Portfolio Optimization among Philippine Shari'ah Compliant Securities and Philippine Stock Exchange Composite Index Securities: A Single Index Model Approach

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ABSTRACT

Over the past decade, the emergence of Islamic Finance led to the development of compliance to the *Shari'ah* principles by financial institutions among publicly listed companies in Muslim and non-Muslim countries. The Philippines is among the few Muslim-minority economies in Asia that recently adopted these principles to promote financial inclusion and Islamic Finance in the country and ASEAN region. The main objective of this paper is to construct an optimized portfolio using the Single Index Model for *Shari'ah*-compliant securities in the Philippine Stock Exchange and the PSE Composite Index for the period 2014-2018 and compare these portfolios with the Philippine Stock Exchange Index. Daily closing prices of 20 *Shari'ah*-compliant stocks and 30 stocks from the PSE Composite Index were utilized to determine average yearly mean returns and compare the portfolio of these securities in terms of their risk and return characteristics measured in terms of their alpha, beta, unsystematic risk, and mean returns, respectively. Results reveal that the Philippine Stock Exchange Composite Index and the *Shari'ah*-compliant portfolios were able to outperform the benchmark (PSE*i*). This paper provides investors in different equity markets with an alternative method of optimizing their portfolios utilizing *Shari'ah*-compliant stocks to improve their returns over the traditional stocks while expanding their portfolio optimization techniques, encourage listing of more *Shari'ah*-compliant stocks in stock exchanges, and promote financial inclusion of Islamic finance.

Keywords: *Shari'ah*-compliant securities, portfolio optimization, Single Index Model, Sukuk.

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1. INTRODUCTION

The emergence of Islamic Finance had led to the development of *Shari'ah*-compliant securities that fully adhered to the principles of Islam. *Shari'ah* law is an essential Islamic concept which governs various practical aspects of an Islamic believer's normal life. Islamic finance in the Philippines started with the establishment of the Philippine Amanah Bank in 1973, now called Al-Amanah Islamic Investment Bank of the Philippines, to provide banking and credit services in the Mindanao region, and later expanded its operations to cater to the needs of Filipino Muslims. Despite public attempts to promote Islamic finance in the nation, the absence or lack of legal and regulatory frameworks and other limitations associated with Islamic finance (e.g., technological incapabilities and undercapitalization), and the minimal knowledge on Islamic finance transactions slowed its development. (ADB, 2018). To date, the government vigorously promotes financial inclusion with respect to Islamic finance alongside conventional banking in the Muslim regions.

The Philippine Stock Exchange (PSE) listed *Shari'ah*-compliant securities in 2013 as part of its initiative to further develop Islamic finance in the country (Ho & Odhiambo, 2015). *Shari'ah*-compliant investment instruments create a mechanism for listed companies to acquire access to potential funding from Muslim investors, especially from Islam-dominant countries. *Sukuk* is an Arabic term broadly known to be "Islamic bonds" (Mosaid & Boutti, 2014). Due to the principles imposed towards financial instruments by the *Shari'ah* law, a conventional bond involving interest payments cannot be used in Islamic financing. Risk and uncertainties are also prevalent in these debt instruments which is also prohibited under the law. Islamic financing institutions created *Sukuk* in order to mimic the financing of conventional bonds but also be compliant to the principles of *Shari'ah* law. *Sukuk* have fixed-term maturity, coupon, and are tradable at normal yield prices just like conventional bonds. Ramasamy et al. (2011) state that *Sukuk* has better sensitivity measures, particularly duration and convexity measures, as compared to conventional bonds. Their study showed that *Sukuk* have better yield over government bonds and less risky and lower rates when compared to conventional bonds.

The use of the Single Index Model provides simplified input parameters and a more practical way in the formation and analysis of an optimal portfolio (Nugroho et al., 2017). Building an optimal portfolio using the Single Index Model of stocks from *Shari'ah* and PSE Composite Index companies paves the way for vast investment opportunities for Filipino and non-Filipino investors. Against this backdrop, this research aims to apply this model to optimize a portfolio based on *Shari'ah*-compliant securities and PSE composite index in the PSE able to outperform the Philippine Stock Exchange Index in terms of risk and returns. This study aims to invigorate the listing of more *Shari'ah*-compliant securities in different stock exchanges and motivate investors to look for alternative ways to optimize their portfolios and improve their returns using *Shari'ah*-compliant securities instead of using traditional securities.

The study aimed to apply the Single Index Model to construct an optimized portfolio among 20 *Shari'ah*-compliant securities and 30 securities included in the PSE composite index and compare the results with the Philippine Stock Exchange Index in terms of their risks and returns.

2. REVIEW OF RELATED LITERATURE

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Single Index Model

The Single Index Model uses the simplest tools in quantifying the factors influencing the return of assets. The construction of the optimal portfolio is more effective and logical by analyzing the inclusion/exclusion of securities using their respective weights (Mandal, 2013). Mary and Rathika (2015) showed that the Single Index Model significantly decreases the information and computational demands needed in creating an optimal portfolio. Nugroho et al., (2017) assessed the performance of *Shari'ah* stocks along with conventional stocks from the Single Index Model, the Treynor index and the Jensen index to measure the performance of the portfolios using the Composite Stock Price Index (CSI) monthly price data of IDX from years 2013 to 2015. They concluded that the Single Index Model proved to be more accurate and effective in screening and selecting stocks to construct an optimal portfolio and can be used as a tool in the investment decision-making system in stocks.

Other studies (Mary & Rathika, 2017; Putra & Dana, 2020, Mistry & Khatwani, 2023) strongly suggested the utilization of the Single Index Model in building an optimal portfolio. Yusuf (2022) utilized two portfolio models, mean variances and single index model in their investigation of the performance of the Indonesian Stock Market and proved that the Single Index Model is the best-fitted model for creating the optimal portfolio that one can hold. With the same returns that were generated, it was found that the average risk using the mean-variance is higher compared to the single index model. Aside from the two models, Hunjra (2020) utilized semi-variance (SV), mean absolute deviation (MaD) and conditional value at risk (CVaR) in their investigation of the portfolios using multiperiod scenarios in India, Pakistan and Bangladesh. Their findings revealed that none of the models used can provide the optimal returns. Sarker (2015) utilized semi-variance (SV), mean absolute deviation (MaD) and conditional value at risk (CVaR) models in examining the performance and comparing the results with other models and revealed that CvaR provided better results, thereby outperforming the other two models. In another study, Nandan and Srivastava (2017) applied Sharpe's Single Index Model (SIM) to create an optimal portfolio shows how they selected securities that have greater or equal excess return to beta (ERB) ratio than the cutoff rate and then proceeded to take into account various factors such as ERB ratio, cutoff rate, risk-free rate and unsystematic risk for construction of their optimal portfolio. Based on this study, findings showed that overall, 15 out of the 50 stocks had been included in the optimal portfolio wherein majority were from the holding firms sector indicating that they were emerging rapidly, and its stocks provide consistent and assured returns.

The Single Index Model was proven to be more accurate and effective when it comes to screening and selecting stocks to create an optimal portfolio and can be used as a tool in the investment decision-making system in stocks.

Diversification and Other Portfolio Optimization Models

Diversification is the process of reducing risk by holding different elements of investment classes in an investor's portfolio. Its overarching goal is to reduce risk while maximizing return. Chen and Lim (2015) looked at the effect of diversification for stocks listed on Bursa Malaysia from January 2002 to April 2014 and indicated that that portfolio risks were reduced, as more assets were added in both *Shari'ah* and non-*Shari'ah* portfolios and the portfolio of *Shari'ah* stocks required a smaller number of stocks to eliminate total diversifiable risk of 40% compared to the non-Shariah portfolio. To understand how the

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relationship between systematic risk and unsystematic risk affects the process of diversification.

The Capital Asset Pricing Model explains the risk and return relationship of any risky asset (Lean & Parsva, 2012). Fama and French (2004), narrated how the breakthrough of the model paved the way for more asset pricing models to be built given the variables that could generate the expected rates of risk and return. Pacho (2014) identified the validity of CAPM by analyzing previous studies and proved that CAPM still prevails as a useful tool in investment management. Regarding the use of CAPM in *Shari'ah*-compliant securities, one main issue is the use of risk-free interest rate as required by one of the variables in CAPM. Risk-free interest rate is not compatible with *Shari'ah* since Islam prohibits payment or acceptance of interest charges. There is theoretically no equal risk-free interest rate in Islamic economies. Hakim et al. (2016) and Hazny, Hasim and Yusof (2017) conducted studies that highlighted the use of CAPM in Islamic finance. Hakim et al. (2016) proposed two forms of *Shari'ah*-compliant CAPM using portfolios that have both 3- and 10-year data with risk-free rate, as proxied by *Shari'ah*-compliant zero-beta portfolio and the other one which assumes the absence of zero-beta portfolio. Findings showed that the two versions of *Shari'ah*-Compliant CAPM had similar outcomes and behavior with the conventional CAPM. Hazny et al. (2017) constructed a *Shari'ah*-compliant capital asset pricing model based on Islamic finance principles by using purification of return, elimination of short sales and zakat using 10-monthly rates of return of Shari'ah-compliant publicly listed firms in Bursa Malaysia and comparing the results with the traditional CAPM. Their findings showed that the constructed *Shari'ah*-compliant CAPM is correct and applicable in determining the relationship of risk and return in the Islamic stock market.

Modern Portfolio Theory

Reducing investment risk through a diversification process is the key aspect of the Modern Portfolio Theory (Hadiyoso et al., 2015), Correlation coefficients will be identified on each asset in the market and the assets that will be selected with opposite correlation shall be the basis of a portfolio with minimum investment risks. Abu Bakar and Rosbi (2018) evaluated the risk in a portfolio of an Islamic investment suggesting that a negative correlation on a stock is more preferred in order to decrease the risk of a portfolio. Results showed a negative correlation factor between the two stocks. This implies that it reduces the portfolio risk and an insignificant correlation for the remaining stock. Robiyanto (2017) showed in his study utilizing the stock indices from the Indonesia Stock Exchange for the years 2013-2016 showing the reduction in risk given that stock returns have no correlation.

3. METHODOLOGY

The research primarily focused on *Shari'ah*-compliant securities and stocks listed in the PSE Composite Index (PSE) that are consistently present in the Philippine Stock Exchange from years 2014-2018. Since the composition of 53 *Shari'ah*-compliant stocks (as of July 5, 2019) changes every quarter, the researchers have decided to use 20 companies whose securities are consistently compliant from the beginning of the time frame. The study allowed the researchers to empirically test the impact of risk and rates of return on twenty (20) *Shari'ah*-compliant securities listed in the PSE and 30 non-*Shari'ah*-compliant securities listed in the PSE. The two optimal portfolios, namely the *Shari'ah*-compliant portfolio and non-*Shari'ah*-compliant portfolio were constructed and benchmarked with the Philippine Stock Exchange Index (PSE). The study utilized causal and evaluative research designs using two stages.

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The first stage comprised of the daily prices of the PSE from 2014 to 2018 and the researchers computed for the following variables: beta, alpha, reward-to-volatility ratio, covariance, optimal investment proportion, rate of return, variance, cutoff rate, error term, and risk-free rate. For the *Shari'ah*-compliant equities, the Malaysian Sukuk Rate was utilized as a proxy for the Risk-Free Rate. The absence of Zakat rate in the Philippines also makes Sukuk rate the most viable rate, as it also complies with the *Shari'ah* law.

The second stage commenced with the evaluative research design to construct, evaluate, and assess the performance of the resulting optimal portfolio with the benchmark, which is the PSE. For the time period of 2014-2018, the constructed optimum portfolio and PSE*i* were compared in terms of returns and the weight of the *Shariah*-Compliant Securities.

This research generated two portfolios that were compared with the benchmark, PSE*i*. Their securities included in these portfolios were computed to derive their average individual stock returns and their risks measured in terms of their corresponding alphas and betas, and the unsystematic risk of each security, in the Composite Index and in the *Shari'ah*-compliant portfolio.

The individual security returns were computed using the formula $\alpha + (ß \times Rm)$. The alpha and beta included in the two tables were generated by running Ordinary Least Squares regression on the yearly market returns, from 2014-2018. The beta was taken from the slope coefficient, while the alpha was derived from the intercept coefficient. Likewise, the unsystematic risk was computed using the formula σ^2ei.

The individual security returns were computed using the formula $\alpha + (ß \times Rm)$. The alpha and beta included in the two tables were generated by running Ordinary Least Squares regression on the Yearly Market returns, from 2014-2018. The beta was taken from the slope coefficient, while the alpha was derived from the intercept coefficient. Likewise, the unsystematic risk was computed using the formula σ^2ei. The pre-computed data was utilized to compute the reward to volatility ratio (R/V). The formula $(R_f\text{-}R_m) \times ß$ was utilized to produce the desired results, using a risk-free rate of 4.26%. The calculated ERB for the two portfolios were ranked in descending order and other data were utilized in order to compute for the cumulative values of Column 2 and 3, as shown in Table 6 for the computation of the security's cut-off rate.

Several limitations are cited for this study. First, the study only covered the period 2014-2018 due to the establishment of *Shari'ah* compliant equities, which only started in 2013 in the Philippine Stock Exchange. Second, the study was also be limited in the Philippines in order to compare the performances of the optimal *Shari'ah* compliant portfolio with the optimal PSE composite index portfolio. Third, the Malaysian *sukuk* bond rate was used instead of the *zakat* rate normally used in Islamic securities, mainly because *zakat* rates are non-existent in the Philippines.

4. RESULTS AND DISCUSSIONS

The following results were derived using the Single Index Model comparing the returns of the *Shari'ah* compliant portfolio and the Philippine Stock Exchange Index.

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Table 1. Description of Data for the Risks and Average Individual Stock Returns in PSE Composite Index

Ticker	α	β	$\bar{R}$	$\sigma^2 e$
AC	0.0588	1.2376	13.4307%	0.0118
AEV	0.0026	0.2125	1.5178%	0.1219
AGI	-0.1855	1.0280	-12.4501%	0.0700
ALI	0.0430	1.3557	12.3364%	0.0114
AP	-0.0254	0.6294	1.1970%	0.0395
BDO	0.0597	1.9512	17.5425%	0.0026
BLOOM	0.0142	2.4531	15.9654%	0.5128
BPI	-0.0148	0.7907	3.2106%	0.0099
DMC	-0.0151	1.0278	4.5889%	0.0620
FGEN	0.1021	0.8420	15.2055%	**0.8060**
GLO	0.0139	0.5284	4.5266%	0.0677
GTCAP	0.0203	0.5629	5.3698%	0.1966
ICT	-0.0454	1.3605	3.5278%	0.1684
JFC	0.0811	0.6693	12.0798%	0.0634
JGS	0.0268	1.5044	11.6006%	0.2679
LTG	0.0104	0.6052	4.6275%	0.3177
MBT	-0.0304	1.1612	3.8491%	0.0503
MEG	0.0116	1.6656	11.0418%	0.0381
MER	0.0991	0.0160	10.0081%	0.1395
MPI	0.0144	0.3710	3.6384%	0.1825
PGOLD	-0.0056	0.7234	3.7258%	0.0588
RLC	0.0014	0.2365	1.5438%	0.1417
RRHI	0.0229	1.3324	10.1881%	0.0571
SCC	-0.2427	2.2642	-10.8434%	0.3373
SECB	0.0204	1.4579	10.6920%	0.1695
SM	0.0512	0.4845	7.9935%	0.2860
SMC	0.2574	-0.1830	**24.6591%**	0.6960
SMPH	0.1791	0.4127	20.3621%	0.0738
TEL	-0.2052	1.1093	-13.9450%	0.0271
URC	-0.0152	1.2512	5.8999%	0.3054

Table 1 and 2 present the list of the average individual stock returns of the Composite Index and *Shari'ah*-compliant securities, its corresponding alphas and betas, and the unsystematic risk of each security.

Table 2. Description of Data for the Risks and Average Individual Stock Returns of Shari'áh-compliant securities

Ticker	α	β	$\bar{R}$	$\sigma^2 e$
AR	-0.0863	1.4519	-0.0202%	**0.9735**
ATN	-0.3543	0.8516	-30.3742%	0.5225
ATNB	-0.3683	1.0922	-30.3545%	0.5478
CEU	0.0494	0.1768	5.9835%	0.0139
CIC	-0.2052	2.3443	-6.6151%	0.2864
DAVIN	-0.2922	0.7321	-24.8803%	0.4895
DMC	-0.0753	1.0253	-1.4461%	0.0154

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DNL	-0.2373	1.1433	-16.9504%	0.1789
HLCM	0.2141	0.8988	26.7401%	0.5731
IPO	-0.0073	0.4459	1.9168%	0.0298
IS	-0.0586	2.9743	11.7783%	**1.4704**
LFM	-0.1489	0.6556	-11.0027%	0.5048
MER	-0.0447	-0.4667	-7.2350%	0.0452
ORE	0.0425	2.0095	16.1725%	0.5312
SCC	0.2896	7.2182	**71.7759%**	**3.8728**
SFI	-0.0380	0.7278	0.5200%	0.0569
STR	-0.1509	2.9886	2.6395%	0.0718
URC	-0.0440	0.8501	0.6460%	0.1401
UPM	0.0780	1.0948	14.2958%	0.1512
WIN	-0.0856	0.7658	-4.0211%	0.2041

Table 3. Portfolio Average Yield and Risk

Portfolio	Average Yield	Average Risk
PSE*i*	6.77%	17.64%
Shari'ah	0.98%	53.39%

Table 3 shows a calculation of the average yield and risks with values of 6.77% and 17.64%, respectively, for the Composite Index portfolio. The average portfolio yield and risk for the *Shari'ah*-compliant portfolio are 0.98% and 53.39%, respectively. It was also discovered that San Miguel Corporation (SMC) and Semirara Mining and Power Corporation (SCC) had produced the highest yield making it one of the most volatile among the stocks in the index. Results revealed that for both portfolios, considerably higher returns were evident compared to their corresponding portfolio yields.

As far as risk computations are concerned, the high-risk characteristic in the *Shari'ah*-compliant portfolio is very evident, showing individual risk associated with SCC, IS and AR due to the limited number of stocks in the *Shari'ah* portfolio (20 stocks vis-à-vis companies in the composite index which consists of 30 stock candidates). This confirms the findings of Chen and Lim (2015) which indicated that risk can be diversified and reduced while returns are maximized.

Table 4. Reward to Volatility Ratio (R/V) using Market Cutoff-rate (PCOMP)

Ticker	C* (%)	Rf (%)	μi (%)	βi	σ2ei	R/V = (μi- rf)/βi
AC	2.6912%	4.2590%	13.4307%	1.2376	0.0118	0.0720
AGI	2.6912%	4.2590%	-12.4501%	1.0280	0.0700	-0.1625
ALI	2.6912%	4.2590%	12.3364%	1.3557	0.0114	0.0596
AP	2.6912%	4.2590%	1.1970%	0.6294	0.0395	-0.0486
BDO	2.6912%	4.2590%	17.5425%	1.9512	0.0026	0.0681
BLOOM	2.6912%	4.2590%	15.9654%	2.4531	0.5128	0.0477
BPI	2.6912%	4.2590%	3.2106%	0.7907	0.0099	-0.0133
DMC	2.6912%	4.2590%	4.5889%	1.0278	0.0620	0.0032
FGEN	2.6912%	4.2590%	15.2055%	0.8420	0.8060	0.1300
GLO	2.6912%	4.2590%	4.5266%	0.5284	0.0677	0.0051
GTCAP	2.6912%	4.2590%	5.3698%	0.5629	0.1966	0.0197

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ICT	2.6912%	4.2590%	3.5278%	1.3605	0.1684	-0.0054
JFC	2.6912%	4.2590%	12.0798%	0.6693	0.0634	0.1168
JGS	2.6912%	4.2590%	11.6006%	1.5044	0.2679	0.0488
LTG	2.6912%	4.2590%	4.6275%	0.6052	0.3177	0.0061
MBT	2.6912%	4.2590%	3.8491%	1.1612	0.0503	-0.0035
MEG	2.6912%	4.2590%	11.0418%	1.6656	0.0381	0.0407
MER	2.6912%	4.2590%	10.0081%	0.0160	0.1395	**3.6038**
MPI	2.6912%	4.2590%	3.6384%	0.3710	0.1825	-0.0167
PGOLD	2.6912%	4.2590%	3.7258%	0.7234	0.0588	-0.0074
RLC	2.6912%	4.2590%	1.5438%	0.2365	0.1417	-0.1148
RRHI	2.6912%	4.2590%	10.1881%	1.3324	0.0571	0.0445
SCC	2.6912%	4.2590%	-10.8434%	2.2642	0.3373	-0.0667
SECB	2.6912%	4.2590%	10.6920%	1.4579	0.1695	0.0441
SM	2.6912%	4.2590%	7.9935%	0.4845	0.2860	0.0771
SMC	2.6912%	4.2590%	24.6591%	-0.1830	0.6960	**-1.1149**
SMPH	2.6912%	4.2590%	20.3621%	0.4127	0.0738	0.3902
TEL	2.6912%	4.2590%	-13.9450%	1.1093	0.0271	-0.1641
URC	2.6912%	4.2590%	5.8999%	1.2512	0.3054	0.0131

Table 4 shows that Manila Electric Company (MER) yielded the best reward to volatility ratio, while San Miguel Corporation (SMC) yielded the largest negative reward to volatility ratio. This implied that MER has the largest excess return per unit of deviation of its stock, while SMC had a negative excess return per unit of deviation for every unit of deviation. This also implied that among all the stocks in the dataset, MER yields the best return on the asset, given the risk that an investor has taken.

Similar results were found on the *Shari'ah* portfolio which utilized the Malaysian *Sukuk* Bond rate of 4.1% as its proxy for the risk-free rate since *Zakat* rates are still non-existent in the country.

Table 5. Reward to Volatility Ratio (R/V) using Market Cutoff-rate for Shari'ah compliant Companies

Ticker	C* (%)	Rf (%)	μi (%)	βi	σ2ei	R/V = (μi- rf)/βi
AR	1.0385%	4.1000%	-0.0202%	1.4519	0.9375	-0.0284
ATN	1.0385%	4.1000%	-30.3742%	0.8516	0.5225	-0.4048
ATNB	1.0385%	4.1000%	-30.3545%	1.0922	0.5478	-0.3155
CEU	1.0385%	4.1000%	5.9835%	0.1768	0.0139	0.1066
CIC	1.0385%	4.1000%	-6.6151%	2.3443	0.2864	-0.0457
DAVIN	1.0385%	4.1000%	-24.8803%	0.7321	0.4895	-0.3959
DMC	1.0385%	4.1000%	-1.4461%	1.0253	0.0154	-0.0541
DNL	1.0385%	4.1000%	-16.9504%	1.1433	0.1789	-0.1841
HLCM	1.0385%	4.1000%	26.7401%	0.8988	0.5731	0.2519
IPO	1.0385%	4.1000%	1.9168%	0.4459	0.0298	-0.0490
IS	1.0385%	4.1000%	11.7783%	2.9743	1.4704	0.0258
LFM	1.0385%	4.1000%	-11.0027%	0.6556	0.5048	-0.2304
MER	1.0385%	4.1000%	-7.2350%	-0.4667	0.0452	0.2429
ORE	1.0385%	4.1000%	16.1725%	2.0095	0.5312	0.0601
SCC	1.0385%	4.1000%	71.7759%	7.2182	3.8728	0.0938
SFI	1.0385%	4.1000%	0.5200%	0.7278	0.0569	-0.0492

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STR	1.0385%	4.1000%	2.6395%	2.9886	0.0718	-0.0049
URC	1.0385%	4.1000%	0.6460%	0.8501	0.1401	-0.0406
UPM	1.0385%	4.1000%	14.2958%	1.0948	0.1512	0.0931
WIN	1.0385%	4.1000%	-4.0211%	0.7658	0.2041	-0.1060

Table 5 presents the reward to volatility ratio or excess return to beta ratio (ERB) of the *Shari'ah* portfolio. Findings reveal that Holcim Philippines Inc. (HLCM) yielded the highest ERB and ATN Holdings, Inc. "A" (ATN) generated the lowest ERB among other stocks. After which, the researchers had ranked the stocks in descending order on the basis of the reward to volatility ratio. The said results support the study of Hadiyoso et al (2015) having a higher ERB value are more likely to be included in the portfolio. Determining the ERB of a particular stock is a vital factor for a stock to be included in the portfolio since ERB variables are said to ascertain the superiority of a stock among the other stocks in the market.

Table 6. Ranking of Securities and Computation of C_i (PCOMP)

Ticker	(R/V)	$\Sigma \beta^2_i / \sigma^2_{ei}$	$\Sigma (\mu_i - r_f)\beta_i/\sigma^2_e$	C_i	$(R / V)_i - C^*$	y_i
MER	360.3790%	0.1001	0.1395	0.3210%	3.56649	11.4349%
SMPH	39.0150%	0.3037	0.2133	0.4886%	0.35285	559.1541%
FGEN	13.0010%	0.4558	1.0193	2.3264%	0.09271	104.4670%
JFC	11.6848%	0.5766	1.0827	2.4642%	0.07955	1056.4026%
SM	7.7073%	0.6565	1.3686	3.1095%	0.03977	169.4458%
AC	7.2012%	0.7908	1.3804	3.1268%	0.03471	10771.7348%
BDO	6.8080%	0.9662	1.3830	3.1203%	0.03078	74925.6560%
ALI	5.9581%	1.0896	1.3944	3.1372%	0.02228	11933.1968%
JGS	4.8801%	1.2056	1.6623	**3.7301%**	0.01150	561.6449%
BLOOM	4.7721%	1.3652	2.1750	4.8633%	0.00000	0.0000%
RRHI	4.4499%	1.4671	2.2321	4.9796%	0.00000	0.0000%
SECB	4.4124%	1.5740	2.4016	5.3450%	0.00000	0.0000%
MEG	4.0723%	1.6845	2.4397	5.4165%	0.00000	0.0000%
GTCAP	1.9733%	1.7382	2.6364	5.8461%	0.00000	0.0000%
URC	1.3114%	1.7972	2.9418	6.5148%	0.00000	0.0000%
LTG	0.6089%	1.8434	3.2595	7.2110%	0.00000	0.0000%
GLO	0.5065%	1.8887	3.3272	7.3535%	0.00000	0.0000%
DMC	0.3210%	1.9346	3.3892	7.4829%	0.00000	0.0000%
MBT	-0.3530%	1.9731	3.4395	7.5876%	0.00000	0.0000%
ICT	-0.5375%	2.0084	3.6079	7.9528%	0.00000	0.0000%
PGOLD	-0.7371%	2.0456	3.6667	8.0758%	0.00000	0.0000%
BPI	-1.3259%	2.0777	3.6766	8.0919%	0.00000	0.0000%
MPI	-1.6728%	2.1141	3.8591	8.4867%	0.00000	0.0000%
AP	-4.8650%	2.1261	3.8986	8.5712%	0.00000	0.0000%
SCC	-6.6702%	2.0176	4.2358	9.3350%	0.00000	0.0000%
RLC	-11.4816%	2.0331	4.3775	9.6439%	0.00000	0.0000%
AEV	-12.8975%	2.0483	4.4993	9.9091%	0.00000	0.0000%
AGI	-16.2541%	1.9238	4.5693	10.0909%	0.00000	0.0000%
TEL	-16.4103%	1.7843	4.5965	10.1822%	0.00000	0.0000%
SMC	-111.4898%	2.0309	5.2925	11.6603%	0.00000	0.0000%

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Table 7. Ranking of Securities and Computation of Cj (SHARI'AH)

Ticker	(R/V)	$\Sigma \beta^2_i / \sigma^2_{ei}$	$\Sigma (\mu_i - r_f)\beta_i/\sigma^2_e$	C_i	$(R / V)_i - C^*$	y_i
HLCM	25.1905%	1.4095	0.4396	0.9819	0.0590	9.2534%
MER	24.2885%	6.2321	5.8179	11.7319%	0.0500	-51.6512%
CEU	10.6555%	8.4802	13.4840	26.0116%	-0.0863	-109.8119%
SCC	9.3758%	21.9336	13.5082	20.6890%	-0.0991	-18.4789%
UPM	9.3133%	29.8614	14.1242	**19.2903%**	-0.0998	-72.2499%
ORE	6.0078%	37.4630	14.2373	17.6159%	0.0000	0.0000%
IS	2.5815%	43.4796	14.2549	16.4156%	0.0000	0.0000%
STR	-0.4887%	167.9117	14.1868	6.7150%	0.0000	0.0000%
AR	-2.8378%	170.0771	14.1576	6.6332%	0.0000	0.0000%
URC	-4.0632%	175.2361	13.8676	6.3440%	0.0000	0.0000%
CIC	-4.5707%	194.4274	13.7080	5.7648%	0.0000	0.0000%
IPO	-4.8964%	201.1074	12.0627	4.9343%	0.0000	0.0000%
SFI	-4.9193%	210.4224	11.1975	4.4123%	0.0000	0.0000%
DMC	-5.4095%	278.8920	7.6738	2.3813%	0.0000	0.0000%
WIN	-10.6045%	281.7652	7.1543	2.2005%	0.0000	0.0000%
DNL	-18.4115%	289.0725	6.1251	1.8425%	0.0000	0.0000%
LFM	-23.0367%	289.9240	5.6687	1.7009%	0.0000	0.0000%
ATNB	-31.5451%	292.1017	5.0929	1.5182%	0.0000	0.0000%
DAVIN	-39.5868%	293.1966	4.2841	1.2729%	0.0000	0.0000%
ATN	-40.4811%	294.5845	3.5094	1.0385%	0.0000	0.0000%

Shown in Table 6 and Table 7 are the calculated ERB for companies in the PSE*i* index and *Shari'ah* compliant companies which were ranked in descending order. The cumulative values found in Columns 2 and 3 were the security cut-off rate. They were computed using the values of MER for the Composite index and HLCM for the *Shari'ah* portfolio as the base and accumulating the values for the succeeding stocks which will serve as the cumulative computation per stock. By doing the step, the researchers had utilized the formula:

$$\frac{\sum (\mu_i - r_f)\beta}{\frac{1}{\sigma^2} + \sum \frac{\beta_i^2}{\sigma_{ei}^2}}.$$

In the computation of the aforementioned, it will yield a normally distributed dataset for the cutoff rate wherein the peak of the distribution, $f_x = MAX(C_{JFC}:C_{BLOOM})$ will be the optimal cutoff rate to produce the optimal portfolio which the market can produce. In the dataset above, the researchers had determined that the cut-off point was from JGS and UPM since these cut-off rates were at the peak of the distribution. Furthermore, the researchers had assigned a value of zero in the difference of the reward to volatility ratio and cut-off rate since they were the set of securities which were "cut-off" from the portfolio.

Table 8. Final Results and Portfolio Allocation (PCOMP)

Ticker	Optional Investment Proportion rf= 4.26%	Mean Return	Weighted Return
MER	0.01%	10.01%	0.000866%
SMPH	0.42%	20.36%	0.086171%
FGEN	0.08%	15.21%	0.012022%

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JFC	0.80%	12.08%	0.096582%
SM	0.13%	7.99%	0.010251%
AC	8.15%	13.43%	1.094938%
BDO	56.71%	17.54%	9.947836%
ALI	9.03%	12.34%	1.114165%
JGS	0.43%	11.60%	0.049311%
BLOOM	0.36%	15.97%	0.000000%
RRHI	1.77%	10.19%	0.000000%
SECB	0.65%	10.69%	0.000000%
MEG	3.31%	11.04%	0.000000%
GTCAP	0.22%	5.37%	0.000000%
URC	0.31%	5.90%	0.000000%
LTG	0.14%	4.63%	0.000000%
GLO	0.59%	4.53%	0.000000%
DMC	1.25%	4.59%	0.000000%
MBT	1.75%	3.85%	0.000000%
ICT	0.61%	3.53%	0.000000%
PGOLD	0.93%	3.73%	0.000000%
BPI	6.04%	3.21%	0.000000%
MPI	0.15%	3.64%	0.000000%
AP	1.21%	1.20%	0.000000%
SCC	0.51%	-10.84%	0.000000%
RLC	0.13%	1.54%	0.000000%
AEV	0.13%	1.52%	0.000000%
AGI	1.11%	-12.45%	0.000000%
TEL	3.09%	-13.94%	0.000000%
SMC	-0.02%	24.66%	0.000000%
		Portfolio Return	12.41%
		Market Return	5.93%

Table 8 shows the final results of the PSE Composite Index portfolio. Through the use of the Single Index Model using a risk-free rate of 4.26%, the research had generated a portfolio that included nine (9) securities which are MER, SMPH, FGEN, JFC, SM, AC, BDO, ALI and JGS. The weighted stock return was computed by multiplying the mean return and the optimal investment portfolio proportions. In the previous table, BDO garnered the highest allocation among other stocks in the portfolio. It should also be noted that it also yielded the highest weighted return. The results were consistent with the study conducted by Mary and Rathika (2015) where Single Index model was used in their research through the use of monthly closing stock prices from ten firms listed in the 2010 to 2014 NSE and CNX PAHRMA price index. Despite having the same cutoff value with the other companies, it exhibited a positive excess return to beta ratio (ERB) that made it qualified as part of the portfolio. To be included in the optimal portfolio, a stock must have the highest cutoff rate and exhibit a positive excess return to beta ratio.

Table 9. Final Results and Portfolio Allocation (SHARI'AH)

Ticker	Optional Investment Proportion rf= 4.10%	Mean Return	Weighted Return
HLCM	-3.81%	26.74%	-1.02%
MER	21.26%	-7.23%	-1.54%
CEU	45.20%	5.98%	2.70%
SCC	7.61%	71.78%	5.46%

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UPM	29.74%	14.30%	4.25%
ORE	0.00%	16.17%	0.00%
IS	0.00%	11.78%	0.00%
STR	0.00%	2.64%	0.00%
AR	0.00%	-0.02%	0.00%
URC	0.00%	0.65%	0.00%
CIC	0.00%	-6.62%	0.00%
IPO	0.00%	1.92%	0.00%
SFI	0.00%	0.52%	0.00%
DMC	0.00%	-1.45%	0.00%
WIN	0.00%	-4.02%	0.00%
DNL	0.00%	-16.95%	0.00%
LFM	0.00%	-11.00%	0.00%
ATNB	0.00%	-30.35%	0.00%
DAVIN	0.00%	-24.88%	0.00%
ATN	0.00%	-30.37%	0.00%
		Portfolio Return	**9.86%**
		Market Return	**5.93%**

Meanwhile, the results of the *Shari'ah* compliant portfolio are shown in Table 9. Utilizing the Single Index Model using a *sukuk* bond rate of 4.1%, the portfolio included five (5) stocks which are HLCM, MER, CEU, UPM and SCC which garnered the highest weighted return. This corroborates the results of Butt and Sadaqat (2018) where they mentioned that *Shari'ah* compliant stocks normally have a better risk adjusted return. There were also minimal to no findings regarding evidence for opportunity loss due to limited diversification opportunities. Most returns on *Shari'ah* compliant firms were negatively linked with market-based risk factors and that indicates higher demand for such assets by investors.

On the other hand, MER and HLCM had garnered a negative proportion according to the results of the model, thus the researchers had interpreted that MER stocks should also be omitted from the portfolio since there is no such thing as a negative allocation within a portfolio. The use of the *sukuk* bond rate had a vital role in the computation of the stock's proportion. In a study by Hakim et al., (2016) showed that if the risk-free rate was used the yield would be about the same. However, when assessed without the utilization of risk-free rate or inflation rate, the results demonstrated a steady trend. Moreover, fewer stocks were included in the *Shari'ah* portfolio due to some restrictions provided under the Islamic law and considering that the number of stocks in this portfolio was less than that of the composite index.

Table 10. Summary of Returns

Portfolio	PCOMP	*SHARI'AH*
Portfolio Return	12.41%	9.86%
Market Return	5.93%	5.93%

The researchers also noted that the portfolio constructed using the Single Index Model outperformed the Average Market Return, as shown in Table 10. The portfolio returns of PCOMP and the *Shari'ah* stocks generated by the Single Index Model yielded 12.41% and 9.86% returns, respectively during the period as compared to the average market return which

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only yielded 5.93%. The returns generated by the Single Index Model garnered a return difference of 6.48% for PCOMP and 3.93% for the *Shari'ah* portfolio over the Average market return. This is consistent with the findings of Koirala and Paudel (2006) and Putra and Dana (2023) which indicated that Sharpe's Single Index Model is better compared to Markowitz model due to the tedious computational work required in the latter's model. While the study only utilized the Single Index Model for the PCOMP and *Shari'ah* compliant portfolios, it was proven to be more accurate and effective when it comes to screening and selecting stocks to create an optimal portfolio and can be used as a tool in the investment decision making system in stocks. Moreover, our findings also corroborated the findings of Butt and Sadaqat (2018) which confirmed that *Shari'ah* compliant firms can fulfill hedging requirements for its investors and that returns would not drop when market returns are lower overall.

5. CONCLUSIONS AND RECOMMENDATIONS

The study constructed an optimized portfolio using the Single Index Model for *Shari'ah*-compliant securities in the Philippine Stock Exchange and the PSE Composite Index for periods 2014-2018 and compared these portfolios with the Philippine Stock Exchange Index. Daily closing prices of 20 *Shari'ah* Compliant stocks and 30 stocks from the PSE Composite Index were utilized.

Based on the calculation of the stocks of PSE composite index and *Shari'ah* compliant from periods 2014-2018, the portfolio generated a PSE Composite Index portfolio that includes nine (9) securities, omitting the security with a negative weighted return, using a risk-free rate of 4.26% and a *Shari'ah*-compliant portfolio including five (5) stocks using a *sukuk* bond rate of 4.1% through the use of Single Index Model.

Results reveal that the portfolio return for PSE composite index portfolio yielded 12.41% which was higher compared to *Shari'ah* compliant portfolio with only 9.86% returns. Meanwhile, the average market return yielded only 5.93%. This indicated that both the PSE composite index and *Shari'ah* compliant portfolios were able to outperform the PSE*i* benchmark. The *sukuk* bond rate demonstrated a portfolio return closer to that of the market return because of the restrictions present under the *Shari'ah* law.

In terms of risk, the study of Abu Bakar and Rosbi (2018) further indicated that this negative correlation is preferred due to its effect on decreasing portfolio risk overall. The high-risk characteristic in the *Shari'ah*-compliant portfolio was very evident. This is mainly because of the limited number of stocks in the *Shari'ah* portfolio (20 stocks vis-à-vis companies in the composite index which consists of 30 stock candidates. The study of Hassan (2012) also confirms that restrictions imposed on these stocks tend to create more risk. This confirms the findings of Chen and Lim (2015) which indicated that risk can be diversified and reduced while returns are maximized.

Based on the results of the research, the study suggests future research in terms of comparing the results from a technical perspective vis à vis a fundamental approach. In addition, the paper also suggests using different sub-periods to consider the various economic changes and shifts in each country. Given such important roles for the markets, including other emerging countries in the region would also give greater scope to the study. Moreover, market participants should be alerted to monitor and dissect all information within the two markets as part of their investment or trading strategy. This research adds to the body of literature

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motivating market participants in different stock exchanges to invest in *Shari'ah*-compliant securities as an alternative way to improve their portfolio returns rather than the exclusive use of traditional securities and stimulating the listing of more *Shari'ah*-compliant securities in their respective equity markets.

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REFERENCES

[1] Abu Bakar, N., & Rosbi, S. (2018). Evaluation of risk reduction for portfolio in Islamic investment using modern portfolio theory. *International Journal of Advanced Engineering Research and Science*. https://doi.org/10.22161/ijaers.5.11.7
[2] Adejoke, A. U. G. (2015). Term structure of profit rates of Sukuk. *Cambridge Scholars Publishing*.
[3] Butt, H., & Sadaqat, M. (2018). Performance of Shariah based investment: Evidence from Pakistani listed firms. Business & Economic Review, 11(4), 133-148.
[4] Chen, Y., & Lim, M. (2015). Diversification: A Sharia Effect? Some Evidence from Malaysia. *Procedia - Social and Behavioral Sciences*, 219, 193-200.
[5] Fama, E. F., & French, K. R. (2004). The Capital Asset Pricing Model: Theory and Evidence. *Journal of Economic Perspectives*, 18(3), 25-46.
[6] Hadiyoso, A., Firdaus, M., & Sasongko, H. (2015). Building an optimal portfolio on Indonesia Sharia Stock Index (ISSI). *International Journal of Administrative Science and Organization*, 22(2), 111-121. https://doi.org/10.20476/jbb.v22i2.5699
[7] Hazny, M. H., Hasim, H. B. M., & Yusof, A. Y. (2017). Mathematical Modelling of a Shariah-Compliant Capital Asset Pricing Model. *Journal of Islamic Accounting and Business Research*. https://doi.org/10.1108/JIABR-09-2016-0105, 2017
[8] Hassan, K. A. (2012). Comparison between Sukuk and conventional bonds: Value at risk approach. Master thesis, Westminster University, UK. http://dx.doi.org/10.2139/ssrn.2215194
[9] Ho, S. & Odhiambo, N. M. (2015). Stock market development in the Philippines: Past and present. *Philippine Journal of Development*, 41-42(1), 135-156.
[10] Hunjra, A. I., Alawi, S. M., Colombage, S., Sahito, U., & Hanif, M. (2020). Portfolio Construction by Using Different Risk Models: A Comparison among Diverse Economic Scenarios. *Risks*, 8(126),1-23. DOI:10.3390/risks8040126
[11] Koirala, S., & Paudel, R. (2006). Application of Markowitz and Sharpe Models in Nepalese Stock Market. *The Journal of Nepalese Business Studies*, 3(1).
[12] Lean, H., & Parsva, P. (2012). Performance of Islamic indices in Malaysia FTSE market: Empirical evidence from CAPM. *Journal of Applied Sciences*, 12(12), 1274-1281. doi: 10.3923/1as.2012.1274.128
[13] Mandal, N. (2013). Sharpe's Single Index Model and Its Application to Construct Optimal Portfolio: An Empirical Study. *Great Lakes Institute of Management*, 7(1), 1-22.
[14] Mary, J. F. (2015). The single index model and the construction of optimal portfolio with CNXPHARMA SCRIP. *International Journal of Management*. 6 (1), 87-96.
[15] Nandan, T., & Srivastava, N. (2017). Construction of Optimal portfolio using Single Index Model: An Empirical study on Nifty 50 stocks. *Journal of Management Research and Analysis*. 6(4), 74-83.

ISSN: 2304-1013 (Online); 2304-1269 (CDROM); 2414-6722 (Print)

[16] Nugroho, M., Moehaditoyo, S. H., & Anam, K. (2017). The system of investment decision making through analysis of stock portfolio performance based single index model (comparison study of Shariah Stocks and conventional stocks). *Journal of Theoretical and Application Information Technology,* 95(6), 1418-1431.
[17] Putra, I. K. A. A. S. & Dana, I. M. (2020). Study of optimal portfolio performance comparison: Single index model and Markowitz model on LQ45 stocks in Indonesia stock exchange. American. *Journal of Humanities and Social Sciences Research (AJHSSR),* 4(12), 237-244.
[18] Ramasamy, R., Munisamy, S., & Helmi, M. (2011), "Relative risk of Islamic sukuk over government and conventional bonds", *Global Journal of Management and Business Research*, 11(6), 4-12.
[19] Republic of the Philippines: Islamic Finance for the Philippines. (2018). Asian Development Bank. Retrieved on July 18, 2019, from https://www.adb.org/sites/default/files/project-documents/50325/50325-001-tar-en.pdf
[20] Robiyanto, R. (2017). Performance Evaluation of Stock Price Indexes in the Indonesia Stock Exchange. *International Research Journal of Business Studies*.10(3). Pp. 173-182. https://doi.org/10.21632/irjbs
[21] Sarker, M. R. (2015). Comparison among Different Models in Determining Optimal Portfolio: Evidence from Dhaka Stock Exchange in *Bangladesh Journal of Business Studies,* Vol. XXXVI (3),
[22] Sherif, M., & Erkol, C., "Sukuk and conventional bonds: shareholder wealth perspective", *Journal of Islamic Accounting and Business Research*, 8(4), 347-374.
[23] Yusuf, A. K. (2022). Mean-Variance and Single-Index Model Portfolio Optimisation: Case in the Indonesian Stock Market. *Asian Journal of Business and Accounting,* 15(2) 79-109.

ISSN: 2304-1013 (Online); 2304-1269 (CDROM); 2414-6722 (Print)