REVISITING PORTFOLIO OPTIMIZATION AND 1/N RULES: SHARIAH *VS* CONVENTIONAL STOCKS' PERFORMANCE DURING THE COVID-19 PANDEMIC

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ABSTRACT

This paper investigates whether Shariah-compliant firms outperform conventional peers in the Malaysia stock market in terms of firm value optimization and 1/N rules, during the recent financial instability period due to the COVID-19 pandemic. Data of 12 of Shariah-compliant portfolios and 12 of conventional portfolios for the seventeen (17) months period from 1st January 2020 to 31st May 2021 were collected. The paper investigates the performance of both sets of portfolios using optimization model under unconstrained, constrained and maximizing Sharpe-ratio strategy and 1/N rules. The results show that Shariah-compliant firms outperform conventional firms in terms of risk minimizing (variance: σ2) and are able to provide competitive returns although lower than conventional counterparts. The findings from the study provide several implications for investors in many ways, especially in investment decisions to consider investing in Shariah-compliant or conventional portfolios.

Keywords: Shariah-Compliant Portfolio, Conventional Portfolio, Optimization, 1/N Rules

INTRODUCTION

On 11th March 2020, The World Health Organization (WHO) officially declared the coronavirus (COVID-19) outbreak as a global pandemic. COVID-19 pandemic negatively impacted several economies as well the global economic growth. In fact, international economic and trade activities, including medical supplies, tourism and hospitality, financial market, consumer products and a range of social activities were also negatively affected. Liu, et al., (2020) showed that the COVID-19 pandemic had a critical adverse consequence on stock market returns. In Malaysia, the government imposes several initiatives including lockdown to mitigate the COVID-19 economic damage. This is important and relevant especially in the context of the current study, which explores the performance of Shariah-compliant and conventional investment portfolios against the naive diversification during the COVID-19 pandemic. Bouri, et al., (2021) argues that lockdown can positively impact stock returns and raise investors' confidence in New Zealand, while Nor and Zawawi (2020) observed that fundamental strategy enhanced by artificial neural networks can provide abnormal returns in the Greece stock market during the crisis. Nonetheless, studies regarding Islamic and non-Islamic stocks portfolios during the crisis period still were not studied. Therefore, our study contributes to the literature regarding the performance of Islamic and non-Islamic portfolios. We make significant contribution not only to the fields of finance (investment and diversification) and management science (portfolio optimization), but also entrepreneurship.

For instance, Li & Qian (2021) very recently showed that asset allocations of entrepreneurial households are generally less diversified. Therefore, this study can be useful for entrepreneurs, researchers, policymakers, and investors.

Due to the global pandemic and reduced economic growth, the Islamic capital market has become an important part of the global financial market. In uncertain economic periods, Shariah-compliant investments have the nature of resilience and potential to perform better than conventional. Recently, Shariah-compliant investments are encountering fast development in different countries such as Bahrain, Egypt, Indonesia, Kuwait, Malaysia, Pakistan, Qatar, Saudi Arabia, Turkey, and UAE (Hussain et al., 2015). In the first half-year of 2021, equity shariah-compliant funds showed higher average returns than conventional funds.

Shariah-compliant funds are considered a type of investment fund that complies with Shariah law and Islamic principles. The funds operate using Shariah principles to ensure equitable wealth distribution among investors and participants of the funds. Shariah-compliant funds stimulate legitimate and fair returns in business activities with a key of integrity, justice, trustworthy and honesty. The institution of Islamic funds is prohibited to involve in elements of a commercial transaction including riba (interest), gharar (uncertainty), maisir (gambling), and non-halal (prohibited food and drinks and immoral activities). Islamic funds are monitoring by an expert to ensure the firm complies with the Sharia criteria, and not get involved in conflict of Islamic principles. According to Kafaou & Chakir (2017), this screening empowers the value to be relabelled from traditional to Islamic. The screening also includes monetary viewpoints, that is, the corporate obligation is restricted to be thought about decidedly by investors, and a low degree of corporate obligation shows a lower risk of bankruptcy (Jaballah et al. 2018). As of 24th May 2021, there are 746 Shariah-compliant securities that are listed on Bursa Malaysia (Securities Commission, 2021).

The conventional funds grew a long time ago and went through a phase of rapid development to meet the needs of customers. Conventional portfolios operated based on traditional economies that were characterized as the sociology that reviewed how people, governments, firms, and countries settled on decisions on selling assets to fulfil their limitless needs, which are positive financial matters. The principles of traditional investment funds are from human thoughts, studies, philosophies, applications. The funds are also not constrained by any limitations and principles. Therefore, conventional funds are seen as investments that prioritize the wealth of investors in the long run and allow speculative activities such as gambling without considering sustainability values.

According to Hordei, et al., (2021), an investment portfolio alludes to set of monetary and genuine real investment with various profitability, maturity and liquidity levels oversaw as a solitary resource. Portfolio diversification is an important topic that investors need to emphasize financial decision making to choose the right investment that is able to minimize risk and maximize the returns. Diversification refers to the strategy of allocating or mixes variety of investments within a portfolio. According to Husnan (2006), the objective of diversification is to ensure the risk or loss of the investment is minimized and return maximized.

In modern finance theory, mean-variance optimization was developed by Markowitz (1952) and provides options for the investors in making portfolio judgments with consideration of returns, risks, and diversification effects. The main issue in mean-variance optimization is identifying risk due to unknown expected returns and covariance matrix. The 1/N strategy was developed to overcome some issues in the mean-variance optimization model. In research from Nor & Islam

(2016, 2017) found that in the 1/N rule, naïve diversification dominates for the individual investor that owning a small number of securities (N<25), and portfolio optimization dominated for a large number of securities (N>25). The research also found that the investment outcomes are responsive to the variability of the constrained and the investor that intend to maximizing investment Sharpe-ratio needs to diversify portfolio investment with utilizing different optimization model, consider other constraints or even other forms of trading strategies.

The main objective of this paper is to examine the performance of portfolio optimization and 1/N strategy for Shariah-compliant portfolios and conventional counterparts in the Malaysian Stock Exchange. The study also answers the question of whether a Shariah-compliant portfolio outperforms better than conventional peers, especially during the COVID-19 pandemic. The findings of the current study are beneficial to investors in many ways, especially in investment decisions to consider investing in Shariah-compliant or conventional portfolios. The investors also have better knowledge to manage risk and return in their investment portfolios and are able to choose the appropriate diversification strategy to maximize their wealth.

The current study is reported as follows. Section 2 describes the data collection and methodology used. Section 3 presents the result and discussion. Section 4 summarizes and provides implications of the study and future research.

DATA AND METHOD

The first phase of this study aims to show list of Shariah-Compliant Securities as of 28th May 2021 approved by the Shariah Advisory Council (SAC) of the Securities Commission Malaysia. Table 1 shows the sample for Shariah-compliant portfolios:

	Company Name	Stock Code	Market Capitalization	Industry
	Table 1 **LIST OF SHARIAH-COMPLIANT PORTFOLIO CONSTITUENTS**			
1	BIMB Holdings Berhad	5258	MYR 7.48B	Financial Services
2	Bursa Malaysia Berhad	1818	MYR 6.19B	Financial Services
3	Syarikat Takaful Malaysia Berhad	6139	MYR 3.59B	Financial Services
4	Al-'Aqar Healthcare REIT	5116	MYR 912.62M	Real Estate Investment Trusts
5	Al-Salam REIT	5269	MYR 330.60M	Real Estate Investment Trusts
6	Axis-REIT	5106	MYR 2.79B	Real Estate Investment Trusts
7	KLCC Property & REIT-Stapled Securities	5235SS	MYR 12.150B	Real Estate Investment Trusts
8	MyETF Dow Jones Islamic Market Malaysia Titans 25	0821EA	MYR 156.06M	Exchange Traded Fund-Equity
9	MyETF MSCI Malaysia Islamic Dividend	0824EA	MYR 44.28M	Exchange Traded Fund-Equity
10	MyETF MSCI SEA Islamic Dividend	0825EA	MYR 47.20M	Exchange Traded Fund-Equity
11	MyETF Dow Jones U.S Titans 50	0827EA	USD 8.90M	Exchange Traded Fund-Equity
12	Tradeplus Shariah Gold Tracker	0828EA	MYR 61.45M	Exchange Traded Fund-Equity

Source: Eikon Datastream (15th July 2021)

Table 2 shows the sample for conventional peers that identified from the Bursa Malaysia website (www.bursamalaysia.com):

	Company Name	Stock Code	Market Capitalization	Industry
	Table 2 LIST OF CONVENTIONAL PORTFOLIO CONSTITUENTS			
1	RHB Bank Berhad	1066	MYR 21.440B	Financial Services
2	CIMB Group Holdings Berhad	1023	MYR 45.46B	Financial Services
3	Kenanga Investment Bank	6483	MYR 975.57M	Financial Services
4	Allianz Malaysia Berhad	1163	MYR 2.27B	Financial Services
5	Public Bank Berhad	1295	MYR 78.61B	Financial Services
6	Sentral REIT (MRCB Quill REIT)	5123	MYR 943.17M	Real Estate Investment Trusts
7	Pavilion Real Estate Investment Trust	5212	MYR 4.175B	Real Estate Investment Trusts
8	Tradeplus HSCEI Daily (2x) Leveraged Tracker	0832EA	MYR 504.07K	ETF-Leveraged and Inverse
9	FTSE Bursa Malaysia KLCI ETF	0820EA	MYR 3.99M	Exchange Traded Fund-Equity
10	Genting Berhad	3182	MYR 18.65B	Consumer Products and Services
11	Media Prima Berhad	4502	MYR 510.23M	Telecommunications and Media
12	Pensonic Holdings Berhad	9997	MYR 90.12M	Consumer Products and Services

Source: Eikon Datastream (15th July 2021)

Weekly adjusted closing prices of the selected firms for the 17 months' period between January 2020 until May 2021. Based on the data collected, the study prepares a historical chart of 12 stocks for the period 1st January 2020 to 31st May 2021 for both portfolios to show the movement of stock price changes during that period.

During the 17 months' period of this research, The Government of Malaysia initiated the Movement Control Oder (MCO) to slow down the transmission rate of the virus COVID-19. The government extended MCO multiple times to contend the pandemic to either the Conditional Movement Control Order (CMCO) or the Recovery Movement Control Order (RMCO). The orders gave a significant impact on the stock price of all portfolios because the companies were forced operating in compliance with regulations.

Figure 1 below presents the historical prices' movements of Shariah-compliant portfolios and Figure 2 represents historical prices' movements of the conventional portfolios during the COVID-19 pandemic. Based on these figures, the stock prices movements of each portfolio fluctuated during that period. The weekly stocks' movements of companies were not relatively stable during MCO 1.0 starting on 18th March 2020 to 12th May 2020. While MCO 2.0 starting from 13th January 2021 to 4th March 2021 and MCO 3.0 starting from 7th May 2021 w to 31st May 2021. The stock overall stock prices movements of companies declined during MCO period, indicating a change in price in 17 months.

Table 3 displays the descriptive statistics of both Islamic and conventional stocks and provides information on general weekly excess returns and related statistics for stock portfolios under investigation. For the Islamic portfolio's results, Table 3 shows that the portfolio of MyETF Dow Jones U.S Titans 50 (0827EA) has the highest mean return and is accompanied by a high standard deviation (risk) of (0.05578). Next the portfolio of MyETF MSCI Malaysia Islamic Dividend (0824EA) with average weekly returns of (0.00491) and standard deviation (risk) of (0.04033). Further, portfolios with code 1818, 5116, 5106, 0821EA, 0824EA, 0825EA, 0827EA and

0828EA show positive returns, while 5258, 6139, 5269 and 5235SS show negative returns. In addition, portfolios with codes 5258, 1818, 6139, 5116, 0824EA and 0825EA show positive skewness values, while portfolios 5269, 5106, 5235SS, 0827EA, and 0828EA show negative skewness values. Moreover, with p-values of less than 5%, the Jarque-Bera normality test indicated that one could reject the null hypothesis of normal distribution of returns for all portfolios except portfolios with codes 5116 and 0821EA.

Table 3
DESCRIPTIVE STATISTICS OF ISLAMIC AND CONVENTIONAL PORTFOLIO RETURNS

Panel A: Islamic Stocks	5258	1818	6139	5116	5269	5106	5235SS	0821EA	0824EA	0825EA	0827EA	0828EA
Mean	-0.00053	0.00595	-0.00139	0.00033	-0.00411	0.00206	-0.00116	0.00185	0.00491	0.00091	0.00602	0.00266
Median	-0.00526	-0.00454	-0.00602	0	-0.00813	0.00487	0	0	0	0	0.00609	0.004
Max	0.15248	0.23115	0.23863	0.03846	0.13698	0.05709	0.068 74	0.11553	0.14604	0.29268	0.19711	0.076 19
Min	-0.18406	-0.09999	-0.19058	-0.04379	-0.2125	-0.08629	-0.07804	-0.11111	-0.09292	-0.26174	-0.16129	-0.08296
Std Dev	0.04745	0.05385	0.05556	0.0177	0.04536	0.02302	0.01904	0.0379	0.04033	0.07599	0.05578	0.02521
Skewness	0.17035	1.52486	0.65741	0.04263	-0.67995	-0.79259	-0.4917	-0.17717	0.78222	0.31476	-0.01709	-0.05247
Kurtosis	6.64133	7.2716	8.10067	2.60191	8.46101	4.95375	8.32413	4.25557	4.64394	6.88131	6.33593	4.56199
J-Bera	40.68354	83.78998	84.39309	0.50413	96.3356	19.2536	89.16209	5.17702	15.66475	47.02689	33.85259	7.45467
P-value	0	0	0	0.77719	0	0.00006	0	0.07513	0.00039	0	0	0.02405
Panel B: Conventional Stocks	1066	1023	6483	1163	1295	5123	5212	0832EA	0820EA	3182	4502	9997
Mean	0.00005	-0.00104	0.02061	-0.00165	0.0028	0.00095	-0.00312	-0.00127	0.00039	0.0005	0.01311	0.01463
Median	-0.00371	-0.00578	0	0	-0.00377	0	0	0	0	-0.00268	0	0.00675
Max	0.14386	0.14576	0.25274	0.10426	0.18553	0.1282	0.051 09	0.37323	0.11999	0.22033	0.36046	0.41428
Min	-0.15342	-0.1977	-0.15384	-0.14148	-0.19653	-0.24418	-0.10404	-0.17218	-0.1358	-0.28381	-0.21052	-0.24528
Std Dev	0.04163	0.05137	0.07419	0.03481	0.05478	0.04772	0.02633	0.06709	0.03343	0.06904	0.09072	0.08731
Skewness	0.29656	0.04038	1.00927	-0.56605	0.66787	-1.24783	-0.85411	2.55692	-0.13096	-0.02549	1.05245	1.2194
Kurtosis	7.0871	6.2081	4.13239	6.76367	7.01797	11.710	5.225	16.3780	7.74864	7.5096	5.76105	8.694

	9	4					12	99	2		9		94
J-Bera	51.881 63	31.325 19	16.2937 9	46.9844 5	54.5319 3	249.70 47	23.94 744	623.915 94	68.7972 2	61.867 39	36.6646		116.7 3987
P-value	0	0	0.00029	0	0	0	0	0	0	0	0		0

The results for the conventional stocks Table 3 show that portfolio of Pensonic Holdings Berhad (9997) has the highest return of (0.01463) with high standard deviation (risk) of (0.08731), followed by the portfolio of Media Prima Berhad (4502) with returns of (0.01311) and risk of (0.09072). In contrast, the portfolio of Tradeplus HSCEI Daily (2x) Leveraged Tracker (0832EA) shows a negative mean returns with high risk of (0.06709) indicating high risk with low returns. Further, the results show that portfolios with codes1066, 6483, 1295, 5123, 0820EA, 3182, 4502 and 9997 had positive mean returns, while 1023, 1163, 5212 and 0832EA had negative mean returns. In addition, portfolios with codes 1066, 1023, 6483, 1295, 0832EA, 4502 and 9997 show positive skewness values, while portfolios 1163, 5123, 5212, 0820EA, and 3182 show negative skewed. However, results indicate that one could reject the null hypothesis of normal distribution for all conventional stock portfolios data, indicating that all conventional data do not follow a normal distribution curve.

Stock price volatility will have a significant impact on the risk and return of investment portfolios. The investors use stock price performance as a benchmark in stock trading to ensure that they can earn the desired return. In research from Baur & Schulze (2009) the stability of the share market refers to the stable propagation of systematic shocks on the share market in normal and extreme market conditions. Several studies have covered the impact of the COVID-19 pandemic on the stock market. In United States, Germany and Italy stock market, the COVID-19 pandemic has had a higher impact on investment return compared to the global financial crises (Shehzad et al., 2020). Kelvin Yong-Ming Lee, et al., (2020) found that the performance of healthcare, REIT and utilities sectoral indices in the Kuala Lumpur Composite Index (KLCI) were relatively stable during the COVID-19 pandemic.
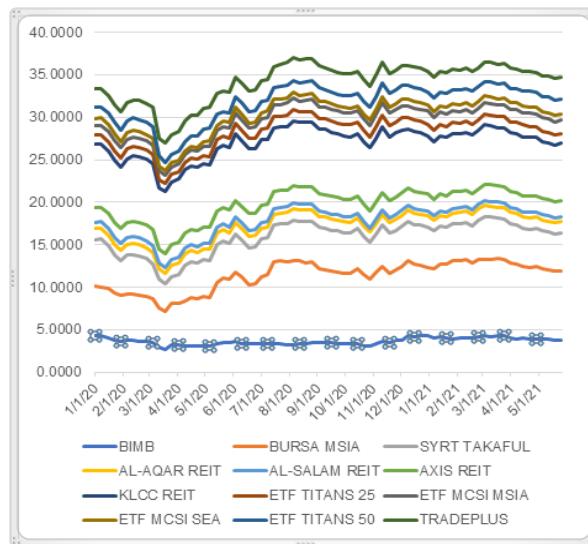
FIGURE 1
HISTORICAL PRICES OF SHARIAH-COMPLIANT PORTFOLIO
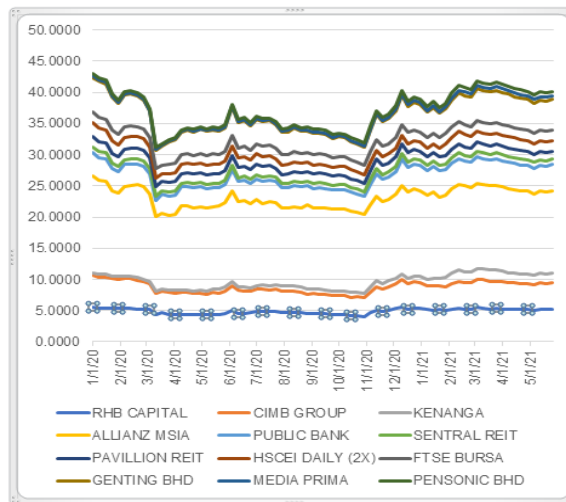
FIGURE 2
HISTORICAL PRICES OF CONVENTIONAL PORTFOLIO

The next process was done by calculating the value of weekly return, average return (expected return), standard deviation and variance (risk). From the data, we used the COVARIANCES function in excel to develop the covariance matrix of each portfolio. The step is to measure the directional relationship of two portfolios whenever one portfolio changes. The covariance matrix has an important function to understand and predict financial markets and economic system because it enables to show the movement of asset prices. The study also explains that the covariance matrix is the main approach that is used in pricing theory and other fundamental regulatory framework including for regulatory capital requirement based on the value at risk measure (VAR).

Table 4 shows the results of the covariance matrix of the Shariah-compliant portfolio. From the table below, we can conclude that six (6) portfolios have positive covariance between others portfolios which is code 1818, 6139, 5269, 5106, 5235S and 0821EA. It shows that they move together in the same direction. For instance when the return of portfolio 1818 increases, the returns of others portfolio also increase. Portfolio code 5258, 5116, 0824EA, 0825EA, 0827ES and 0828EA show negative covariance, indicating that they move inversely or in opposite direction. For an example, when the return of portfolio code 5258 increases, the return of portfolio code 0827EA decreases. All portfolios on the covariance matrix as below have a relationship with each others because no zero covariance value.

Table 4 **COVARIANCE MATRIX OF SHARIAH-COMPLIANT PORTFOLIO**												
Stock Code	**5258**	**1818**	**6139**	**5116**	**5269**	**5106**	**5235SS**	**0821EA**	**0824EA**	**0825EA**	**0827EA**	**0828EA**
5258	0.00225	0.00124	0.0013	0.00016	0.00094	0.00016	0.00028	0.00009	0.00032	0.00115	-0.00003	0.00003
1818	0.00124	0.0029	0.00123	0.00019	0.00053	0.00006	0.00023	0.0004	0.0001	0.00047	0.00011	0.00009
6139	0.0013	0.00123	0.00309	0.00026	0.00054	0.00034	0.0005	0.00068	0.00058	0.00099	0.00049	0.00028
5116	0.00016	0.00019	0.00026	0.00031	0.0002	0.00002	0.00015	0.00004	-0.00003	0.00028	-0.00001	0.00011

5269	0.00094	0.00053	0.00054	0.0002	0.00206	0.00023	0.00031	0.00011	0.00001	0.00124	0.00008	0.00022
5106	0.00016	0.00006	0.00034	0.00002	0.00023	0.00053	0.0001	0.00016	0.00032	0.00025	0.00004	0.00016
5235SS	0.00028	0.00023	0.0005	0.00015	0.00031	0.0001	0.00036	0.00015	0.00005	0.00053	0.00019	0.0001
0821EA	0.00009	0.0004	0.00068	0.00004	0.00011	0.00016	0.00015	0.00144	0.00048	0.00082	0.00018	0.00016
0824EA	0.00032	0.0001	0.00058	-0.00003	0.00001	0.00032	0.00005	0.00048	0.00163	0.00096	0.00065	0.00003
0825EA	0.00115	0.00047	0.00099	0.00028	0.00124	0.00025	0.00053	0.00082	0.00096	0.00577	0.00102	-0.00012
0827EA	-0.00003	0.00011	0.00049	-0.00001	0.00008	0.00004	0.00019	0.00018	0.00065	0.00102	0.00311	-0.00028
0828EA	0.00003	0.00009	0.00028	0.00011	0.00022	0.00016	0.0001	0.00016	0.00003	-0.00012	-0.00028	0.00064

Table 5 shows the covariance matrix of the conventional portfolio. Nine (9) portfolios have positive covariance among other portfolios or move together in same direction with portfolio code 1023, 6483, 1163, 5123, 5212, 0820EA, 3182, 4502 and 9997. As an example when the return of portfolio code 1023 increases, the return of others portfolio also increases. Portfolio code 1066, 1295 and 0823EA show negative covariance, which indicates that returns of these the portfolios move inversely or in opposite direction. For an example, when the return of portfolio code 1066 increases, the return of portfolio code 0832EA decreases. All portfolios on the covariance matrix as below have a relationship with each other because no zero covariance value.

Table 5 COVARIANCE MATRIX OF CONVENTIONAL PORTFOLIO												
Stock Code	1066	1023	6483	1163	1295	5123	5212	0832EA	0820EA	3182	4502	9997
1066	0.00173	0.00156	0.00085	0.0008	0.00167	0.00059	0.00047	-0.00012	0.00069	0.00213	0.00078	0.00029
1023	0.00156	0.00264	0.00114	0.00103	0.0021	0.00125	0.00064	0.00057	0.00089	0.00292	0.00161	0.00027
6483	0.00085	0.00114	0.00551	0.00076	0.00082	0.00063	0.00024	0.00164	0.00038	0.00151	0.00177	0.00202
1163	0.0008	0.00103	0.00076	0.00121	0.0009	0.00057	0.00042	0.00056	0.00048	0.00142	0.00074	0.00079
1295	0.00167	0.0021	0.00082	0.0009	0.003	0.00109	0.00051	-0.00012	0.00102	0.00276	0.00158	0.00008
5123	0.00059	0.00125	0.00063	0.00057	0.00109	0.00228	0.00047	0.00126	0.00082	0.00192	0.00104	0.0003
5212	0.00047	0.00064	0.00024	0.00042	0.00051	0.00047	0.00069	0.00046	0.00026	0.001	0.00047	0.00018
0832EA	-0.00012	0.00057	0.00164	0.00056	-0.00012	0.00126	0.00046	0.0045	0.00047	0.00111	0.00089	0.00179
0820EA	0.00069	0.00089	0.00038	0.00048	0.00102	0.00082	0.00026	0.00047	0.00112	0.00144	0.00044	0.00078
3182	0.00213	0.00292	0.00151	0.00142	0.00276	0.00192	0.001	0.00111	0.00144	0.00477	0.00235	0.00108
4502	0.00078	0.00161	0.00177	0.00074	0.00158	0.00104	0.00047	0.00089	0.00044	0.00235	0.00823	0.00136
9997	0.00029	0.00027	0.00202	0.00079	0.00008	0.0003	0.00018	0.00179	0.00078	0.00108	0.00136	0.00762

Portfolio Design

Mathematical portfolios can be challenging due to various factors, such as required size, different optimization models, and complex constraints (including NP-complete problem). Factors affecting stock prices such as macroeconomic variables are also exposed to smooth or sharp

structural breaks (Emirmahmutoglu et al., 2021). Interestingly, however, many funds and investors follow the naïve 1/N policy (Huberman & Jiang, 2006). Accordingly, this study aims to compare Shariah-compliant and conventional portfolio through several variations: unconstrained and constrained Markowitz (with different lambda (λ) values) and Sharpe-maximization portfolios, as well as the 1/N benchmark policy. The study sets risk aversion values of λ=0.1, λ=0.5 and λ=0.9 as parameters. Specifically, the low value of λ indicates that investors are concerned with maximizing the returns rather than lowering risks. The efficient return frontier of each risk indicates an optimal portfolio and matches with the level of λ. The value of λ determines the outcomes of the portfolio according to the level of risk. In short, the formula of the basic Markowitz mean-variance model can be estimated as follows (see Jin, Qu & Atkin, 2016; Nor & Islam, 2017):

$$Min \quad \sum_{i=1}^{N} \sum_{j=1}^{N} x_i x_j \sigma_{ij} \qquad (1)$$

$$Max \quad \sum_{i=1}^{N} x_i \mu_i \qquad (2)$$

$$S.t. \quad \sum_{i=1}^{N} x_i = 1 \qquad (3)$$

$$l \leq x_i \leq u \quad i = 1, \dots, N \qquad (4)$$

Equation (1) represents variance *i.e.,* minimizing portfolio risk, Equation (2) denotes maximizing expected returns. Equation (1) and Equation (2) are subject to Equation (3) and Equation (4), respectively, which represent that all capital is fully invested and short sell restriction (l=0 and u=100% in the case of unconstrained portfolios). It is also common to present Equation (1) and (2) as a single objective optimization as:

$$Max \ (1-\lambda)\left[\sum_{i=1}^{N} x_i \mu_i\right] - \lambda\left[\sum_{i=1}^{N} \sum_{j=1}^{N} x_i x_j \sigma_{ij}\right] \qquad (5)$$

Where λ is the risk aversion parameter. For constrained portfolios, we set l=5% and u=20% for each stock to allow sufficient holding and limit excessive exposure. Sharpe ratio introduced by Nobel Laureate William Sharpe evaluates the portfolio performance and provides the risk premium per unit of total risk, which is measured by the portfolio's standard deviation of return (Scholz, 2006; Sharpe, 1966). The portfolio with a high Sharpe ratio is considered superior relative to its peers. Under this condition, the objective function is to maximize the Sharpe-ratio objective. Sharpe ratio of the portfolio p can be expressed as below:

$$Sharpe = \frac{\mu_p}{\sigma_p} \qquad (6)$$

Finally, we use 1/N naïve diversification by simply allocating an equal percentage of wealth to each of N as the benchmark policy. This rule is deemed as passive investment strategy because no consideration of any optimization of portfolio. However, Demiguel, et al., (2009) showed that 1/N rule is efficient and superior to the mean-variance approach out-of-sample. Similarly, Nor & Islam (2017) found that 1/N dominated optimized portfolio in terms of the Sharpe value, information ratio and maximum drawdown. Therefore, consistent with previous studies, this 1/N investment policy serves as a reliable benchmark for optimization method.

RESULTS AND DISCUSSION

Using the Markowitz and Sharpe (constrained and unconstrained) and 1/N approach described earlier, Table 6 and Table 7 show the result for these portfolios. The portfolio that has a higher value of expected return and Sharpe-ratio and lower variance out perform the others. Based on the results above, the results show that both portfolios under optimization are better than 1/N rule.

Based on Panel A: unconstrained method in Table 6, the expected return (μ) for λ=0.1 with a value of 0.599% is better as compare to other divisions. For the part of variance (σ2), the value in the division the λ=0.9 is better because it achieves the lowest value among others which is 0.00026531. For the Sharpe-Ratio (SR), the method of maximizing Sharpe ratio is better with attaining the highest value, which is 0.21164876. Based on Panel B: constrained method, shows that the expected return (μ) for both portfolio in λ=0.1 and λ=0.5 with value 0.32% achieve the highest value among others. The lowest variance (σ2) in division λ=0.9 is better among others with a value of 0.000319. The next evaluation is for the Sharpe ratio (SR), the method of maximizing Sharpe ratio is better and has a higher value which is 0.13119935.

Table 6 INVESTMENT PERFORMANCE - SHARIAH-COMPLIANT PORTFOLIO					
	λ=0.1	λ=0.5	λ=0.9	Max Sharpe	1/N
Panel A: Unconstrained					
Expected Returns (μ)	0.60%	0.57%	0.33%	0.41%	0.15%
Variance (σ2)	0.16%	0.11%	0.03%	0.04%	0.05%
Sharpe Ratio (SR)	0.1509	0.1726	0.2037	0.2116	0.0665
Panel B: Constrained					
Expected Returns (μ)	0.32%	0.32%	0.20%	0.28%	0.15%
Variance (σ2)	0.06%	0.06%	0.03%	0.05%	0.05%
Sharpe Ratio (SR)	0.1291	0.1291	0.1134	0.1312	0.0665

In Table 7 below, Panel A: Unconstrained method, the expected return (μ) for the portfolio λ=0.1 with a value of 2.06% is better as compare to other divisions. For the part of variance (σ2), the value in a division the λ=0.9 is better because it achieves the lowest value among others which is 0.00089705. For the Sharpe ratio (SR), the method of maximizing Sharpe-ratio is better with attaining the highest value which is 0.29805230. The part of Panel B: the constrained method, shows that the expected return (μ) for the portfolio in λ=0.1, λ=0.5 and maximizing Sharpe ratio of 0.89% achieve the highest value among others. The lowest variance (σ2) in division λ=0.9 is outperformed with a value of 0.00107175. For the Sharpe-Ratio (SR), the method of λ=0.1, λ=0.5 and maximizing Sharpe ratio again achieves the better indicator and has a higher value which is 0.21496025.

Table 7 INVESTMENT PERFORMANCE - CONVENTIONAL PORTFOLIO					
	λ=0.1	λ=0.5	λ=0.9	Max Sharpe	1/N
Panel A: Unconstrained					
Expected Returns (μ)	2.06%	2.03%	0.57%	1.83%	0.38%
Variance (σ2)	0.55%	0.52%	0.09%	0.38%	0.12%
Sharpe Ratio (SR)	0.2779	0.2827	0.1912	0.2981	0.1107
Panel B: Constrained					
Expected Returns (μ)	0.89%	0.89%	0.53%	0.89%	0.38%
Variance (σ2)	0.17%	0.17%	0.11%	0.17%	0.12%
Sharpe Ratio (SR)	0.215	0.215	0.1604	0.215	0.1107

Table 8 shows the ranking of portfolio performances. The expected return of the conventional portfolio is greater and perform better than Shariah-compliant with condition $\lambda=0.1$ in the unconstrained method. However, Shariah-compliant portfolio performed in terms of risk under the unconstrained method and $\lambda=0.9$ and achieve the lowest variance value. For Sharpe ratio, the conventional portfolio is able to perform better than its peers with maximizing Sharpe-ratio under the unconstrained method. However, using the 1/N rule conventional portfolio again achieves a greater expected return and Sharpe ratio value than the conventional portfolio. Shariah-compliant portfolio has the lowest risk under this rule.

Table 8 RANKING OF PORTFOLIO PERFORMANCES			
	μ	$\sigma2$	SR
Panel A: Shariah Portfolios			
UC $\lambda=0.1$	7	12	11
UC $\lambda=0.5$	8	10	9
UC $\lambda=0.9$	13	1	7
C $\lambda=0.1$	14	6	12
C $\lambda=0.5$	14	6	12
C $\lambda=0.9$	17	2	14
UC Max Sharpe	11	3	18
C Max Sharpe	16	4	17
Panel B: Conventional Portfolios			
UC $\lambda=0.1$	1	18	3
UC $\lambda=0.5$	2	17	2
UC $\lambda=0.9$	8	8	8
C $\lambda=0.1$	4	13	4
C $\lambda=0.5$	4	13	4
C $\lambda=0.9$	10	9	10
UC Max Sharpe	3	16	1
C Max Sharpe	4	13	4
Panel C: Benchmark Portfolios			
Shariah 1/N	18	5	16
Conventional 1/N	12	11	15
Note: The table ranks the performance of portfolios. Grey shades denote the best metrics for each type of portfolio (Shariah, conventional and benchmark), namely best returns, lowest risks and highest Sharpe ratios. Bolds indicate the top metrics overall.			

The findings from the study indicate that the expected return of the conventional portfolio outperforms its counterparts. However, it is worth noting that during the COVID-19 pandemic, Shariah-compliant portfolio outperformed conventional portfolio in terms of minimizing risk. These results are consistent with Al-Zoubi & Maghyereh (2007) research that found that Islamic stocks are not as volatile as conventional stocks based on Dow Jones Islamic Indices and the Down Jones Global World Indices. Sukma & Kolid (2012) and Al-Awadhi & Dempsey (2017) also found that the Islamic investment is less risky and have higher liquidity than conventional peers. Despite the lower expected return than non-Shariah portfolio, they are still able to minimize risk as it is proven

they offer competitive and relevant returns. In other words, they are still able to provide more competitive returns and offer socially responsible investment than conventional one. For maximizing Sharpe ratio, the study found that conventional portfolios also outperform Shariah portfolios. The main point that needs to be considered is whether the purpose of the investment is to maximize firm value or to ensure that the return generated meets the requirements of Shariah principles. The screening process to ensure whether the investments are complying with the Shariah laws are among the factors that cause the portfolio having low investment risk, and is a viable target for Muslims and non-Muslims investors who are conscious about socially responsible investments.

CONCLUSION AND IMPLICATIONS

The objective of this study is to compare whether Sharia-compliant portfolios outperform conventional peers regarding risk-return tradeoff on Malaysia stock market during the COVID-19 pandemic. This research uses different types of performance measures including expected return, risk and Sharpe ratio. Performance measurement for each Markowitz parameter also considers different levels risk aversion. Risk and return are two fundamental financial metrics that are used in this research. The level of risk measurement is to ensure that more accurate outputs are obtained as the variety of risk levels is different for each portfolio. Moreover, there are several types of ways how the investors respond to different levels of risk. The 1/N rule was used in this study as a benchmark and to balance the result from the other parameters.

COVID-19 has caused major disruptions to capital markets, global supply chains, economies and standard of living. The financial market has become volatile and may take a while for it to normalize into a V-shaped recovery. The study concludes that to make a conclusive assertion as which type of portfolio investment performs better than the other the investors should consider financial and non-financial factors such as robustness of the investment, especially during times of uncertainty. The Shariah-compliant portfolios fulfil the requirement of robustness because aren't exposed to volatile investment, while the conventional counterparts are affected due to being exposure to the volatile investment. Thus, the Shariah-compliant portfolios outperformed the conventional peers during the times of economic instability. The findings of this study are consistent with past findings where the Dow Jones Islamic Market Index outperformed the Dow Jones Industrial Average Index by 14.26% during and after the 2008/2009 global financial crises and SARS outbreak in 2003. Moreover, during the US subprime in 2008, Shariah-compliant portfolios were not greatly impacted. This has an important implication for practitioners who decide to invest in Shariah-compliant stocks.

Ultimately, portfolio diversification models rely on the market being efficient. This means that stock prices already reflect available information. Indeed, there are many factors affecting equity prices, such as causality and interactions, macroeconomic indicators, oil prices, economic policy uncertainty and geopolitical risks, as shown empirically by Abuoliem, et al., (2019a,b); Hasan, et al., (2020a,b); Naeem, et al., (2021); Shahzad, et al., (2017a,b), among others. Nonetheless, recent studies such as Khan, et al., (2021); Nor & Wickremasinghe (2014); Filipiak & Filipiak (2018); Nor & Zawawi (2019); Shahzad, et al., (2017) suggest that some markets are not efficient. In Malaysia for instance, Nor & Wickremasinghe (2017) argued that market efficiency gradually improves due to the advancement of technology and thus portfolio optimization can be promising in this market. Therefore, future research can explore different portfolio models, sectors and markets. For example, topical studies about environment, social and governance (ESG) can be

investigated. This line of research includes Nor and Zawawi (2018) who focused on portfolio performance based on strong and weak corporate governance, while Rehman, et al., (2021) confirmed that investors in developing markets are now inclined towards socially responsible investments and proposed future studies to explore ESG portfolios. Finally, financial anomalies in constructing portfolios (Markowitz et al., 2021) can also be examined.

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