THE MODIFICATION OF SHARPE RATIO TO MEASURE ISLAMIC STOCK PERFORMANCE IN INDONESIA

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**ABSTRACT -** Since the late 1960s, one of the stock performance analysis tools commonly used is Sharpe Ratio. The Sharpe Ratio consists of three components, namely stock return, risk-free returns, and stock risk. Many studies approach risk-free returns with interest rates, including when measuring the performance of Islamic stocks, while interest rates are prohibited in the concept of Islamic finance. And the stock risk is measured by a standard deviation which assumes returns are normally distributed, while many stock returns are non-normally distributed. This paper will modify the Sharpe Ratio with four approaches, namely: eliminating interest rates, changing zakah rates, changing inflation, and changing nominal gross domestic product growth (GDP), and using Value at Risk (VaR) as a measure of stock risk. Then implement it in the Islamic capital market in Indonesia for the period January 2011 - July 2018. The results obtained are that there is a very high suitability for the measurement results of the five models. Judging from the closeness of the results of performance measurement, the five models can be grouped into two, namely models with interest rates, inflation, and GDP as the first group, while models without interest rates and zakah- rate as the second group.

**Keywords:** Islamic Finance, Islamic Stock Performance, Modification Sharpe Ratio, and Value at Risk

***ABSTRAK –Modifikasi Sharpe Ratio untuk mengukur Kinerja Saham Syariah di Indonesia.*** Sejak akhir 1960-an, salah satu alat mengukur kinerja saham yang biasa digunakan adalah *Sharpe Ratio*. Model *Sharpe Ratio* terdiri atas 3 (tiga) komponen, yaitu *return* saham, *return* bebas risiko, dan risiko saham. *Return* bebas risiko diukur mengunakan variabel suku bunga yang digolongkan riba dan dilarang dalam konsep keuangan islam. Sedangkan risiko saham diukur dengan standar deviasi yang mengasumsikan data berdistribusi normal. Paper ini akan memodifikasi model *Sharpe Ratio* dengan mencari variabel alternatif penganti suku bunga dengan melakukan 4 (empat) pendekatan, yaitu: menghilangkan variabel suku bunga tersebut, mengganti dengan *zakat rate*, mengganti dengan inflasi, dan mengganti dengan *gross domestic produc* (GDP), serta mengganti standar deviasi dengan *Value at Risk* (VaR) sebagai pengukur risiko saham yang selanjutnya diimplementasikan pada pasar modal syariah di Indonesia periode Januari 2011 - Juli 2018. Hasil yang diperoleh adalah terdapat kesesuaian yang sangat tinggi untuk hasil pengukuran kelima model tersebut. Dilihat dari kedekatan hasil pengukuran kinerja, kelima model tersebut dapat dikelompokkan menjadi dua, yaitu model dengan tingkat suku bunga, inflasi, dan PDB sebagai kelompok pertama, sedangkan model tanpa suku bunga dan tingkat zakat sebagai kelompok kedua.

***Kata Kunci:*** *Keuangan Islam, Kinerja Saham Syariah, Modifikasi Sharpe Ratio, dan Value at Risk*

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| --- | --- |
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**INTRODUCTION**

Investment according to Islam is a muamalah activity that is highly recommended. By investing, owned assets become productive so they can bring benefits to themselves and others. In general, investment can be divided into two, namely real sector investment and financial sector investment. One form of investment rapidly growing financial sector in line with the development of information technology is investing in stocks on the capital market.

The countries that first implemented Islamic principles in the capital market were Jordan in 1978 and Pakistan in 1980. While presently Islamic mutual funds are operating mainly in Saudi Arabia, UAE, Bahrain, Kuwait, Qatar, Pakistan, Malaysia, Brunei, Singapore, Germany, Ireland, the UK, the USA, Canada, Switzerland, and South Africa (Ayub, 2007).

In Indonesia, on July 3, 2000, the Jakarta Stock Exchange (JSX) published a list of Islamic mutual funds, stocks, and bonds in the Jakarta Islamic Index (JII). Since then, the Islamic capital market in Indonesia has experienced significant growth and shows the potential for development from year to year. Based on the State of the Global Islamic Economy (GEI) Report in the last four years (2015/2016, 2016/2017, 2017/2018, and 2018/2019), Indonesia has always been in the top ten countries in the world that have health and development in the field of Islamic Finance. From 2015 - 2018, the number of Islamic stocks in Indonesia increased by 25% with large capitalization up by around 46%.

Table 1 Indonesian Capital Market 2015 - 2018

|  |  |
| --- | --- |
| **Description** | **Year** |
| **2015** | **2016** | **2017** | **2018** |
| Number of Stock | 521 | 537 | 566 | 619 |
| Number of Islamic Stock | 331 | 345 | 393 | 414 |
| Large Stock Capitalization\*) | 4796,80 | 5753,61 | 7052,39 | 7023,50 |
| Large Islamic Stock Capitalization \*) | 2600,85 | 3175,05 | 3704,54 | 3666,69 |
| \*) in Trillion Rupiah |  |
| *Source: www.ojk.go.id (data processed)* |  |

Stock investments in the capital market, including in Islamic stocks, are investments that have high risk but have a high level of profit (high risk-high return) (Jogiyanto, 2007). So it needs careful consideration before deciding to invest. As a Muslim investor, one of them is 'How to choose Islamic stocks to be invested?'. Muslim investors do not only expect to gain maximum returns, but their investments are also in harmony with Islamic principles (Yani, et. al, 2020).

Since the late 1960s, one of the stock performance analysis tools commonly used is Sharpe Ratio. The Sharpe Ratio consists of three components, namely stock return, risk-free returns, and stock risk. Research on the performance analysis of Islamic stocks in Indonesia using the Sharpe Ratio has been done and usually combines with Treynor Ratio and Jansen Index (Utami and Nugraha, 2011; Hasbullah, et. al., 2013; Setiawan and Oktariza, 2013; Andhyka, 2017). Some studies compare the performance of Islamic stocks and conventional stocks (Hanafi and Hanafi, 2012; Hamzah and Yohanes, 2014; Lestari, 2015; Kusumawati, 2016; Huda, 2017).

Risk-free returns in the Sharpe Ratio model in these studies are still approached with interest rates, that is Bank Indonesia Certificates or BI Rate. While the concept of interest rates in Islam is classified as *riba* and *riba* is expressly prohibited in the Al-Quran (QS. Al-Imran (130)).



*'O people who believe, do not eat usury by multiplying and fearing God so that you may have good fortune'* (QS. Al-Imran:130)

While some researchers (Kurniawan and Asandimitra, 2014; Rumintang and Azhari, 2015; Tulasmi and Trihariyanto, 2016; ) approaching risk-free returns using Bank Indonesia Syariah Certificates (SBIS) or Bank Indonesia Syariah Wadiah Deposits (SWBI). Whereas some researchers from other countries approached it with interest rates in their country such as the Kuala Lumpur Inter-Bank Offered Rate (KLIBOR) (Mansor and Bhatti, 2011; Albaity and Ahmad, 2008), Saudi Inter-Bank Offered Rate (SIBOR) (Merdad, et. al., 2010; Ashraf, 2013), Karachi Inter-Bank Offered Rate (KIBOR) (Shaikh, et. al., 2019).

Efforts to find a substitute variable for interest rates with other variables that do not conflict with Islamic financial principles have been carried out by Tomkin and Karim (1987), Sheikh (2009), El-Ashker (1987), and Hanif (2011), all of whom modified the Capital Asset Pricing Model (CAPM). Tomkin and Karim eliminating interest rate, Sheikh replaces GDP, El-Ashker replaces zakah rate, and Hanif replaces inflation. Furthermore, these models are known as Sharia's Compliant Asset Pricing Model (SCAPM) or Islamic Capital Asset Pricing Model (ICAPM).

In addition, the risk of the stock on the Sharpe Ratio is measured by standard deviations that assume returns that are normally distributed, while many stock returns are non-normally distributed. Because Sharpe Ratio is a reward-to-risk ratio, many studies replace standard deviations with other risk measures, such as Sortino and Price (1994) and Ziemba (2005) replace standard deviations with downside deviations. Down (2000) and Gregoriou and Gueyie (2003) use Value at Risk (VaR) to measure risk in the Sharpe Ratio.

This paper will modify the Sharpe Ratio by changing interest rates with 4 (four) approaches, namely: eliminating interest rates, changing zakah rates, changing inflation, and changing GDP, and using Value at Risk (VaR) as a measure of stock risk. Then implement it in the Indonesia Stock Exchange (IDX), which is Islamic stocks listed in the Jakarta Islamic Index (JII) for the period January 2011 - July 2018 for testing the models.

**LITERATURE REVIEW**

**Jakarta Islamic Index (JII)**

On July 3, 2000, the Indonesia Stock Exchange in cooperation with PT Danareksa Investment Management (DIM) launched a stock index made based on Islamic sharia, the Jakarta Islamic Index (JII). This index is expected to be a benchmark for the performance of sharia-based stocks and to further develop the Islamic capital market. JII consists of 30 shares selected from stocks that are following Islamic sharia, whose shares are conducted by Bappepam-LK in collaboration with the Dewan Syariah Nasional (DSN) every six months through two stages, namely sharia selection and transaction volume value selection.

|  |
| --- |
| **Sharia Selection** |
| Emitents do not run gambling/game businesses classified as gambling, and trade that is prohibited |
| Not producing, distributing, and providing goods/services that are morally damaging and harmful |
|  |
| **Sharia Selection** |
| This process filters 60 shares with the highest market capitalist value on the Indonesia Stock Exchange (IDX) |
|  |
| **Select Value of Transaction Volume** |
| This process filters 30 shares with the highest daily average transaction value on the Indonesia Stock Exchange (IDX) |
|  |
| **EVALUATION PROCESS OF STOCKS EVERY 6 MONTHS AT ONCE** |

 *Source: Sudarsono, H. (2003)*

Figure 1. Jakarta Islamic Index (JII) Stock Selection

**Returnand expected return**

The actual return (return) on investment, during a certain period, is the income received during the period together with any change in the value of investment (Henderson, et al., 1992). There are several types of returns commonly used in calculations, namely simple net return$ ( r\_{t}$) and geometric return or log return$ (R\_{t}$).

|  |  |
| --- | --- |
|  | (1) |
|  | (2) |

where, $r\_{t}$ is the simple net return for period *t*, $R\_{t}$ is the geometric return for period *t*, $ P\_{t}$ is the market price at the end period *t*, $P\_{t-1}$ is the market price at the end period *t-1*, and $ D\_{t}$ is the dividends (or interest) received during period *t*. From equations (1) and (2) can be obtained relation log return and simple net return, i.e. : $R\_{t}=ln\left(r\_{t}+1\right)$.

The expected return on investment is merely the weighted average of probably expected return (Sharpe, 1985). If there is *T* observation, then expected return $(E\left(R\_{t}\right))$ can be expressed as:

|  |  |
| --- | --- |
|  | (3) |

**Risk and *Value at Risk* (VaR)**

According to Van Horne (1992), the risk is the possibility that the actual return on an investment will be different from the expected return on that investment, and that it is possible to attach probabilities to these expected outcomes. Rees (1995) further states that: the variability in return is taken to represent the risk of investment to investors since the variability reflects the uncertainty attached to return.

Risk can be measured, either by the average (or mean) variance or the standard deviation of returns from their expected values. Standard deviation can be expressed as:

|  |  |
| --- | --- |
|  | (4) |

But the standard deviations assume returns that are normally distributed, while many stock returns are non-normally distributed.

During the 1990s, a new technology to measure and control financial risk, based on statistical techniques, emerged as the VaR methodology (Allen, 2003). VaR is defined as the maximal loss of a financial position during a given period for a given probability (Jorion, 2002). According to Tsay (2010), VaR is the minimal loss under extraordinary market circumstances.

In formal terms, given a random Loss ($L$) and a confidence level $(α)$, $VaR\_{α}\left(L\right) $can be defined as the greatest lower bound (infimum) with a probability $α$ on the cumulative distribution function $F$ of any financial position $L$, expressed as a random variable (BCBC, 2011; Chen, 2014).

|  |  |
| --- | --- |
|   | (5) |

As a matter of statistical modeling, parametric VaR is computed as a product of the statistical percentiles/ quantiles of the standard normal distribution function $\left(Z\_{α}\right)$, standard deviation $\left(σ\right)$, total investment value $\left(v\right)$, and the square root of time (Concolation, 2016), which can be expressed as follows:

|  |  |
| --- | --- |
|  | (6) |

When returns are normally distributed, the VaR estimate is simplified as shown in equation (6). However, when returns are somewhat close to normally distributed, but not too close to normally distributed, the Cornish-Fisher approach can be used (Chambers dan Lu, 2011). Where $ S$ is the coefficient of skewness, the Cornish-Fisher approximation is used by determining a critical value $\left(Z\_{α}^{\*}\right)$ to be used in place of $Z\_{α}$ in the formula for VaR.

|  |  |
| --- | --- |
|   | (7) |

**The Sharpe's Ratio and its Modifications**

**The Sharpe's Ratio**

The predicted performance of a portfolio is described with two measures: the expected rate of return $\left(\overbar{R}\_{t}\right)$ and the predicted variability (risk), expressed as the standard deviation of return $\left(σ\right) $(Sharpe, 1966). The Sharpe Ratio $\left(SR\right)$ is computed as shown in equation 8 (Camilleri and Farragui, 2018).

|  |  |
| --- | --- |
|   | (8) |

where,$ R\_{f}$ is the risk-free return rate.

A higher Sharpe Ratio is good, and a lower one is bad. When choosing between two alternatives, the Sharpe Ratio criterion is therefore to choose the one with the higher Sharpe Ratio (Down, 2000).

**The Modification of Sharpe's Ratio**

Based on equation (8), Sharpe Ratio ($SR$) consists of three components, namely the mean return of portfolio (stock) ($\overbar{R})$, risk-free return rate ($R\_{f}$) which is commonly measured using interest rates, and portfolio (stock) variability or risk expressed as standard deviations ($σ$). Down (2000) using VaR instead of standard deviation as a risk measure. VaR can work, when returns are close to normally distributed or not too close to normally distributed. And Modified Sharpe Ratio ($MSR$) with interest rates can be expressed as:

|  |  |
| --- | --- |
|  | (9) |

Modification of the Sharpe Ratio ($MSR\_{RF}$) in equation (9) still contains interest rates. In order not to conflict with the concept of Islamic finance, interest rates are replaced by four approaches, namely: eliminating variable interest rates, replacing zakah rates, replacing with inflation, and replacing with the gross domestic product (GDP).

Then obtained four new modifications of the Sharpe Ratio, namely: the modification of Sharpe Ratio without interest rate ($MSR\_{NRF}$) (equation 10), the modification of Sharpe Ratio with zakah rate ($MSR\_{ZR}$) (equation 11), the modification of Sharpe Ratio with inflation ($MSR\_{INF}$) (equation 12), and the modification of Sharpe Ratio with gross domestic product ($MSR\_{GDP}$) (equation 13).

|  |  |
| --- | --- |
|   | (10) |
|  | (11) |
|  | (12) |
|  | (13) |

where, $\overbar{R}\_{ZR} $ is Zakah Rate which is equal to 2.5% / (1-2.5%) = 2.56%, $\overbar{R}\_{INF} $ is mean of inflation, and $\overbar{R}\_{GDP}$ is mean of GDP.

**METHODOLOGY**

The data used in this study are monthly data from January 2011 - July 2018, which consists of closing prices of stock that are consistently listed in the Jakarta Islamic Index (JII) during that period, interest rates (BI-Rate), Inflation, and GDP.

There are the following steps for analyzing the data:

1. Calculate the monthly return of selected stock with equation (2).
2. Calculate descriptive statistics of stock returns (mean, standard deviation, skewness, and kurtosis), then calculate the mean of the BI-Rate, Inflation, and GDP.
3. Perform a normality test for stock return data using a 95% confidence level using the Kolmogorov–Smirnov test. If the return is normally distributed, $Z\_{0,95}=1,645$, but if the data is non-normally distributed then $Z\_{0,95}$ must be adjusted using Cornish Fisher Expansion.

|  |  |
| --- | --- |
|  | (14) |

1. Calculate $VaR\_{α}\left(L\right)$ for the next 1 period with assuming the total investment value are equal to 1 for each stock
2. Calculate the stock performance using five modifications of the Sharpe Ratio with equations (9), (10), (11), (12), and (13), and determine the stock rank of each model.
3. Perform suitability analysis of 5 (five) modifications of Sharpe Ratio using Kendall's W Concordance test. Statistical test$ (W$) can be expressed as (Kendall and Smith, 1939; Qudratullah, 2017) :

|  |  |
| --- | --- |
|   | (15) |

where *Ri* is the number of ranks of the *i* stock, *n* is the number of stock, and *m* is the number of models.

Then calculate the Spearman correlation coefficient for each pair of modifications of the Sharpe Ratio, which can be expressed as follows (Spearman, 1904; Qudratullah, 2017):

|  |  |
| --- | --- |
|   | (16) |

where, *rs*$r\_{s}$ is the Spearman rank correlation coefficient, *di* =(*RAi - RBi*), *RAi*$ R\_{A\_{i}}$ is the *i* stock rank of the first model and *RBi*$R\_{B\_{i}}$ is the *i* stock rank of the second model.

1. Perform cluster analysis for five modifications of the Sharpe Ratio. Cluster analysis is a technique to group similar observations into many clusters based on the observed values of several variables for each individual (models).

Proposed dissimilarity measures can be broadly divided into distance measures and correlation-type measures. The distance measure most commonly used is Euclidean distance (Everitte, et. al., 2011). The Euclidean distance between these two subjects is given by:

|  |  |
| --- | --- |
|   | (17) |

where *xAi* $x\_{Ai}$and *xBi* $x\_{Bi}$ are respectively the *i*th stock performance for models *A* and *B*. $d\_{AB}$ *dAB* can be interpreted as the physical distance between *A* and *B*.

1. Create a chart of stock performance for five modifications of the Sharpe Ratio.

**RESULT AND DISCUSSION**

**Stock and Risk Return**

Based on table 2, eight stocks have a positive return with the highest UNVR, and three stocks have a negative return with the lowest LSIP. While the stocks that have the lowest volatility are UNVR and stocks that have the highest volatility are LSIP.

Before calculating VaR with equation 6, the normality test is done for the return of each stock. From table 3, seven shares are normally distributed and three of them have non-normally distribution. After VaR calculation at a confidence level of 95%, the stock that has the lowest VaR (risk) is UNVR and the highest is LSIP.

Table 2.Descriptive Statistics of Stock Returns

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **No.** | **Stock** | **Mean** | **Std. Dev** | **Skewness** | **Kurtosis** |
| 1 | AALI | -0,00380 | 0,09258 |  0,25383 |  0,22914 |
| 2 | ASII | 0,00579 | 0,06647 | -0,61964 |  0,35356 |
| 3 | ASRI | 0,00323 | 0,11692 | -0,36251 |  0,88152 |
| 4 | INTP | 0,00289 | 0,09266 | -0,37337 |  1,04592 |
| 5 | KLBF | 0,00927 | 0,06622 | -0,10148 |  0,98370 |
| 6 | LPKR | -0,00419 | 0,10645 |  0,29967 | -0,04430 |
| 7 | LSIP | -0,00450 | 0,12478 | -0,03704 |  0,23869 |
| 8 | SMGR | 0,00225 | 0,07788 | -0,14287 | -0,07650 |
| 9 | TLKM | 0,01065 | 0,06325 |  0,03285 |  0,22968 |
| 10 | UNTR | 0,00727 | 0,08159 | -0,28606 |  0,36664 |
| 11 | UNVR | 0,01273 | 0,06176 | -0,00093 |  2,11869 |

Table 3.Distribution of Return and Value at Risk (VaR) of Stock

|  |  |  |  |
| --- | --- | --- | --- |
| No. | Stock | Distribution of Return | |VaR95%| |
| 1 | AALI | Normally | 0,15229  |
| 2 | ASII | Non normally | 0,12106  |
| 3 | ASRI | Non normally | 0,20438  |
| 4 | INTP | Normally | 0,15242  |
| 5 | KLBF | Normally | 0,10893  |
| 6 | LPKR | Normally | 0,17511  |
| 7 | LSIP | Normally | 0,20526  |
| 8 | SMGR | Normally | 0,12811  |
| 9 | TLKM | Normally | 0,10404  |
| 10 | UNTR | Normally | 0,13421  |
| 11 | UNVR | Non normally | 0,10161  |

**The Performance Analysis of Sharia Stocks using Modification of Sharpe Ratio**

In table 4, five modifications of the Sharpe Ratio, namely MSR, MSR-NRF, MSR-ZR, MSR-INF, and MSR-GDP rank almost the same for all stocks. Slightly different is the MSR-NRF model, which places the shares of INTP, SMGR, and ASRI ranked 6th, 7th, and 8th, while the other four models rank 7th, 8th, and 6th.

Table 4.Value and Ranking of Stock Performance with Modification of Sharpe Ratio

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Stock** | **MSR** | **MSR - NRF** | **MSR - Z R** | **MSR - INF** | **MSR - GDP** |
| **Value** | **Rank** | **Value** | **Rank** | **Value** | **Rank** | **Value** | **Rank** | **Value** | **Rank** |
| AALI | -0,06165 | 11 | -0,02494 | 11 | -0,03897 | 11 | -0,05284 | 11 | -0,04991 | 11 |
| ASII |  0,00162 | 5 |  0,04780 | 5 |  0,03015 | 5 |  0,01270 | 5 |  0,01638 | 5 |
| ASRI | -0,01154 | 6 |  0,01581 | 8 |  0,00536 | 6 | -0,00498 | 6 | -0,00280 | 6 |
| INTP | -0,01770 | 7 |  0,01898 | 6 |  0,00496 | 7 | -0,00890 | 7 | -0,00597 | 7 |
| KLBF |  0,03374 | 3 |  0,08506 | 3 |  0,06544 | 3 |  0,04606 | 3 |  0,05014 | 3 |
| LPKR | -0,05583 | 10 | -0,02390 | 10 | -0,03610 | 10 | -0,04816 | 10 | -0,04562 | 10 |
| LSIP | -0,04917 | 9 | -0,02194 | 9 | -0,03235 | 9 | -0,04264 | 9 | -0,04047 | 9 |
| SMGR | -0,02610 | 8 |  0,01754 | 7 |  0,00086 | 8 | -0,01563 | 8 | -0,01215 | 8 |
| TLKM |  0,04860 | 2 |  0,10234 | 2 |  0,08180 | 2 |  0,06150 | 2 |  0,06578 | 2 |
| UNTR |  0,01252 | 4 |  0,05418 | 4 |  0,03826 | 4 |  0,02252 | 4 |  0,02584 | 4 |
| UNVR |  0,07025 | 1 |  0,12526 | 1 |  0,10424 | 1 |  0,08345 | 1 |  0,08784 | 1 |

**The Suitability Analysis for the Modification of Sharpe Ratio**

The suitability analysis of the measurements of five modifications of the Sharpe Ratio can use Kendall's Concordance test. In table 5, it is found that the suitability coefficient is very high, which is 0.991. While the suitability between models can be seen from the Spearman correlation coefficient in table 6, it appears that all pairs have very strong (very high) correlation coefficients.

Table 5. The Result of Kendall's Concordance Test

|  |  |  |  |
| --- | --- | --- | --- |
| **Kendall's Coef. of Concordance** | **Chi-Square** | **Asymp. sig** | **Note** |
| 0,991 | 49,564 | 0,000 | very high |

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| 0,991 | 49,564 | 0,000 | very high |

Table 6. Coefficient Correlation between Modification of Sharpe Ratio

|  |  |  |
| --- | --- | --- |
| **Pair** | **Spearman Coef.** | **Note** |
| MSR - MSR NRF | 0,973\* | very high |
| MSR - MSR ZR | 1,000\* | very high |
| MSR - MSR INF | 1,000\* | very high |
| MSR - MSR GDP | 1,000\* | very high |
| MSR NRF - MSR ZR | 0,973\* | very high |
| MSR NRF - MSR INF | 0,973\* | very high |
| MSR NRF - MSR GDP | 0,973\* | very high |
| MSR ZR - MSR INF | 1,000\* | very high |
| MSR ZR - MSR GDP | 1,000\* | very high |
| MSR INF - MSR GDP | 1,000\* | very high |
| *\*) Significant at 99% confidence level\** |

**The Cluster Analysis for the Modification of Sharpe Ratio**

Cluster analysis aims to group five modifications of the Sharpe Ratio into several groups, based on the proximity of the measurement results. Looking at the dendrogram in figure 2, the five models can be grouped into two clusters: the first group is MSR, MSR-INF, and MSR-GDP, the second group is MSR-NRF, and MSR-ZR.

This is supported by Figure 3, especially in the measurement results at ASRI, INTP, and SMGR. It appears that MSR, MSR-INF, and MSR-GDP gave a negative performance while MSR-NRF and MSR-ZR gave a positive performance.



Figure 2. Cluster Analysis Dendrogram for Modification of Sharpe Ratio



Figure 3. Chart of Islamic Stock Performance for Modification of Sharpe Ratio

CONCLUSIONS

The modification of Sharpe Ratio with interest rate and Value at Risk (VaR) (MSR) with four other modifications of Sharpe Ratio, namely models that eliminate interest rates (MSR-NRF), models that replace them with zakah rates (MSR-ZR), models that replace them with inflation (MSR-INF), and models that replace them with gross domestic products (GDP) (MSR-GDP) gives almost the same results or has a very high level of suitability in measuring the performance of Islamic stocks in Indonesia in the period January 2011 - July 2018.

Judging from the closeness of the results of performance measurement, the five models can be grouped into two, namely models with interest rates, inflation, and GDP as the first group, while models without interest rates and zakah- rate as the second group. This means, on the concept of Islamic finance, risk-free returns can be measured using these four approaches.

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