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# Portfolio Analysis Using Malaysia Stock Market Data: Before and During COVID-19 Pandemic

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ABSTRACT

This study attempts to evaluate Malaysia's stock performance before and during COVID-19 across all sectors by using the Sharpe ratio and Sortino ratio with risk measured by standard deviation. We develop an algorithm for stock selection to construct the portfolio investment. In our study, we apply the Sharpe ratio, Treynor ratio and Jensen's alpha to identify the optimal portfolio. The result shows that the portfolio with stock selection based on the Top 20 Sortino ratio from all stocks is superior to stock selection based on the Top 3 Sortino ratio for each sector. The daily adjusted closing stock prices are collected from March 1, 2019 to December 31, 2021. The result of this study indicates that several sectors are not affected during the COVID-19 pandemic, which are Technology, Industrial, Consumer Products and Services and Property. Hence, investors are suggested to form an optimal portfolio investment based on these sectors. Stock analysts are recommended to imply various risk-adjusted measures to evaluate the portfolio performance with a comprehensive perspective to support the outcome analysis.

## 1. Introduction

The present COVID-19 infection pandemic is having a tremendous impact on many sectors of life. The COVID-19 is quickly expanding at a rapid pace, wreaking havoc not only on health but also on the economy and society. The COVID-19 has sent the world economy and Malaysia into a slump. Several industries have suffered severe recessions, while others have profited from the catastrophe. In general, Malaysia's economy has experienced a terrifying downturn. Portfolio diversification persists as a strong investment strategy to be dealt with during pandemic strikes as this will reduces portfolio risks. This research suggests a better instrument for the investor, portfolio manager as well as beginners who just started their investment by means of, they gain a good representation of the portfolio performance on each stock according to the sectors. Evaluating the performance of wide-ranging stocks requires plenty of time to pick the optimal stock for the portfolio selection. This study provides a guideline on the sector preferences reported in projected results in terms of the risk and return for each industry. With supported technical justification in stocks selection, it should give discrete advantages in decision making. Under normal circumstances, the practitioner constantly assumes preferred choices regarding the popularity of the company, certainly, such doubtful action further drives into unforeseen occasions. Stock performance analysis promotes several benefits to

investors which aims to provide an understanding of the stock held by the investor, the remuneration of stock return concerning the risk exposure that is required to evaluate the performance of a portfolio manager. Due to the pandemic, many business sectors were unable to continue their operations. With the high volatility in stock market prices, investors must be careful in the selection of stocks to form an ideal portfolio. The effective risk-adjusted performance measure such as Sortino, Sharpe, Treynor and Jensen's alpha ratios are ideal for evaluating the performance of the stock market. This research provides guidance for investors on the stock performance across all sectors in Malaysia to avoid some risk or redundant mistakes that are commonly made when selecting an ideal portfolio investment.

In modern times, a well-managed portfolio is essential to indicate the success of an investor as well as portfolio managers. A diversified investment portfolio reduces the risk by allocating the fund over different areas in the long run of financial goals. Diversification tends to protect the investors from one area that performed poorly without affecting other stocks. So, any downturn movement that happens in any stock will be counterbalanced by the other. Despite the fact, that the risk associated with assets is unavoidable, risk can be mitigated when handled together as part of a diversified portfolio. A diversified stock portfolio consists of various sectors to be invested whereby each stock reacts independently at the same time. Investors can select the stocks that are preferable according to the sectors. However, there are 761 Main Market and 138 Ace Market in these 13 sectors excluding leap Market under Bursa Malaysia. In such a case, the investor or portfolio manager is unable to monitor and compare the performance of each stock. Also, they will select those stocks based on the reputation and popularity of the companies. The proper way to choose the outperforming stock according to risk and return is to study each sector's background according to its business type.

Among the research studies, it has been done mostly on portfolio management by assets allocation and risk tolerance, consequently, this research engages in studying the fundamental of the stock market in Malaysia. Substantial studies indicated that the combination of economic-related sectors within an investment portfolio most likely reduces the investment risk compared to single sector investment. Due to the higher cost of investing in every stock, sector breakdown stipulates analysis for the investor in fund allocation. Although there are previous empirical investigations have been conducted by other researchers, there is indeed a gap since the economic trends changes over time. The study period employed in this study varies from previous studies and the outcome of the analysis will be different based on the selected time frame. Moreover, the majority of the past empirical research did mostly was the relation of risk-return in other countries, there is only a few research did examine Malaysia's stock market.

The statistical measures used to evaluate the risk-adjusted measures on portfolio returns are the Sharpe ratio, Sortino ratio, Treynor ratio and Jensen's alpha ratio. These ratios are necessary to determine the performance of an investment instead of being solely dependent on the average return [1]. These ratios are certainly widely acceptable to evaluate the portfolio performance [2][3]. Rational investors are only interested in participating in stock performance with a great return at a given risk level or avoid investing for an expected return at a risky level. To evaluate the investment characteristic, Sharpe ratio is included as one of the measures to analyze the risk-adjusted and risk-return performances [4]. The ratio is described solely considering the total risk preferably, instead of just taking systemic risk into account. The selected top ten funds from the sector of the banking and finance showed higher Sharpe ratios with lower standard deviations if the fund has a good return [5]. However, the trend is said to get some boost by selling out and enhancing the Sharpe. Also, Sharpe in no way will provide information in distributing the returns or performance of the fund. When comparing with standard deviation and Sortino ratio, the ratio included only negative deviation but not for both, negative and positive deviation of the mean return as shown in standard deviation. This is following the exclusion of the plus side of the investment into risk analysis and calculation. For that, some limitations of the Sharpe ratio can be covered by the Sortino ratio since it is superior to the Sharpe ratio in performance analysis. Due to Sharpe ratio measures only in pure number which contributes no meaning to the outcome but only acts as a mathematical tool for comparative analysis in fund performance. Hence, it is recommended in a comparative approach toward risk-adjusted


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return on a single fund with some benchmarking index. In addition, financial analysts prefer to use the Sharpe ratio approach when assessing low volatility on portfolio investments, whereas the Sortino ratio is frequently applied to assess high volatility on portfolio investments.

Choosing fund values with a high Sharpe ratio in the lists of Financial Information Systems by the investors is more advisable for fund investment [6]. When the benchmark of riskless security (which can be further simplified into the benchmark of a portfolio) is applied to analyze the previous return of the funds, a higher return of funds is often identified with a higher Sharpe ratio, provided the extent of risk is similar. The findings initiated with two properties of the ratio, one of which is time aggregation. When the two different frequencies of sample statistics were compared, Sharpe ratios of both analyses are matched if only in elaboration of time aggregation. Internally, different frequencies of data are not advisable to compare directly with the derived ratio when one set of data is based on monthly and weekly for another. Sharpe ratio uses variance to indicate total risk while the Treynor ratio focuses more on systematic risk. However, Jensen's alpha cannot be implemented whenever the levels of stock market performance are not the same. Instead, the adjusted Jensen's alpha was applied to measure the systematic risk [7]. There are three different sectoral in the Indonesia stock exchange between 2011 to 2017 were outperformed compared to risk-free which are the property, consumer and finance sectors [7]. The portfolio that compromises the indexes from this outperformed sector shows an effective and well-diversified portfolio. Comparatively, the mining sector has the worst performance based on the Sharpe, Treynor and Jensen alpha ratios because the commodities prices were slumped during the research period.

This study aims to evaluate performance on portfolio analysis using Malaysia stock market data. The objectives for this study are comparing the performance of the technology sector before and during COVID-19, identifying the effects of COVID-19 on the Malaysia stock performance by using four approaches, namely the Sharpe ratio, Sortino ratio, Treynor ratio and Jensen's alpha ratio, to propose an effective risk-adjusted performance measure to select a portfolio of stocks and investigating the best portfolio that maximizes the investment returns of investors for the stock market in Malaysia.

This study was only done by using the R programming algorithm which covers stocks from all sectors in Malaysia excluding exchange-traded funds, bonds, special purpose acquisition companies, leap and closed-end funds. The R programming algorithm will be shown in Section 2 Method. The technical analysis in favor of studying the historical stock price trend of the stock was involved instead fundamental analysis. Rebalance method on equal weight was applied in this study. The daily adjusted closing stock prices are extracted from 1 March 2019 to 28 February 2020 (before COVID-19) and 1 March 2020 to 31 December 2021 (during COVID-19).

## 2. Method

A total of 13 sectors according to the Bursa Sectoral Indices inclusive of 761 Main Market and 138 Ace Market that can be retrieved from Yahoo! Finance. To study the fundamental of stocks in Malaysia, it is important to first assess the risk and return for individual stock by calculating the expected return. The daily adjusted closing stock price was selected to compute the daily rate of return on each stock, $r_t$, [8]:

$$r_t = \frac{P_t - P_{t-1}}{P_{t-1}} \quad (1)$$

where $P_t$ denotes the stock closing price at time t and $P_{t-1}$ denotes the closing price at time t-1.

The cumulative return or the aggregate amount of investment return can be noted as [9]:

$$(1 + r_1)(1 + r_2)(1 + r_3) \dots (1 + r_t) - 1 = \prod(1 + R) - 1 \quad (2)$$

Then, the annualized return can be computed as [9]:


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$$\prod(1+R)^{\frac{scale}{n}} - 1 = \sqrt[n]{\prod(1+R)^{scale}} - 1 \quad (3)$$

where scale denotes number of periods in a year (daily = 252, monthly = 12, quarterly = 4) and *n* denotes number of years.

The methods of analysis have been implemented to evaluate the performance analysis of the stocks market by using downside risk (semi-deviation risk), Sharpe ratio, Sortino ratio, Treynor ratio and Jensen's alpha ratio. The weight on each stock exercised the rebalance method as a measurement of the portfolio return. The downside semi deviation, $\sigma_D$, simply means replacing the mean of observation with the risk-free rate, which is the minimum risk-free rate, $r_F$ on an investment:

$$\sigma_D = \sqrt{\sum_{i=1}^{N} \frac{min\,[(r_i - r_F), 0]^2}{N}}, i = 1,2, \dots, N \quad (4)$$

The Sharpe ratio was formulated by William F. Sharpe in 1966. The general formula for the Sharpe ratio, is:

$$Sharpe\ ratio = \frac{(r_i - r_F)}{\sigma_i} \quad (5)$$

where $r_i$ denotes as single stock return and $\sigma_i$ denotes as standard deviation of single stock. For the case when we calculate the performance of the portfolio, (5) will be modified as $Sharpe\ ratio = \frac{(r_p - r_F)}{\sigma_p}$, where $r_p$ denotes as portfolio return and $\sigma_p$ denotes as standard deviation of portfolio return [10]. Sharpe ratio helps investors identify whether the risk adopted holds the assumption of worthwhile in return in comparison to the returns with the absence of risk. The Sharpe ratio measurement performance analysis on the stock market along with identifying the maximum return in the event of downturn uprise. Broadly speaking the higher the Sharpe ratio, the better the return. Nevertheless, a positive Sharpe ratio does not guarantee a good return, considering the deduction in the risk-free rate, which is the minimum risk that one would accept in the existence of risk. The limitation of the Sharpe ratio is that duration for investment to analyse is more widely used in long-term investment. This is because it will show investors are more optimistic in handling short-term investments.

Sortino ratio is an improvement of the Sharpe ratio whereby only the negative side of deviation is reviewed as the risk measurement [11]. As such, the portfolio returns that are larger than the risk-free rate will not be taken into account. Sortino ratio is outperformed compared the Sharpe ratio as this approach focuses on both upside and downside deviation, thus, higher positive returns will be reflected [12]. Investor tends to plan for the worst investment whereby the Sortino ratio stipulates a real-world scenario given that higher risk investment commonly prevail. Sortino ratio can be realized as follows:

$$Sortino\ ratio = \frac{(r_i - r_F)}{\sigma_D} \quad (6)$$

where $\sigma_D$ denotes as downside semi deviation which can be computed in Equation (4) [10].

The Treynor, which is named after Jack L. Treynor, estimates the risk premium per unit of systematic risk. The risk premium is depending on the similar principles as in the Sharpe measure. Treynor, in contrast to Sharpe, analyses both systematic and unsystematic risk, whereas Treynor exclusively considers systematic risk. The following is Treynor ratio, T, formula [13]:

$$T = \frac{(r_p - r_F)}{\beta_p} \quad (7)$$

where $\beta_p$ represents beta value of portfolio which can be computed in (9).

Jensen's alpha ratio also serves as an evaluation of the portfolio manager's abilities in portfolio development. An investment manager shall not measure the portfolio performance solely depending on the overall return. Instead, the investor should also refer to the portfolio risk and identify whether


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the portfolio returns have offset the risk taken. A positive (negative) in Jensen's alpha ratio indicates that the portfolio is earning excess (deficit) returns [14]. In other words, a positive (negative) in the ratio shows a fund manager is doing beating (worse) with their stock-picking skills. The Jensen' alpha ratio, α, is stated as follows:

$$\alpha = r_p - [r_F + \beta_p(r_m - r_F)] \quad (8)$$

where $r_m$ represents the market return. Beta, $\beta_p$, can be computed as following:

$$\beta_p = \frac{\sigma_{pm}}{\sigma_m^2} \quad (9)$$

where $\sigma_{pm}$ represents the covariance between portfolio return and market return and $\sigma_m^2$ represents the variance of the market return. Portfolio selection framework steps include:

(1) Data collection of Bursa Sectoral Indices from Yahoo! Finance using R programming.
(2) Identification of delisted company and remove the stocks that are delisted or leap market from database.
(3) Obtain the risk adjusted price follow by computing the daily rate of return, annualized return and cumulative return of each stock.
(4) Evaluate the performance analysis of each stock using measures of annualized Sharpe ratio, nonannualized Sharpe ratio and Sortino ratio to identify good stocks whereby obtaining positive values for all three measures.
(5) Evaluate the selected good stocks using measures of Sortino ratio superior to the nonannualized Sharpe ratio to select the optimal stocks for portfolio formation.
(6) Build portfolios based on two different methods which based on the individual stock's Sortino ratio. The first method is stock selection based on the Top 3 Sortino ratio for each sector. The second method is the stock selection based on the Top 20 Sortino Ratio for all stocks in Bursa Malaysia.
(7) Performance analysis based on the Sharpe ratio, Treynor ratio and Jensen's Alpha ratio of the selected portfolio.

## 3. Results and Discussion

The fundamental of Malaysia stock market data were studied to select the optimal stocks for portfolio formation. The appropriate analysis tools that are required to measure the performance of each stock are annualized Sharpe ratio, nonannualized Sharpe ratio and Sortino ratio. The performance comparison of all Malaysia stock market based on these tools were computed, daily data before the pandemic of COVID-19 from 1 August 2019 to 29 February 2020 were used. The optimum stocks must first attain positive values in all the ratios followed by comparing the nonannualized Sharpe ratio and Sortino ratio. Stock with a Sortino ratio superior to the nonannualized Sharpe ratio should be considered due to the Sortino ratio emphasizes the downside risk instead both upside and downside risk. This indicates that the stock is reliable and safeguard investor to invest. Comparatively, stocks with negative value in either one of the measures is not recommended to be selected for the portfolio due to a negative annualized Sharpe suggests a loss in annualized return according to substantial change in stock price. However, referencing to negative in nonannualized Sharpe ratio and Sortino ratio explained that the mean return in the selected period is negative. In the real world, investors are more concerned about their worst investment in relation to their returns and the Sortino ratio only considers its downside risk. Hence, an optimal stocks selection for a portfolio is recommended to apply the risk-adjusted measurement of the Sortino ratio. The data sample for technology sector are represented in Table 1.

**Table 1.** Annualized Sharpe, Nonannualized Sharpe and Sortino Before COVID-19 for Technology Sector

| Stocks | Annualized Sharpe | Nonannualized Sharpe | Sortino |
|---|---|---|---|
| APPASIA | 1.2482 | 1.2542 | 2.1446 |
| D&O | 0.0394 | 0.2380 | 0.3698 |
| DSONIC | 3.0652 | 2.1065 | 3.1499 |


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| Stocks | Annualized Sharpe | Nonannualized Sharpe | Sortino |
|---|---|---|---|
| FRONTKN | 3.7661 | 2.5149 | 4.1852 |
| GRANFLO | 0.5700 | 0.7268 | 1.1276 |
| GREATEC | 13.8441 | 4.2093 | 9.5016 |
| GTRONIC | 0.3533 | 0.5117 | 0.7996 |
| HTPADU | 0.5490 | 0.7923 | 1.7208 |
| IFCAMSC | 0.1599 | 0.4627 | 0.8548 |
| IRIS | 0.0739 | 0.3158 | 0.4722 |
| JCY | 0.7589 | 0.9221 | 1.5768 |
| JFTECH | 2.9378 | 2.0986 | 3.9885 |
| JHM | 0.1884 | 0.3645 | 0.5480 |
| KRONO | 0.1513 | 0.3503 | 0.5595 |
| MI | 1.6186 | 1.4360 | 2.4428 |
| MICROLN | 1.6907 | 1.4682 | 2.3180 |
| MMAG | 0.4051 | 0.6113 | 1.1084 |
| MPI | 0.3606 | 0.4796 | 0.7588 |
| MYEG | 0.1966 | 0.4182 | 0.6922 |
| NOTION | 1.6258 | 1.4360 | 2.4676 |
| OMESTI | 2.0795 | 1.7311 | 2.8771 |
| OPENSYS | 0.8532 | 0.9105 | 1.5213 |
| PENTA | 3.2782 | 2.4103 | 4.0910 |
| REVENUE | 1.8533 | 1.5910 | 2.8895 |
| REXIT | 0.0287 | 0.1890 | 0.3041 |
| RGTECH | 0.9361 | 0.9984 | 1.6898 |
| SMTRACK | 0.2261 | 0.7255 | 1.1551 |
| UWC | 9.6245 | 3.8786 | 6.9174 |
| VIS | 0.2374 | 0.5176 | 0.8041 |
| VITROX | 0.9780 | 0.9948 | 1.6472 |
| VSTECS | 1.0841 | 1.0908 | 2.1384 |
| WILLOW | 0.2944 | 0.4740 | 0.7681 |
| YGL | 0.2623 | 0.5532 | 0.9890 |

Of the total of 898 Bursa Malaysia Main and ACE stocks across all sectors, there are only 276 stocks or approximately 30.73% of all stocks that are best fit in portfolio formation in which having positive values in all three ratios, whereas there are 622 stocks or about 69.27% of all stocks have either negative sign in all three ratios or having only negative signs in annualized Sharpe ratio. Based on past empirical research, an effective portfolio investment requires stock holdings between 20 and 30 stocks with a varied combination of sectors.

Two different methods are proposed in this research to build a portfolio in which the methods will based on the individual stock's Sortino ratio. The first method is stock selection based on the Top 3 Sortino ratio for each sector whereas the second method is the stock selection based on the Top 20 Sortino Ratio for all stocks in Bursa Malaysia. By using the first method of selection, there would be a total of 39 stocks selected from every sector and the risk of a portfolio can be diversified as the stocks are equally selected from each sector instead of limited to only a few sectors. The performance measurement on the portfolios will further compare across the time frame before the pandemic of COVID-19 from 1 March 2019 to 28 February 2020 and during the pandemic of COVID-19 from 1 March 2020 to 31 December 2021.

Table 2 shows that market capitalization and changing of stock prices before and during COVID-19 for Top 3 Sortino ratio for each sector. Stocks from technology sector have the highest market capitalization indicates that the company is well-established and experiencing rapid growth.


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Investors tend to be interested in investing in companies that are well known and stable whereby the company will offer a consistent dividend to the investors. Out of 39 stocks that are selected from the first selection method, there are 11 stocks or approximately 28% of all stocks that are experiencing a decline in stock prices. On the other hand, there are 28 stocks or approximately 72% of all stocks show an incline in stock prices.

**Table 2.** Market Cap and Changing of Stock Prices Before and During COVID-19 for Top 3 Stocks for Each Sector

| Sector | Stocks | Market-Cap (RM) | Average Closing Price | | |
|---|---|---|---|---|---|
| | | | Before COVID-19 | During COVID-19 | Changing (Decrease/ Increase) |
| Technology | GREATEC | 6.323b | 0.9147 | 4.6264 | 3.7118 |
| | UWC | 4.998b | 0.8150 | 4.2316 | 3.4166 |
| | FRONTKN | 4.946b | 1.1075 | 2.7038 | 1.5963 |
| Bank | ELKDESA | 392.83m | 1.3943 | 1.3033 | -0.0910 |
| | RCECAP | 1.302b | 0.6868 | 1.1463 | 0.4595 |
| | TAKAFUL | 3.025b | 5.3443 | 4.2101 | -1.1342 |
| Construction | GDB | 375.00m | 0.2442 | 0.4695 | 0.2253 |
| | ZECON | 58.96m | 0.3769 | 0.4584 | 0.0815 |
| | PTARAS | 454.47m | 2.5153 | 2.5000 | -0.0153 |
| Consumer | KPOWER | 181.84m | 0.2593 | 1.0237 | 0.7644 |
| | FOCUS | 254.89m | 0.1080 | 0.3418 | 0.2338 |
| | FOCUSP | 227.70m | 0.2333 | 0.5579 | 0.3246 |
| Energy | YINSON | 6.311b | 5.8937 | 5.3682 | -0.5255 |
| | KNM | 496.46m | 0.2978 | 0.1932 | -0.1046 |
| | DAYANG | 1.042b | 1.6816 | 1.1612 | -0.5204 |
| Health | DPHARMA | 1.394b | 0.9725 | 1.9697 | 0.9972 |
| | KOSSAN | 4.630b | 1.7476 | 3.7277 | 1.9800 |
| | ADVENTA | 138.27m | 0.4576 | 1.5478 | 1.0902 |
| Industrial | KAB | 595.63m | 0.1284 | 0.5662 | 0.4378 |
| | MASTER | 90.12m | 1.4227 | 1.6756 | 0.2529 |
| | SCIB | 139.69m | 0.3186 | 0.8879 | 0.5693 |
| Plantation | SOP | 2.115b | 2.5542 | 3.4654 | 0.9112 |
| | TAANN | 1.512b | 2.1212 | 2.4735 | 0.3523 |
| | RSAWIT | 490.01m | 0.2119 | 0.2518 | 0.0399 |
| Property | MPCORP | 24.45m | 0.0770 | 0.1400 | 0.0630 |
| | YNHPROP | 1.375b | 2.2675 | 2.7297 | 0.4622 |
| | AYER | 404.21m | 4.3219 | 5.5081 | 1.1861 |

Table 3 shows that the overall stock performance for all 39 selected stocks sectors in Malaysia is performing good, it can be shown from the positive signs in all three ratios which are annualized Sharpe, nonannualized Sharpe and Sortino ratio. Furthermore, the Sortino ratios for all 39 stocks are superior to the nonannualized Sharpe ratio suggesting that the downside risk is low. This can be further explained by the annualized standard deviation in which all the 39 stocks have low risk with a risk level of less than 1. Hence, the 39 stocks selected from every sector are recommended for stock selection in a portfolio. The 39 stocks from first method of stock selection will further be categorized into three different portfolios based on the annualized standard deviation such as a portfolio with high-risk, medium-risk and low-risk. For example, the high-risk portfolio is formed by the stocks with the Top 20 highest annualized standard deviation. Medium risk portfolio contains the 20 stocks with middle-ranked in annualized standard deviation and the low-risk portfolio is formed by the 20 stocks with lowest-ranked in annualized standard deviation.


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**Table 3.** Stock Performance on Top 3 Sortino Ratio from Each Sector

| Sector | Stocks | Annualized Stock Performance Before COVID-19 | | | | |
|---|---|---|---|---|---|---|
| | | Return | Standard Deviation | Semi Deviation | Nonannualized Sharpe | Nonannualized Sortino |
| Technology | GREATEC | 7.9134 | 0.5466 | 0.8328 | 4.2093 | 9.5016 |
| | UWC | 4.7514 | 0.4704 | 0.6869 | 3.8786 | 6.9174 |
| | FRONTKN | 1.5674 | 0.3896 | 0.3745 | 2.5149 | 4.1852 |
| Bank | ELKDESA | s0.2633 | 0.1784 | 0.1331 | 1.1749 | 1.9784 |
| | RCECAP | 0.1088 | 0.1677 | 0.1388 | 0.4602 | 0.7837 |
| | TAKAFUL | 0.1345 | 0.2997 | 0.2056 | 0.4369 | 0.6541 |
| Construction | GDB | 1.7556 | 0.4923 | 0.4212 | 2.2221 | 4.1678 |
| | ZECON | 1.5920 | 0.9099 | 0.4899 | 1.3944 | 3.2494 |
| | PTARAS | 0.4429 | 0.2996 | 0.1997 | 1.2375 | 2.2181 |
| Consumer | KPOWER | 4.6051 | 0.7883 | 0.9208 | 2.5170 | 5.0013 |
| | FOCUS | 4.7686 | 0.6410 | 0.9827 | 2.9999 | 4.8525 |
| | FOCUSP | 2.4603 | 0.6839 | 0.5927 | 2.0865 | 4.1509 |
| Energy | YINSON | 0.6349 | 0.2411 | 0.1480 | 1.9922 | 4.2896 |
| | KNM | 1.6289 | 0.7473 | 0.5143 | 1.5927 | 3.1673 |
| | DAYANG | 1.3276 | 0.6361 | 0.5435 | 1.5863 | 2.4429 |
| Health | DPHARMA | 0.4614 | 0.2550 | 0.1885 | 1.4578 | 2.4477 |
| | KOSSAN | 0.3134 | 0.1850 | 0.1325 | 1.3496 | 2.3660 |
| | ADVENTA | 0.9459 | 0.8565 | 0.4447 | 1.1220 | 2.1271 |
| Industrial | KAB | 8.1921 | 0.5510 | 0.8702 | 4.2369 | 9.4139 |
| | MASTER | 4.0153 | 0.6188 | 0.6399 | 2.7954 | 6.2752 |
| | SCIB | 5.0866 | 0.6878 | 0.9025 | 2.9058 | 5.6361 |
| Plantation | SOP | 0.3442 | 0.3830 | 0.2517 | 0.7997 | 1.3677 |
| | TAANN | 0.2661 | 0.2997 | 0.1970 | 0.8010 | 1.3504 |
| | RSAWIT | 0.3874 | 0.7496 | 0.2950 | 0.7428 | 1.3134 |
| Property | MPCORP | 1.7201 | 2.5320 | 0.3422 | 0.9879 | 5.0273 |
| | YNHPROP | 1.2700 | 0.3254 | 0.2579 | 2.5596 | 4.9252 |
| | AYER | 0.5213 | 0.3110 | 0.2144 | 1.3735 | 2.4314 |
| REIT | KIPREIT | 0.1686 | 0.1194 | 0.1088 | 1.0298 | 1.5497 |
| | AXREIT | 0.1797 | 0.1847 | 0.1433 | 0.7697 | 1.2540 |
| | SUNREIT | 0.1464 | 0.1488 | 0.1277 | 0.7234 | 1.1460 |
| Telco | GPACKET | 1.4150 | 0.4841 | 0.3891 | 1.9756 | 3.6361 |
| | REDTONE | 1.3463 | 0.6096 | 0.4455 | 1.6308 | 3.0222 |
| | MTOUCHE | 1.5468 | 0.8559 | 0.6462 | 1.4664 | 2.3937 |
| Transport | SEALINK | 2.0675 | 0.8541 | 0.6970 | 1.6796 | 2.9664 |
| | GCAP | 0.8215 | 0.6102 | 0.4059 | 1.2171 | 2.0237 |
| | MISC | 0.1778 | 0.1691 | 0.1371 | 0.8153 | 1.2964 |
| Utilities | MFCB | 0.4049 | 0.1988 | 0.1384 | 1.6336 | 2.9247 |
| | EDEN | 0.5795 | 0.7044 | 0.3705 | 0.9306 | 1.5641 |
| | MALAKOF | 0.1052 | 0.2153 | 0.1677 | 0.3854 | 0.6273 |

Aside from equally stock selection in every sector in KLSE to form the portfolio, there is an alternative method of stock selection for a portfolio which is selecting stock based on the ranked Top 20 Sortino ratio from all stocks in Bursa Malaysia. The stocks selected in this portfolio according to the ranking of Sortino ratio cover only 6 different sectors out of 13 sectors in Malaysia which are technology, construction, consumer products and services, energy, industrial products and services and property sectors. The stocks selected for this portfolio compromise GREATEC, UWC, FRONTKN, PENTA, JFTECH, GDB, KPOWER, FOCUS, FOCUSP, PERMAJU, YINSON, KAB,


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MASTER, SCIB, SLVEST, PWRWELL, DUFU, FPGROUP, MPCORP and YNHPROP. Table 4 shows that market capitalization and changing of stock prices before and during COVID-19 for Top 20 Sortino ratio for all stocks. The market capitalization in this portfolio suggested that the technology sector own the biggest market cap as compared to other sectors. There are 17 stocks or 85% of selected stocks that have risen in stock prices during the pandemic.

**Table 4.** Stock Performance on Top 20 Sortino Ratio for All Stocks

| Sector | Stocks | Market-Cap (RM) | Average Closing Price | | |
|---|---|---|---|---|---|
| | | | Before COVID-19 | During COVID-19 | Changing (Decrease/ Increase) |
| Technology | GREATEC | 6.323b | 0.9147 | 4.6264 | 3.7118 |
| | UWC | 4.998b | 0.8150 | 4.2316 | 3.4166 |
| | FRONTKN | 4.946b | 1.1075 | 2.7038 | 1.5963 |
| | PENTA | 2.664b | 2.4907 | 4.7783 | 2.2876 |
| | JFTECH | 1.168b | 0.2541 | 1.1105 | 0.8564 |
| Construction | GDB | 375.00m | 0.2442 | 0.4695 | 0.2253 |
| Consumer | KPOWER | 181.84m | 0.2593 | 1.0237 | 0.7644 |
| | FOCUS | 254.89m | 0.1080 | 0.3418 | 0.2338 |
| | FOCUSP | 227.70m | 0.2333 | 0.5579 | 0.3246 |
| | PERMAJU | 105.90m | 0.6458 | 0.2569 | -0.3890 |
| Energy | YINSON | 6.311b | 5.8937 | 5.3682 | -0.5255 |
| Industrial | KAB | 595.63m | 0.1284 | 0.5662 | 0.4378 |
| | MASTER | 90.12m | 1.4227 | 1.6756 | 0.2529 |
| | SCIB | 139.69m | 0.3186 | 0.8879 | 0.5693 |
| | SLVEST | 734.31m | 0.5994 | 1.1370 | 0.5376 |
| | PWRWELL | 113.21m | 0.2950 | 0.2495 | -0.0455 |
| | DUFU | 1.710b | 1.2092 | 3.4847 | 2.2755 |
| | FPGROUP | 314.55m | 0.4642 | 0.8314 | 0.3672 |
| Property | MPCORP | 24.45m | 0.0770 | 0.1400 | 0.0630 |
| | YNHPROP | 1.375b | 2.2675 | 2.7297 | 0.4622 |

The approaches applied in portfolio performance are significant in affecting an investment decision. For risk adjusted performance and risk measures on Malaysia's stocks across all sectors, there are three different approaches used to compare the performance of selected stocks in different portfolios. The suggested risk-adjusted performance ratios are Sharpe, Treynor and Jensen's alpha. The implications of different approaches to evaluating the portfolio performances give investors the insights they need to determine how well their investment has invested. An investor is unable to visualize the entire investment performance unless risk-adjusted returns are evaluated. Each method has its unique features or characteristics, Sharpe ratio is calculated using the total risk that compromised both upside and downside risk of the investment, Treynor ratio refers to the market risk and Jensen's alpha ratio is measured using market return and undiversifiable systematic risk. Sortino ratio will not be used to compare the portfolio performance because this ratio only measures the downside risk but other three approaches mentioned are taken into both upside and downside risks. Using these approaches simultaneously suggest better recommendations for the manager or investor on the investment strategy.

The comparison of portfolio performance before COVID-19 and during COVID-19 using Treynor ratio, Jensen's alpha ratio and Sharpe ratio for four different portfolios are presented in Table 5. Treynor ratio is a risk adjusted performance measure based on the beta value, which refers to the systematic risk and the ratio can be calculated using (7). Beta value is dependent on the sensitivity of the overall market movement. For instance, if the market performance is moving in an upward trend, the return of the stocks will eventually behave in the same direction. Adopting beta value as a


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risk reference in investing is desirable due to high stock prices fluctuation or the movement of the stock market is constantly changing. The higher the beta value suggests that the stocks are risker or more volatile than the overall market, concerning a higher return. A positive Treynor ratio with a low beta value indicates that the portfolio performance is good since the systematic risk measured by beta value is small. By comparing different risk level portfolios in Table 5, the result suggested that the low-risk portfolio had the highest Treynor ratio during the pandemic of COVID-19. This means that the low-risk portfolio has a low systematic risk based on the beta value of 0.5020 and leads to generating a high Treynor ratio. High-risk portfolio obtained a negative value in Treynor ratio, suggesting that the portfolio return is not able to compensate for the risk taken by the portfolio. The beta value in the high-risk portfolio is the highest among other risk level portfolio, showing that the volatility rate for the high-risk portfolio is high.

Jensen's alpha measures the excess return generated from the portfolio rate of return. If the Jensen's alpha ratio is high, it implies that the excess return is high, in which the portfolio return is above the expected return or the average rate of return. The empirical result indicates that the Top 20 Sortino portfolio performance is superior to the other portfolio when using Jensen's alpha during the pandemic of COVID-19. However, the beta value in Top 20 Sortino portfolio is the highest, this concludes that the actual return for the Top 20 Sortino portfolio is significantly greater than the market return and risk-free rate return. A positive alpha reveal that the investor has beat the market through earning an excess return while a negative alpha reveals that the return earned by the investor is insufficient to cover the amount of risk have taken. Thus, a high-risk portfolio is not recommended to be invested during the pandemic.

The portfolio performance measure using Sharpe ratio is similar to Treynor ratio, except for the denominator factor. The Sharpe ratio focuses on a systematic and unsystematic risk that uses standard deviation, but Treynor ratio only focuses on the systematic risk that calculates using beta value. The Top 20 Sortino portfolio shows a positive and highest Sharpe value among other portfolios during the pandemic of COVID-19. This denotes that the standard deviation for the Top 20 Sortino portfolio is low and leads to generating a higher value in the Sharpe ratio. According to three different portfolio performance measures on different risk levels in the portfolio, the result shows that it is recommended to invest in the low-risk portfolio and Top 20 Sortino portfolio shows. To select an effective portfolio that achieves the investment goals of low-risk and high return, investors should not solely be based on a single risk adjusted measure to make decision. With the ratios suggested, the Top 20 Sortino portfolio is more favourable to allocate the investment fund into it by reason of having the highest value in Jensen's alpha ratio and Sharpe ratio. Even though Treynor ratio for the portfolio selected from the Top 20 Sortino ratio for all stocks is not the highest, but it only has a slight difference of 0.01% as compared to the low-risk portfolio.

**Table 5.** Stock Performance on Top 20 Sortino Ratio for All Stocks

| Ratios | Portfolio | Beta | Annualized Standard Deviation | Portfolio Performance | |
|---|---|---|---|---|---|
| | | | | Before COVID-19 | During COVID-19 |
| Treynor | High Risk | 0.9421 | - | 3.0631 | -0.0328 |
| | Medium Risk | 0.7706 | - | 2.3333 | 0.1345 |
| | Low Risk | 0.5020 | - | 1.1805 | 0.1698 |
| | Top 20 Sortino | 0.8522 | - | 3.0097 | 0.1564 |
| Jensen's Alpha | High Risk | 0.9421 | - | 3.0000 | -0.0901 |
| | Medium Risk | 0.7706 | - | 1.8915 | 0.1104 |
| | Low Risk | 0.5020 | - | 0.6535 | 0.1016 |
| | Top 20 Sortino | 0.8522 | - | 2.6682 | 0.1676 |
| Sharpe | High Risk | - | 0.2535 | 5.3360 | -0.0095 |
| | Medium Risk | - | 0.1617 | 6.2095 | 0.4670 |
| | Low Risk | - | 0.0882 | 4.8728 | 0.5019 |
| | Top 20 Sortino | - | 0.2125 | 5.9122 | 0.5937 |


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## 4. Conclusion

In a nutshell, to determine a good stock for portfolio selection, judgement should be made based on the ratios of annualized Sharpe, nonannualized Sharpe and Sortino, but not solely based on nonannualized Sharpe ratio and Sortino ratio as these ratios do not reflect the stock prices change from the beginning and ending of the period whereby it only reflects the average daily changes in stock price. To select the ideal stock for portfolio formation, criteria such as obtaining positive values in annualized Sharpe, nonannualized Sharpe and Sortino ratios and having Sortino ratio that is superior to the nonannualized Sharpe ratio should be met. A good portfolio is highly dependent on a good method of stock selection. Sortino ratio is a good indicator of risk-adjusted measure to crucially select stocks for the portfolio. A stock with a high Sortino ratio suggests that the risk exposure of the stock is more on the positive side. In this research, there are two different methods of stock selection for portfolios which are stock selection based on the Top 3 Sortino ratio for each sector and the Top 20 Sortino ratio for all stocks in KLSE. By selecting stocks from different sectors, the risk of a portfolio is able to be minimized through diversification. Investing in different sectors in a portfolio is similar to investing in different market capitalization. The portfolio constructed will, on average, yield higher longer-term returns and lower the risk, especially during the pandemic.

The empirical findings conclude that evaluating the portfolio performance is applicable with the aid of risk-adjusted measure of Sharpe ratio, Treynor ratio and Sharpe ratio. These ratios cannot be used solely or separately since these approaches are complementary to promote a better investment decision through investing portfolios with different stocks. Relying on a few different methods provides more insightful information that could help the investor to support sufficient details in a portfolio. Due to the extreme volatility of the stock market, investors must exercise caution by considering the important factors when constructing an ideal stock portfolio. The optimum portfolio tends to meet the objective of a maximum rate of return with minimal risk. As a result of the different methods to evaluate the portfolio performance, the portfolio with stock selection based on the Top 20 Sortino ratio for all stocks in KLSE demonstrates the best performance among other selected portfolios. The portfolio has met the investment objectives in terms of the portfolio return and risk during the pandemic of COVID-19. From this research findings, the optimum portfolio does not depend on selecting stocks equally from every sector. For instance, the portfolio with stock selection based on the Top 3 Sortino ratio from each sector in KLSE suggested that the portfolios have a lower value in all ratios although these portfolios have met the objective of risk diversification through selecting stocks equally from all sectors.

The Top 20 Sortino portfolio is the optimal portfolio which contains a few sectors in KLSE, which are technology, construction, consumer products and services, energy, industrial products and services and property sectors. These suggest that the businesses from these sectors are not affected before and during the pandemic of COVID-19. Several sectors e.g., the technology sector, even have a positive impact due to the influence of COVID-19. During this period, heavy internet usage and high demands of hardware and software by workers or employees, since they were required to adopt a transition from working in the office to working from home. In addition, the industrial sector had an incline at stock prices by the view of the company providing packaging materials and engaged in manufacturing technical components. At the same time, several sectors have been substantially impacted during the pandemic such as REIT, plantation and bank sectors. Hence, investors are recommended to invest in stocks that are related to sectors from technology, industrial, consumer products and services and property. It is recommended that more research can be conducted on the following:

1. In the future, more studies can be conducted to investigate data frequency intervals e.g., the basis of monthly and yearly, as the empirical study shows that a decreasing number of selected stocks are necessary to eliminate risk. Due to high volatility in stock price, a variable such as exchange rate may appear to be more sensitive toward daily frequency data.


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2. Future research is recommended to incorporate additional variables or determinants in evaluating an optimal stock performance based on risk and return in the stock market. Instead of focusing on features like stock price and beta, which assess systematic risks and market return, the general status of the economy and elements such as interest rates, output, earnings, employment, GDP, housing, manufacturing, and management that impact the change in the financial market improve or assist the study of result. As a result, investors would have a comprehensive perspective on viewing the Malaysia stock market performance and the influence of the variables or factors on the market changes.

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