mean	Series	Return to Risk
PBS15 '47	0.00396	PBS15 '47	0.00061	PBS02 '22	0.292
PBS22 '34	0.00360	PBS05 '43	0.00058	SR10 '21	0.202
PBS05 '43	0.00351	PBS12 '31	0.00050	PBS14 '21	0.196
PBS04 '37	0.00334	PBS04 '37	0.00048	PBS17 '25	0.179
PBS12 '31	0.00318	PBS22 '34	0.00043	PBS11 '23	0.168
PBS07 '40	0.00305	PBS07 '40	0.00042	PBS05 '43	0.164
PBS21 '26	0.00261	PBS17 '25	0.00040	PBS12 '31	0.156
PBS17 '25	0.00220	PBS21 '26	0.00034	PBS15 '47	0.153
PBS19 '23	0.00177	PBS02 '22	0.00026	PBS04 '37	0.145
PBS11 '23	0.00138	PBS11 '23	0.00023	PBS07 '40	0.139
SR10 '21	0.00092	PBS19 '23	0.00023	PBS21 '26	0.131
PBS02 '22	0.00088	SR10 '21	0.00019	PBS19 '23	0.128
PBS14 '21	0.00081	PBS14 '21	0.00016	PBS22 '34	0.119
Average	0.00240	Average	0.00037		

Table 2. Descriptive statistics of SBSN return during pandemic

Series	Std. Dev.	Series	Mean	Series	Return to Risk
PBS05 '43	0.00640	PBS04 '37	0.00033	PBS04 '37	0.061
PBS04 '37	0.00544	PBS05 '43	0.00027	PBS05 '43	0.041
PBS22 '34	0.00455	PBS17 '25	0.00014	PBS17 '25	0.037
PBS07 '40	0.00451	PBS15 '47	0.00010	PBS02 '22	0.024
PBS15 '47	0.00447	PBS22 '34	0.00004	PBS15 '47	0.023
PBS12 '31	0.00444	PBS02 '22	0.00003	PBS14 '21	0.019
PBS17 '25	0.00363	PBS12 '31	0.00002	PBS22 '34	0.010
PBS21 '26	0.00361	PBS19 '23	0.00002	PBS19 '23	0.009
PBS19 '23	0.00210	PBS07 '40	0.00002	PBS12 '31	0.005
PBS11 '23	0.00198	PBS21 '26	0.00001	PBS21 '26	0.004
PBS02 '22	0.00133	PBS14 '21	0.00001	PBS07 '40	0.004
PBS14 '21	0.00076	PBS11 '23	-0.00002	PBS11 '23	(0.012)
SR10 '21	0.00051	SR10 '21	-0.00004	SR10 '21	(0.069)
Average	0.00336	Average	0.00007		

Table 3. Descriptive statistics of SBSN return after primary dealer system

Series	Std. Dev.	Series	Mean	Series	Return to Risk
PBS05 '43*	0.00666	PBS04 '37	0.00056	PBS04 '37	0.109
PBS25 '33*	0.00519	PBS05 '43*	0.00051	PBS15 '47	0.083
PBS04 '37	0.00519	PBS15 '47	0.00041	PBS17 '25	0.081
PBS15 '47	0.00488	PBS12 '31	0.00033	PBS02 '22*	0.080
PBS07 '40	0.00471	PBS07 '40	0.00032	PBS05 '43*	0.077
PBS12 '31	0.00456	PBS25 '33*	0.00031	PBS12 '31	0.073
PBS21 '26	0.00376	PBS17 '25	0.00030	PBS21 '26	0.071
PBS17 '25	0.00371	PBS21 '26	0.00027	PBS07 '40	0.067
PBS26 '24*	0.00357	PBS26 '24*	0.00021	PBS19 '23	0.062
PBS19 '23	0.00223	PBS19 '23	0.00014	PBS25 '33*	0.060
PBS02 '22*	0.00142	PBS02 '22*	0.00011	PBS26 '24*	0.058
PBS14 '21	0.00080	PBS14 '21	0.00002	SR10 '21	0.030
SR10 '21	0.00056	SR10 '21	0.00002	PBS14 '21	0.022
Average	0.00363	Average	0.00027		

Note: *(Government Sukuk Benchmark Series)

The relationship between risk and return in Table 1 and Table 2 then is being converted relatively in to a graph as shown in Figure 1 and Figure 2. The figures shows the distribution of risk and returns, consisting of four quadrants. Quadrant I and III are quadrants with classic characteristics where quadrant I is high risk-high return, and quadrant III is low risk-low return. Meanwhile, quadrant II and IV show relatively unconventional characteristics where quadrant II is low risk-high return and quadrant IV is high risk-low return.

In before Covid-19 (Figure 1), quadrant I was occupied by SBSN with medium tenors (PBS12 and PBS022) and long tenors (PBS004, PBS007, PBS005, and PBS015). Quadrant III was occupied with short tenors (SR010, PBS014, PBS002, PBS011, and PBS019). Quadrant II was occupied by PBS027 with a short tenor category, while PBS021 inhabits quadrant IV with a relatively short tenor.

Meanwhile, during the Covid-19 period (Figure 2), there were several series shifts. Quadrant I now inhabited by PBS022 (medium tenor), long tenor (PBS004, and PBS005), and short tenor (PBS017) which is the result of shifting from quadrant II. The same series still inhabit quadrant III, but the SBSN series have negative returns (SR010 and PBS014). This is acceptable because those tenors are coming mature soon. Meanwhile, quadrant IV

is now inhabited by PBS021 and series that are shifting from quadrant I (PBS012, PBS007, and PBS015).

Table 3 shows an analysis of the return-to-risk ratio that the long -term benchmark series of SBSN (PBS005) has lower return-to-risk ratio than the non-benchmark series (PBS037 and PBS025) and below short term benchmark series (PBS002). The medium-term benchmark series (PBS025) also has a lower return-to-risk value than the non-benchmark series (PBS017, PBS012, PBS021, and PBSS019) and it is also below the short-term benchmark series (PBS002). Meanwhile, PBS002 has a higher return-to-risk value than the SBSN series with a longer tenor.

In Figure 3, for the long-term benchmark series (PBS005) has a higher level of risk than the non-benchmark series PBS004 but has a lower rate of return than PBS004. Meanwhile, PBS025 has a higher risk than the non-benchmark series, namely PBS007, PBS012, and PBS015, but it has a lower return than those series. PBS025 has a much higher risk than PBS17 but it has almost the same return as PBS017. Therefore, the long benchmark series (PBS005 and PBS025) have a higher risk with a relatively lower return than the non-benchmark series.

Best Model EGARCH

After all the classical assumption test stages have been carried out and the SBSN return data has an ARCH effect, the next step is to simulate the formation of the best EGARCH model with a combination of orders (p,q). The order simulation in this study combines the values of p = 1, 2, 3 with the values of q = 1, 2, 3 to form nine EGARCH models (p, q) for each observed SBSN return as research conducted by Reswara (2014).

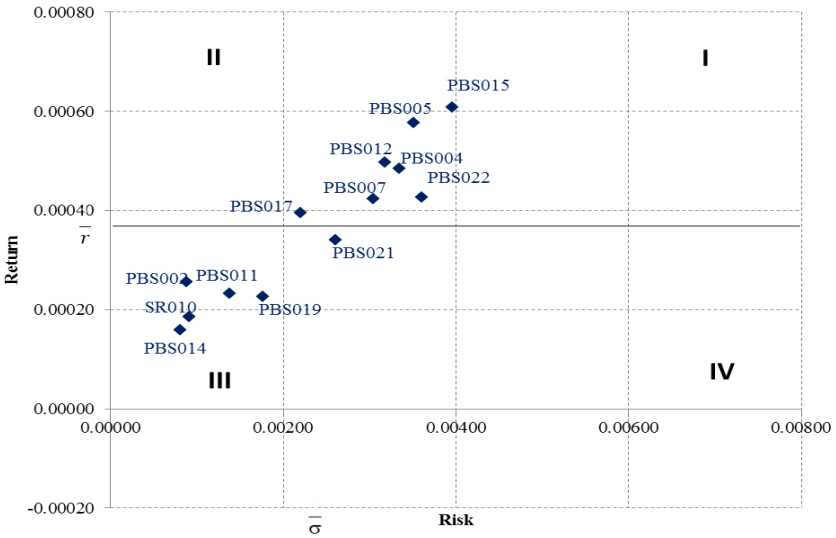

Figure 2. Distribution of SBSN risk and return before pandemic

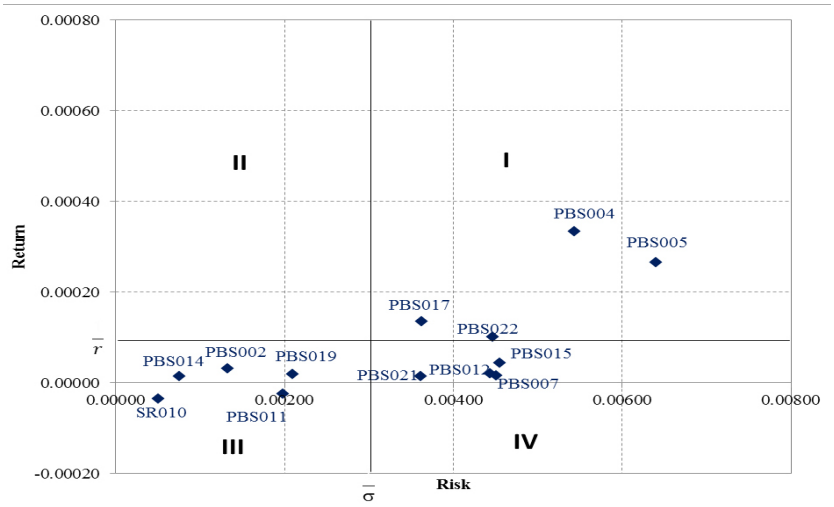

Figure 3. Distribution of SBSN risk and return during pandemic

Table 4 shows the results of the selection of the best models to describe the observed volatility in SBSN before Covid-19. From 13 SBSN series observed before the Covid-19 outbreak, six SBSN series had an ARCH effect (SR010, PBS002, PBS017, PBS012, PBS022, and PBS005). Hence, the ARCH model was only continued for the six series. The result is that all SBSN series show significant asymmetric volatility parameters. There are two SBSN series that show negative coefficient values (SR010 and PBS005). Thus, the volatility in the two series during the observation period will cause bad news to have a more significant impact on return volatility than good news. Meanwhile, PBS002, PBS017, PBS012, and PBS022 show positive and significant coefficient values indicating asymmetric volatility where positive information has a more significant influence than negative information.

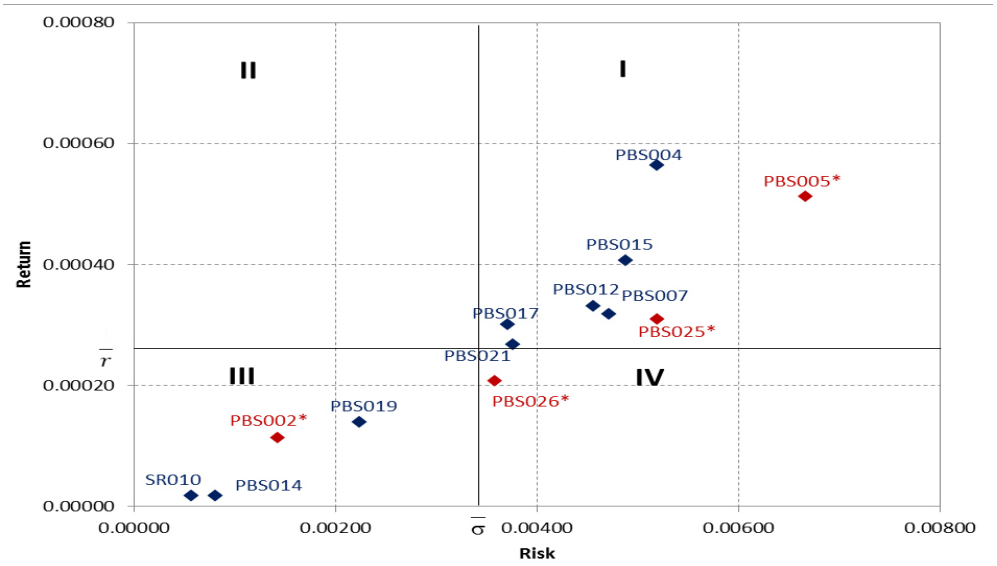

Figure 4. Distribution risk and return after primary dealer system

Tabel 4. Best model EGARCH of SBSN before Covid-19

Variable	Maturity	EGARCH Model	Volatility Asymmetric Parameter		AIC	ARCH Effect
		Ordo	Coefficient	Prob.		
PBS014	2021					
SR010	2021	(3,3)	-0.0558	0.0754*	-11.2695	doesn't exist
PBS002	2022	(1,3)	0.0730	0.0170	-11.3421	doesn't exist
PBS011	2023					
PBS019	2023					
PBS017	2025	(2,3)	0.0948	0.0308	-9.5190	doesn't exist
PBS021	2026					
PBS012	2031	(3,3)	0.0815	0.0283	-8.9799	doesn't exist
PBS022	2034	(2,3)	0.0685	0.0000	-8.7525	doesn't exist
PBS004	2037					
PBS007	2040					
PBS005	2043	(3,3)	-0.0607	0.0375	-8.5564	doesn't exist
PBS015	2047					

Note: * (significant at 10% of significance level)

Table 5 shows the results of selecting the best models to describe the volatility of SBSN observed during the pandemic. From 13 SBSNs observed from February 2020 to March 2021, one SBSN does not have an ARCH effect, namely PBS005. Hence, the ARCH model is only continued 12 SBSNs. The result is that 11 of 12 SBSN return series show asymmetric volatility parameters (PBS014, SR010, PBS002, PBS011, PBS019, PBS017, PBS021, PBS012, PBS022, PBS004, PBS007, and PBS015), while the PBS005 series does not show any significant asymmetric volatility. Five SBSN series show negative coefficient values and significant probability, namely the PBS014, PBS002, PBS019, PBS017, and PBS012 series. Meanwhile, the coefficient values are positive and significant for SR010, PBS011, PBS021, and PBS022.

During the Covid-19 period, some additional models had an ARCH effect, namely PBS014, PBS011, PBS019, PBS021, PBS004, PBS007, and PBS015. There is a pattern where orders during the pandemic are smaller than before the Covid-19 pandemic. Thus, shocks are responded to more quickly after the Covid-19 outbreak.

Table 6 shows the results of the selection of the best models to describe volatility in the benchmark and non-benchmark SBSN series. Of the 13 SBSN observed during the period January 2020 to December 2021, one SBSN benchmark series does not have an ARCH effect, namely PBS005. Thus, the ARCH model continued the three SBSN benchmark series only. The result is that all SBSN benchmark series (PBS002, PBS026, and PBS025) show negative asymmetric coefficient values and significant probabilities. As for the non-benchmark series, all have ARCH effects, and the result is that all non-benchmark SBSN series show asymmetric volatility parameters with significant probability. There are four SBSN series that show negative coefficient values and significant probability, namely PBS014, SR010, PBS019, and PBS017. Meanwhile, PBS021, PBS012, PBS004, PBS007, and PBS015 show positive and significant coefficient values. If observed further, the benchmark series has a smaller order than the non-benchmark series, which means that the SBSN benchmark series responds more quickly to shocks because the benchmark series is more liquid than the non-benchmark series.

Tabel 5. Best model EGARCH of SBSN during pandemic

Variable	Maturity	EGARCH Model	Volatility Asymmetric Parameter		AIC	ARCH Effect
		Ordo	Coefficient	Prob.		
PBS014	2021	(3,1)	-0.2964	0.0000	-12.4641	doesn't exist
SR010	2021	(2,3)	0.0767	0.0999	-13.2785	doesn't exist
PBS002	2022	(1,2)	-0.3522	0.0000	-10.8674	doesn't exist
PBS011	2023	(3,3)	0.1588	0.0001	-10.4245	doesn't exist
PBS019	2023	(1,2)	-0.0908	0.0316	-10.2786	doesn't exist
PBS017	2025	(2,2)	-0.1901	0.0000	-9.0591	doesn't exist
PBS021	2026	(2,2)	0.1341	0.0281	-9.4080	doesn't exist
PBS012	2031	(3,3)	-0.0283	0.0011	-8.7870	doesn't exist
PBS022	2034	(1,2)	0.0945	0.0001	-8.7882	doesn't exist
PBS004	2037	(1,3)	0.2708	0.0000	-8.3382	doesn't exist
PBS007	2040	(3,3)	0.0650	0.0000	-8.9031	doesn't exist
PBS005	2043					
PBS015	2047	(3,1)	-0.0036	0.8933*	-8.6375	doesn't exist

*not significance

Tabel 6. Best model EGARCH of SBSN after primary dealer system

Variable	Maturity	EGARCH Model	Volatility Asymmetric Parameter		AIC	ARCH Effect
		Ordo	Coefficient	Prob.		
Benchmark Series						doesn't exist
PBS002	2022	(2,1)	-0.3817	0.0004	-10.6775	doesn't exist
PBS026	2024	(2,3)	-0.1271	0.0001	-9.3388	doesn't exist
PBS025	2033	(2,3)	-0.1445	0.0000	-8.4883	doesn't exist
PBS005	2043					
Non Benchmark Series					-9.0591	doesn't exist
PBS014	2021	(3,1)	-0.3327	0.0000	-12.2363	doesn't exist
SR010	2021	(3,3)	-0.0867	0.0004	-12.7622	doesn't exist
PBS019	2023	(2,3)	-0.1002	0.0102	-9.8590	doesn't exist
PBS017	2025	(2,3)	-0.2689	0.0000	-8.8951	doesn't exist
PBS021	2026	(2,3)	0.0853	0.0008	-9.2203	doesn't exist
PBS012	2031	(3,3)	0.1976	0.0104	-8.6266	doesn't exist
PBS004	2037	(3,3)	0.1143	0.0090	-8.5726	doesn't exist
PBS007	2040	(3,3)	0.1079	0.0371	-8.6693	doesn't exist
PBS015	2047	(2,2)	0.0759	0.0000	-8.3847	doesn't exist

Managerial Implications

The goal of the Ministry of Finance is to make sukuk more liquid and create a transparent price discovery mechanism. This study is expected to help stakeholders in mapping out various SBSN series. For investors, this study can be used as a reference in making a ranking of SBSN based on the level of risk and return of each series as a strategy in diversifying the SBSN portfolio. For stakeholders who have the authority to make risk management policies, this study can be used as a reference in determining the budget loss for the SBSN portfolio based on the series. For the Ministry of Finance as an issuer, this study can be used as input in issuing SBSN series as and examination the extent of the impact of shocks on SBSN volatility who investors will face.

The managerial implications in this study include: For investors, this study provide reference for choosing SBSN series based on level of risks (Table 7 and Table 8). The Ministry of Finance can use this study as input in managing the issuance of SBSN series as well as knowing the extent of the impact of shocks on the volatility of the benchmark and non-benchmark SBSN series that will be faced by investors (Table 9). For example, the benchmark series PBS02, PBS25, and PBS26 have the characteristics of return volatility with a negative asymmetric shape. Thus, it is feared that bad news will have a greater effect than when there is good news. PBS26 has a high risk-low return category so that the Ministry of Finance can switch PBS26 with another non-benchmark series that is more attractive to investors. For example by replacing it alternately with the SBSN series in quadrant I or quadrant III by issuing PBS26 alternately with the non-benchmark series. This is expected to make PBS6 more attractive in the eyes of investors.

Table 7. Characteristics of SBSN return volatility before pandemic

Characteristics	Quadrant	SBSN series
high risk-high return	I	PBS04, PBS05(-), PBS07, PBS12(+), PBS15, PBS22(+)
low risk-low return	III	PBS02(+), PBS11, PBS14, PBS19, SR10(-)
low risk-high return	II	PBS17(+)
high risk-low return	IV	PBS21

Table 8. Characteristics of SBSN return volatility after pandemic

Characteristics	Quadrant	SBSN series
high risk-high return	I	PBS04(+), PBS05, PBS07(+) PBS22(+)
low risk-low return	III	PBS02(-), PBS11(+), PBS14(-), PBS19(-), SR10(+)
low risk-high return	II	-
high risk-low return	IV	PBS17(-), PBS12(-), PBS15, PBS21(+)

Table 9. Characteristics of SBSN return volatility after primary dealer system

Characteristics	Quadrant	SBSN series
high risk-high return	I	PBS04(+), PBS05*, PBS07(+), PBS12(+),PBS15(+), PBS17(-), PBS21(+), PBS25*(-)
low risk-low return	III	PBS02*(-), PBS14(-), PBS19(-), SR10(-)
low risk-high return	II	-
high risk-low return	IV	PBS26*(-)

Note: *(Government Sukuk Benchmark Series)

Primary dealers as investors who have an obligation to meet the targets set by the Ministry of Finance can consider what SBSN series to buy in order to fulfill the main dealer's obligations but with more measurable risks and returns. For example, investors should not buy the PBS26 series but they buy other benchmark series depending on their risk preferences, for example PBS05 or PBS25 in quadrant I or PBS02 in quadrant III.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

Before the pandemic, the return volatility characteristic of SBSN benchmark series has a smaller order than the non-benchmark series. Three SBSN benchmark series (PBS25, PBS02, and PBS26) have return volatility with a negative asymmetric. Based on risk and return, SBSN series are classified into high risk-high return (PBS04, PBS05, PBS07, PBS22), low risk-low return (PBS02, PBS11, PBS14, PBS19, SR10), and high risk-low return (PBS17, PBS12, PBS15 and PBS21). Based on impact, SBSN series are classified into negative asymmetric return volatility (PBS02, PBS14, PBS19, PBS17, PBS12, SR10) and positive asymmetric return volatility (PBS04, PBS07, PBS22, PBS11, PBS21). The existence of negative news or issues will have a greater effect on series with a negative asymmetric return volatility. Moreover, during the pandemic, based on risk and return, the benchmark series are classified into high risk-high return (PBS05, PBS25), low risk-low return (PBS02), and high risk-low return (PBS26). Furthermore, PBS02, PBS25 and PBS26 have a negative asymmetric return volatility characteristic. Therefore, the presence of negative news or issues will have a greater effect than the increase due to good news.

Recommendations

For further research, it is suggested to the time duration for the Covid-19 pandemic period until the end of 2021 or conducting research with the theme of increasing interest rates. Future research can also add to the 2021 benchmark series to examine the pattern compared to the previous benchmark series.

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