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Performance Analysis of a Philippine REIT and Its Optimal Allocation in a Mixed-asset Portfolio

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Real estate investment trusts (REIT) are new and potentially lucrative investment vehicles in the Philippines with their inherent risks and rewards. Understanding their behavior and characteristics allows investors to maximize their profits and mitigate their risks. This study specifically considers the Ayala REIT (AREIT) and aims to conduct a performance analysis on it. The study used daily closing quotes of AREIT, Philippine Stock Exchange index and sectoral indices, S&P Philippine bond index, and monthly Philippine treasury bill from August 2020–April 2021. By using established methods in the modern portfolio theory (MPT), the risk-adjusted returns of the AREIT were obtained and compared with those of other assets. Other descriptors, such as correlations that indicate diversification potential were also obtained. This research also extends beyond performance and comparative analyses by using the mean-variance framework to determine the efficient frontiers that highlight the opportunity set of portfolios with the best return for a given level of risk. As a final modification in our AREIT description, this study employed the utility theory to incorporate an investor's risk appetite in determining the optimal allocation of AREIT. The results show that AREIT had high returns and low risk relative to the other assets considered, as well as low to negative correlations with these assets. Moreover, it was observed that optimal AREIT weight increased with risk-aversion. AREIT played a dual role in increasing yields and mitigating risks in the portfolios considered.

Keywords: mean-variance utility analysis, modern portfolio theory, optimal portfolio allocation, Philippine REIT

INTRODUCTION

A Philippine REIT is a publicly listed corporation that owns, manages, or operates income-generating real estate. It earns from rents and leases, generates funds through capital markets, and in return, distributes dividends to its shareholders. Participation in a REIT is only by means of subscription to its shares of stock (The LawPhil Project 2009). These REIT stocks are treated as part ownership of the company's real-estate portfolio and are characterized by their high yields and low risks. The first REIT company to be listed in the PSE is the AREIT, which had its initial public offering (IPO) last 27 Jul–23 Aug 2020 at PHP 27.00/share. It currently owns six properties with a gross leasable area of 334,000 m^2 amounting to PHP 36.1 billion and plans to expand its portfolio with 10 more properties *via* a share swap with its sponsor company Ayala Land Incorporated (ALI). This will increase its deposited property value to PHP 52 billion (Dumlao-Abadilla 2021).

REIT stockholders are expected to enjoy benefits unique from other assets in the market. Investors are most likely guaranteed returns *via* dividend yields, as 75% of a REIT's total assets are mandated to be invested in income-generating real estate, and REIT companies are obligated to disburse 90% of their taxable income at least quarterly,

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according to the REIT Act of 2009. Furthermore, REITs are not subject to corporate income tax. As a result of these provisions, REIT dividends are often much higher than those paid by the average stock, and the total return of equity REITs will include the capital appreciation of the underlying properties (Union Bank 2022). AREIT dividends were within the forecasted 5–7% with PHP 0.34, 0.31, 0.28, and 0.47/share distributed to shareholders for the four quarters of 2020, respectively (Lañeda 2020a; AREIT, Inc. 2021). The stock nature of this asset also makes it a liquid investment, and this overcomes the illiquidity problem of brick-and-mortar real estate, which has a paucity of immediate buyers (BDO Securities 2022). Finally, the REIT Act provides additional safeguards for stakeholders like external and specialized management, which AREIT is able to outsource from its established sponsor, ALI.

However, AREIT also has unique risks that investors should be wary of. REITs are generally subject to the cyclic nature of the real estate market, which differentiates them from normal stocks. Companies, for example, can influence their plummeting stock prices by carrying out restructuring policies, but very little can be done if the real estate market experiences a downswing. AREIT prices are also dependent on the ability of large tenants to pay and its ability to expand is constrained by oversubscription of institutional investors, which prevent shares from reaching secondary and foreign markets. AREIT has disclosed that all of its properties – except for one at 98% capacity – are fully occupied, with the majority of the lease agreements still valid for the next 5–10 years. Finally, REIT yields are also subject to market risk through their supposed correlation with interest and inflation rates plus the demand from real-estate consumers like the business process outsourcing sector and overseas Filipino workers (Wenceslao 2008). However, the demand from these sectors has plummeted during the pandemic. Philippine interest rates have also recently been at their lowest at 2%, reducing the yield of alternative investments like bonds but raising inflation to 3.5–4.5%, thus reducing purchasing power and increasing the incentive to lease instead.

The novelty of the Philippine REIT and its data results in a paucity of academic literature on it and much more so on its commonalities and differences with other Philippine financial assets. In their research, Victor and Razali (2009) point to the dearth of REIT studies in emerging markets as reason for the lack of consumer confidence in these assets. The call for more, particularly empirical, REIT studies has similarly been echoed by researchers in other emerging markets. Ong *et al.* (2012) and Low and Johari (2014) in Malaysia and Pham (2011) in Thailand point to the lack of REIT research in their respective countries as motivations for conducting empirical studies. Ong *et al.* (2012) investigated the performance of Malaysian REITs in comparison to the market index in periods before, during, and after the global financial crisis of 2009. The study of Low and Johari (2014) focused on the comparison of different Malaysian REITs. Pham (2011) conducted a performance analysis of Thai REITs using the same performance metric as the studies on Malaysian REITs but extended the study by using mean-variance analysis to determine the efficient frontier of a mixed-asset portfolio containing Thai REITs. Efficient frontiers are useful because they assign optimal allocations of assets to obtain the best yields per level of risk, but it ignores an investor's appetite for risk. It becomes difficult to choose an optimal portfolio when returns increase with risk. Bhuyan *et al.* (2014), thus, incorporated the utility theory into the analysis to take into account an investor's risk aversion. This study aims to determine the behavior and performance of the first Philippine REIT and then apply these findings in constructing a mixed-asset portfolio. We aim to give light on the effect of Philippine REITs in more complex financial undertakings like investment portfolios.

METHODS

Data Description

Most REIT companies in the country are new, and AREIT is the only one with enough data to study, so it represented the REIT in our portfolio. The data in this study consisted of daily AREIT stock closing quotes from 13 Aug 2020, the first trading day of AREIT, until 30 Apr 2021. This amounted to nine months of trading data. Daily closing quotes of the Philippine Stock Exchange index (PSEi) and the seven PSEi subindices from the industry sectors (financials, industrial, holding firms, services, mining and oil, property, and all shares) from the same period of REIT data were also gathered. One of these indices served as the market benchmark and represented a diversified portfolio of stocks. Meanwhile, daily closing quotes from the S&P Philippine bond index represented a diversified portfolio of risk-free assets and were collected for the same time period as well. AREIT and PSE index and sectoral indices raw data were gathered from the PSE (2021a, b) website, whereas the bond index was obtained from the S&P Dow Jones Indices (2021) website. On the other hand, monthly Philippine treasury bill rates from Aug. 2020–Apr. 2021 were also collected from the *Bangko Sentral ng Pilipinas* (BSP 2021) website, averaged, and then converted into a nine-month average and served as the risk-free rate of the experiment.

Modern Portfolio Theory (MPT) and Mean-Variance Analysis

MPT is a technique to optimize portfolio yields for given levels of risk. It tells us that the optimal weights of assets in a portfolio can be determined once returns, volatilities, and covariances or correlations of the relevant assets are determined (Markowitz 1959). After the mean returns, standard deviations, and correlation coefficients of the REIT, stock, and bond components are computed, two-asset and three-asset portfolios can be created. Each portfolio is a different combination of weights assigned for each asset. The following formulas were used. We refer the reader to the work of Francis and Kim (2013) for the discussion of these concepts.

Return Measure: Holding Period Return

This is the change in the value of an investment over the period it is held, expressed as a percentage of the original invested amount. It reflects the compounding value from reinvesting dividends earned and is computed as:

$$HPR = \frac{P_{x+1} - P_x + D}{P_x} \tag{1}$$

where P_{x+1} is the current day's asset close quote, P_x is the previous day's asset close quote, and D is the asset's dividend payment. The holding period return is used in this experiment to reflect the incorporation of the AREIT's quarterly dividends into the daily returns of its stock. For the four times the dividends were distributed in the period we considered, the corresponding dividend amounts were added to the difference between the current the and previous day's asset closing quotes then divided by the previous day's closing quote to represent the return of the asset given reinvestment of the dividends into it.

For the succeeding formulas, we use the following notations: $I = \{r, s, b\}$ is the class of assets in the portfolio representing the REIT, stock, and bond components, respectively; for $i \in I$, R_i is the average rate of return of asset, σ_i is the standard deviation of returns of asset, β_i is the systematic risk of the asset i relative to the market portfolio, W_i is the weight of the ith asset in a portfolio; R_f is the risk-free rate or average return on three-month Philippine Treasury Bills; σ_s is the standard deviation of stock returns; and ρ_{ij} is the correlation coefficient of components i and j in a portfolio, $i, j \in I$.

Expected Portfolio Return

This is the weighted average of all the assets included in the portfolio and is computed as:

$$Mean\ Return\ of\ Portfolio = R_p = \sum_{i \in I} W_i R_i. \tag{2}$$

Portfolio Standard Deviation

This is obtained by taking the square root of the portfolio variance, which measures dispersion (also known as volatility) of the portfolio returns. Thus, for a portfolio with n assets, the standard deviation is obtained through the following formula:

$$\sigma_p = \sqrt{\sum_{i=1}^{n} (W_i \sigma_i)^2 + \sum_{i=1}^{n} \sum_{\substack{j=1 \\ i \neq j}}^{n} W_i W_j \sigma_i \sigma_j \rho_{ij}} \tag{3}$$

Performance and Comparative Analysis

On a superficial level, one can already compare and rank the 10 assets using the computed expected returns and standard deviations from their data. Essentially, we are looking for assets with the highest returns coupled with low standard deviations. We can extend our performance analysis further by considering the returns of these assets in excess of the risk-free rate or essentially the real return of the assets factoring in their individual risk. This is done using the risk-adjusted performance metrics. The best-performing assets are those that produce the largest values for the risk-adjusted performance metrics.

Sharpe Ratio

This is the ratio of the risk-premium to the standard deviation of the risky asset, and it highlights the profit earned by assuming the risk for that asset. A larger Sharpe ratio means greater returns for that level of risk.

$$SR_i = \frac{R_i - R_f}{\sigma_i} \tag{4}$$

Treynor Index

The Treynor index measures the excess return per unit of systematic or market risk given by beta, as a diversified portfolio should have already eliminated specific risks of an asset. Higher Treynor index values indicate greater returns per unit of systematic risk.

$$TI_i = \frac{R_i - R_f}{\beta_i} \tag{5}$$

Jensen's Alpha

Jensen's alpha is a performance metric that measures an asset's performance relative to the capital asset pricing model's prediction. A positive alpha means the asset has beaten market returns.

$$\alpha_i = R_i - \{R_f + \beta_i(R_s - R_f)\} \tag{6}$$

M-squared Measure

The M-squared measure determines an asset's return based

on the portfolio's risk relative to that of the market benchmark. It was derived from the Sharpe ratio and will have the same order, but the magnitude of the ordering can be interpreted in percentages.

$$M_i = \frac{R_i - R_f}{\sigma_i}\sigma_s + R_f \qquad (7)$$

Leverage Factor of REIT

$$L_r = \frac{\sigma_s}{\sigma_r} \qquad (8)$$

The M-squared measure also incorporates leverage as a means to achieve maximum gains given a certain level of risk. The leverage on a REIT can be adjusted to equal the risk of the market portfolio with the REIT leverage factor computed through the above equation. If $L_r < 1$, then the REIT is riskier than the market portfolio, and a percentage of the REIT amounting to $(1 - L_r)$ should be sold and invested in a risk-free asset. On the other hand, a leverage ratio greater than one indicates a REIT to be less risky than the market portfolio. An investor should then invest an additional $(L_r - 1)$ percent on the REIT by borrowing at the risk-free rate.

Correlation Analysis and Spearman Rank Correlation Coefficient

An examination of the REIT's diversification potential will be determined through Spearman rank correlation tests with the market benchmark and the risk-free asset. The seven different PSEi industry sectors were also tested for correlations with the REIT to further clarify the latter's diversification benefit when combined with different assets. Correlations closer to one indicate little diversification potential between the REIT and that asset, and the opposite is true for coefficients closer to the negative one. Low correlations between assets mean a portfolio is diversified since the assets are not expected to follow each other's fluctuation patterns.

Utility Theory in Optimal REIT Allocation

The final modification made to determine optimal REIT allocation is to consider investors' various risk appetites through the utility theory. This framework uses the concept of an investor's relative satisfaction with a portfolio and allows them to rank these different choices according to the desired level of risk. In this case, satisfaction is interpreted as maximizing returns for a chosen level of risk. Utility theory seeks to generate a set of indifference curves or combinations of acceptable risk-return pairs for a given level of risk. Each point on a curve is said to present the same level of utility, but curves presenting greater returns for a given level of risk are said to be superior to curves with lower returns for the same risk. The superior indifference curves are those closer to the northwest portion of the plane, where points have a lower risk but higher returns. The optimal allocation of the assets is found by intersecting the efficient frontier with superior indifference curves. This framework also assumes the efficiency of markets, the rationality of investors, and the capacity to short-sell bonds. There are several functions that can be used to measure the utility of an investor from a portfolio. In this study, we will use the following utility function as this is commonly used by financial theorists, and this is consistent with the notion that utility is enhanced by the expected returns and diminished by high risk (Bhuyan *et al.* 2014):

$$U = R_p - \frac{A}{2}\sigma_P^2 \qquad (9)$$

where U is the level of utility, and A is the level of risk-aversion of an investor. Lower values of A indicate a higher appetite for risk, and higher values of A indicate a low tolerance to risk. For this study, we follow the convention used by Bhuyan *et al.* (2014) of using risk levels $1-10$ for ease of interpretation.

We then construct our two-asset and three-asset portfolios, which are weighted sums of the assets included in the portfolio. Note the structure of the portfolio also depends on the investor's risk aversion for each asset as seen in the utility function.

Weights for a Two-asset Portfolio

Consider the general utility function equation for a two-asset portfolio containing REIT and asset i, i is either stock or bond. In this case, the utility function in Equation 9 is given by

$U = R_p - \frac{A}{2}\sigma_p^2 = W_r R_r + W_i R_i - \frac{A}{2}\left(W_r{}^2\sigma_r{}^2 + W_i{}^2\sigma_i{}^2 + 2W_r W_i \sigma_r \sigma_i \rho_{ri}\right)$, with $W_i = 1 - W_r$. We obtain the optimal weight of the REIT component, $W_r = W_r{}^*$, by setting to 0 the partial derivative of the utility function with respect to W_r, *i.e.* $\frac{\partial U}{\partial W_r} = 0$. Thus, we get

$\frac{\partial U}{\partial W_r} = 0 = R_r - R_i - \frac{A}{2}(2W_r\sigma_r{}^2 - 2(1 - W_r)\sigma_i{}^2 + (2 - 4W_r)\sigma_r\sigma_i\rho_{ri}4W_r)$. This leads to the formula for the optimal REIT weight for a portfolio containing two-risky assets given by

$$W_r^* = \frac{R_r - R_i + A(\sigma_i^2 - \sigma_r\sigma_i\rho_{ri})}{A(\sigma_r^2 + \sigma_i^2 - 2\sigma_r\sigma_i\rho_{ri}}. \quad (10)$$

Weights for the Three-asset Portfolio

For the three-asset portfolio case, we replicate Bhuyan *et al.*'s (2014) model adapted from Agrrawal and Waggle's (2006) derivation applied to Philippine assets. Note that our market benchmark is also our diversified portfolio of stocks. The bond and REIT weights in the three-asset portfolio can be respectively computed as:

$$W_b^* = \frac{[R_b - R_s + A(\sigma_s^2 - \sigma_{bs})] - [W_r^* A(\sigma_s^2 - \sigma_{rs} - \sigma_{rb} - \sigma_{bs})]}{A(\sigma_b^2 + \sigma_s^2 - 2\sigma_{bs})}, \text{ and} \quad (11)$$

$$W_r^* = \frac{[R_r - R_s + A(\sigma_s^2 - \sigma_{rs})]Y - [R_b - R_s + A(\sigma_s^2 - \sigma_{sb})]Z}{A(XY - Z^2)} \quad (12)$$

where $X = (\sigma_r{}^2 + \sigma_s{}^2 - 2\sigma_{rs})$, $Y = (\sigma_s{}^2 + \sigma_b{}^2 - 2\sigma_{bs})$, $Z = (\sigma_s^2 - \sigma_{rs} + \sigma_{rb} - 2\sigma_{bs})$, and $\sigma_{ij} = (\sigma_i\sigma_j\rho_{ij})$.

RESULTS

Exploratory Analysis

Table 1 shows the average nine-month daily returns and volatilities of the AREIT, PSEI, and PSEI sectoral indices plus the S&P Philippine bond index. It can be observed that, on average, AREIT provided the third-highest daily return of 0.1949% among the assets considered. It is not the best-performing asset in terms of returns since holding firms and

Table 1. Descriptive statistics of Philippine securities.

Asset	Average return	Rank	Standard deviation	Rank
AREIT	0.1949%	3	1.1289%	4
PSEi[a]	0.0333%	8	1.2138%	5
All shares	0.0564%	6	0.9446%	2
Financials	0.1196%	4	1.3887%	6
Industrial	0.0636%	5	1.5274%	7
Property	0.0411%	7	1.7341%	8
Holding firms	1.1711%	1	20.7828%	10
Services	0.0003%	9	0.9678%	3
Mining and oil	0.3253%	2	2.1409%	9
S&P bond index	–0.0066%	10	0.1702%	1

[a]Diversified stock portfolio
Note that the average return and standard deviation are based on the nine-month data set

mining and oil produced 1.1711 and 0.3253% returns, respectively. Unsurprisingly, bonds were the poorest performers as they were the only asset with negative daily returns, but they compensated for this by having the lowest volatility among the assets considered. AREIT had the fourth-lowest volatility at 1.1289% just after bonds, all shares, and services but the second and third had 0.9466 and 0.9678% standard deviations, respectively. What is important to note here is that even if AREIT had a relatively high yield, it was matched by low volatility. This is in contrast with holding firms and mining and oil, which had the highest return but also had the highest volatilities. Thus, for the time frame considered, it can be observed that AREIT deviated from expectations that assets with high returns are offset with corresponding high volatility.

Correlation Analysis

Table 2 displays the Spearman rank correlations of the different assets considered with the AREIT. Using Gilford's rule of thumb to assess correlation strength, AREIT had low correlations, *i.e.* correlation coefficients from 0.3–0.5, with the PSEi and all shares index. These weak correlations were seen despite the fact that the AREIT is already contained in the all shares index and that the PSEi is a smaller version of the former, incorporating only select stocks from different sectors. Specifically, the all shares index and PSEi just had 0.3139 and 0.3032 correlation coefficients with the AREIT. Furthermore, AREIT had negligible correlations, *i.e.* correlation coefficients from 0–0.3 with the seven remaining assets considered. It had the lowest correlation with the bond index at 0.414% and had the second-lowest correlation of 0.1684 with property stocks, an asset often confused with REITs. These results indicate the diversification potential of AREIT in a portfolio of stocks and much more so with bonds.

Table 2. Correlations with AREIT.

Asset	Rank correlations with AREIT	Rank
AREIT	100.000%	1
PSEi[a]	30.320%	3
All shares	31.390%	2
Financials	26.663%	5
Industrial	25.270%	6
Property	16.840%	9
Holding firms	24.875%	7
Services	27.988%	4
Mining and oil	17.306%	8
S&P bond index	0.414%	10

[a]Diversified stock portfolio

Risk-adjusted Performance

Table 3 presents the ranking of the different assets considered according to the risk-adjusted performance metrics. For the metrics considered, a higher ranking indicates good performance, whereas the opposite is true for assets with lower rankings. Having obtained the risk and reward characteristics of the assets in the previous sections, we combined these descriptors to understand the real returns of these assets in light of the risk they each assume. The first two metrics employed are the Sharpe ratio and M-squared measure, which are expected to produce the same rankings. We can see from both metrics that the AREIT emerged as the best-performing asset with the lowest Sharpe ratio and M-squared measure at 0.1406 and 0.1735%, respectively. This simply means that AREIT produced the best return in excess of the risk-free rate per unit of risk among the assets considered. Moreover, there is an additional benefit in using the M-squared measure, which is expressed in percentages because we can directly compare the assets. Therefore, we can see that AREIT has 0.0065% more risk-adjusted return than the second-best performing asset, *i.e.* mining and oil. It also had 0.1735 and 0.4756% more risk-adjusted return than the PSEi index and S&P Philippine bond index, respectively. Another benefit of the M-squared measure is its use of the leverage factor. From the M-squared measure, the AREIT has a leverage factor of 1.0752. Since this value is greater than 1, it means the AREIT is less risky than the market benchmark. An investor has the option to increase AREIT exposure by 7.5212% to equal the risk of the market index. The other two metrics considered are the Treynor index and Jensen's alpha, which use beta as a specific risk that should have already been eliminated through diversification. The results show the AREIT was still the best performing asset for the Treynor index, but it slid to third place for Jensen's alpha. This weaker performance for the last metric could be attributed to the fact that AREIT is a sole asset, whereas the others are portfolios of stocks under the same sector. We note that there is still room for the REIT sector to improve its beta values and performance in these metrics once more REITs are established in the Philippine and diversified REIT portfolios could be created.

Efficient Frontiers

In the creation of the portfolios, we chose the mining and oil sector to serve as the market benchmark for a diversified portfolio of stocks because of its high yield and substantial risk that would better resemble the performance of stocks outside of a pandemic. Other indices had significantly lower returns or higher volatilities, reflecting the impact of the COVID-19 pandemic on these sectors during the time the experiment was conducted. The mining and oil subindex also has a low correlation with AREIT, which

Table 3. Performance analysis of Philippine securities.

Asset	Sharpe ratio	Rank	M2 measure	Rank	Treynor index	Rank	Jensen's alpha	Rank
AREIT	0.1406	1	0.1735%	1	0.0077	1	0.001593	3
PSEi[a]	–0.0024	8	0.0000%	8	0	8	0.00000	8
All shares	0.0214	5	0.0290%	5	0.00029	6	0.000224	6
Financials	0.0601	3	0.0760%	3	0.00107	4	0.000859	4
Industrial	0.0179	6	0.0248%	6	0.00048	5	0.000291	5
Property	0.0028	7	0.0065%	7	0	7	0	7
Holding firms	0.0546	4	0.0694%	4	0.00659	3	0.011402	1
Services	–0.0371	9	–0.0420%	9	–0.00067	9	–0.00034	9
Mining and oil	0.1350	2	0.1670%	2	0.00673	2	0.002904	2
S&P bond index	–0.2514	10	–0.3021%	10	–0.07822	10	–0.00043	10

[a]Diversified stock portfolio

is suitable for diversification and performs well based on the considered risk-adjusted metrics.

Figure 1 presents the minimum variance and efficient frontiers of the different portfolios considered. To generate the minimum variance frontier, portfolios containing different weights of the assets were created. Plotting the mean returns and standard deviations resulted in a curve called the minimum-variance frontier (MVF). The global minimum-variance portfolio (GMVP) or the portfolio with the least risk is found on the leftmost portion of the MVF. The efficient frontier or opportunity set with the best returns for each level of risk begins from the GMVP and contains the optimal portfolio.

For the portfolio containing AREIT and stock, it was observed that adding AREIT to a portfolio that consisted purely of stocks decreased portfolio returns and reduced standard deviations. This is because, as seen in Table 1, AREIT had lower yields but also lower volatility than our stock for the time frame considered. The GMVP consists of 82% AREIT and 18% stock. The efficient frontier, highlighted in orange in this case, is found above the GMVP – starting from that point until the portfolio containing 65% AREIT and 35% stock. That is, these portfolios provide higher returns for the same amount of risk compared to the portion of the MVF below the GMVP, having a higher concentration of AREIT. Still, it can be seen that AREIT still dominates the optimal portfolios by carrying a heavier weight than the stock component.

For the AREIT bond portfolio, the efficient frontier begins at the GMVP, which contains 2% AREIT and 98% bonds. From this point, AREIT weight increased with risk throughout the efficient frontier. Adding AREIT to a portfolio of bonds increased yields but also increased volatility, as AREIT has higher risk and return than bonds seen in Table 1.

For the portfolio containing AREIT, stocks, and bonds, the GMVP contains 2.39% AREIT, no stocks, and 97.74% bonds. This three-asset portfolio has the lowest risk at 0.003% and a negative return of 0.0028%. This result is supported by bonds having the least risk, followed by AREIT and stocks. This portfolio also has the least return, being dominated by bonds that also have the lowest returns among the three assets. Thus, even the portfolio with the least risk has some exposure to AREIT

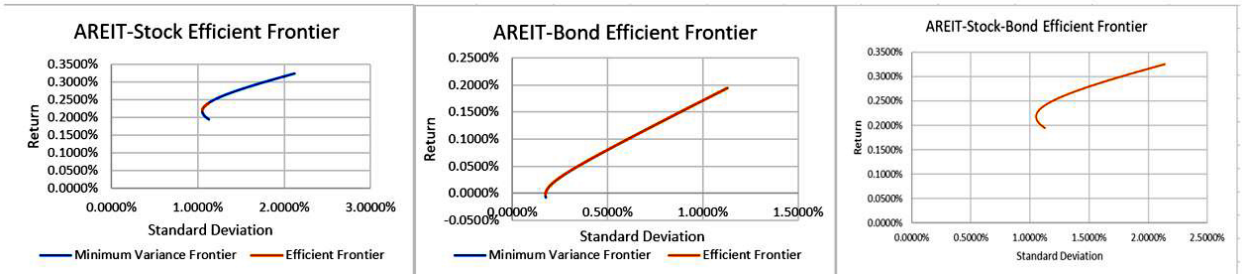

Figure 1. Minimum variance and efficient frontiers of different portfolios.

due to its low volatility. The mean-variance efficient portfolio (MVEP), the portfolio with the highest Sharpe ratio contains only AREIT and stocks and is found in the northeast-most portion of the graph. AREIT comprises 67% of this portfolio. This point also has the greatest return of 0.2382% and risk at 0.1289%. Thus, it can be observed that AREIT dominates the portfolio with the best return according to the Sharpe ratio. The efficient frontier, which contains the optimal portfolio, is found from the GMVP until MVEP.

Optimal Allocations

Note that even if the formulas in mean-variance utility analysis give us suggestions on the optimal AREIT allocation per level of risk aversion, we are more concerned with understanding the change in optimal AREIT weight throughout the different risk levels. We can always modify and extend the risk-aversion levels if we want finer or larger increments for our risk-appetite levels. This, in turn, would give new suggestions for the optimal AREIT weight, which is dependent on the risk-aversion level. For this study, we follow the convention used by Bhuyan *et al.* (2014) of using risk levels 1–10 for ease of interpretation. Thus, we focus on the behavior of the AREIT throughout the risk-aversion levels to capture the general trend or change in AREIT weight.

AREIT-stock Case

Table 4 presents the results of mean-variance utility analysis for the optimal AREIT and stock weights in a portfolio of two risky assets. From the table, it can be observed that optimal AREIT weight increased when the risk-aversion level increased. In return, the optimal stock weight fell. Specifically, we can see those portfolios at levels of high risk appetite, *i.e.* levels 1–3, are dominated by stocks with no allocation for AREIT. On the other hand, we can see from portfolios with medium to high risk aversion, *i.e.* levels 4–10, that more AREIT was being added to the portfolio. AREIT and stock weight were almost equal by level 8 and at the highest levels of risk-aversion, *i.e.* levels 9 and 10, AREIT dominated the portfolio. The increase of AREIT weight together with risk-aversion points to the AREIT being the less risky asset between the two, and it can be seen in Table 1 that AREIT had lower volatility than stocks. Consequently, portfolio returns also decreased with the risk aversion level. This section reveals that the mining and oil stock sector behaved similarly to the expected performance of stocks as the risky asset that increased both yield and risk in a portfolio. Moreover, the AREIT took on the role of the less risky asset – in this case, reducing both yield and risk when added to the portfolio.

AREIT-bond Case

Table 5 presents the suggestions of mean-variance utility analysis for the optimal AREIT and bond weights in a portfolio with one risky and one risk-free asset. The recommendation is to put most, if not all, resources on AREIT. It can be observed that as risk-aversion increased, optimal AREIT weight decreased, and optimal bond weight increased. In all levels of risk aversion considered, the computed weights for bonds are negative, reducing the portfolio to one that contains AREIT only. We can observe here that replacing AREIT with bonds reduced portfolio risk since bonds have less return and risk than AREIT. In a similar way, adding AREIT to a portfolio of bonds increased risk but also yields. We can see from the results in this section that bonds played their traditional role of reducing risk at the expense of additional returns.

Table 4. AREIT-stock optimal asset allocation**.**

Risk aversion level	Computed optimal weight		Portfolio percentage		Portfolio return	Portfolio standard deviation
	AREIT	Stock	AREIT	Stock		
1	–1.707	2.707	0.00%	100.00%	0.3253%	2.141%
2	–0.4430	1.443	0.00%	100.00%	0.3253%	2.141%
3	–0.0218	1.022	0.00%	100.00%	0.3253%	2.141%
4	0.1889	0.8111	18.89%	81.11%	0.3006%	1.780%
5	0.3152	0.6848	31.52%	68.48%	0.2841%	1.558%
6	0.3995	0.6005	39.95%	60.05%	0.2732%	1.423%
7	0.4597	0.5403	45.97%	54.03%	0.2653%	1.335%
8	0.5048	0.4952	50.48%	49.52%	0.2594%	1.274%
9	0.5399	0.4601	53.99%	46.01%	0.2549%	1.231%
10	0.5680	0.4320	56.80%	43.20%	0.2512%	1.199%

Table 5. AREIT-S&P Philippine bond index optimal asset allocation.

Risk aversion level	Computed optimal weight		Portfolio percentage		Portfolio return	Portfolio standard deviation
	AREIT	Bond	AREIT	Bond		
1	15.514	–14.51	100%	0	0.1949%	1.129%
2	7.769	–6.769	100%	0	0.1949%	1.129%
3	5.187	–4.187	100%	0	0.1949%	1.129%
4	3.896	–2.896	100%	0	0.1949%	1.129%
5	3.122	–2.122	100%	0	0.1949%	1.129%
6	2.605	–1.605	100%	0	0.1949%	1.129%
7	2.236	–1.236	100%	0	0.1949%	1.129%
8	1.960	–0.9598	100%	0	0.1949%	1.129%
9	1.745	–0.7447	100%	0	0.1949%	1.129%
10	1.573	–0.5726	100%	0	0.1949%	1.129%

Table 6. AREIT-Stock-S&P Philippine bond index optimal asset allocation.

Risk aversion level	Computed optimal weight			Portfolio percentage (%)			Portfolio return	Portfolio standard deviation
	AREIT	Bond	Stock	AREIT	Bond	Stock		
1	13.84	–19.06	6.225	68.97%	0.00%	31.03%	0.002353	0.01094
2	6.930	–9.042	3.112	69.01%	0.00%	30.99%	0.002353	0.01094
3	4.628	–5.702	2.074	69.06%	0.00%	30.94%	0.002352	0.01094
4	3.477	–4.032	1.555	69.10%	0.00%	30.90%	0.002352	0.01093
5	2.787	–3.030	1.244	69.14%	0.00%	30.86%	0.002351	0.01093
6	2.326	–2.362	1.036	69.18%	0.00%	30.82%	0.002350	0.01093
7	1.997	–1.885	0.888	69.22%	0.00%	30.78%	0.002350	0.01093
8	1.751	–1.527	0.777	69.26%	0.00%	30.74%	0.002349	0.01092
9	1.559	–1.249	0.690	69.30%	0.00%	30.70%	0.002349	0.01092
10	1.405	–1.026	0.621	69.34%	0.00%	30.66%	0.002348	0.01092

Three-asset Case

Table 6 presents the generated raw values from the three-asset optimal allocation formulas used by Bhuyan *et al.* (2014), as derived by Agrrawal and Waggle (2006). The model suggests investing the majority of one's resources in AREIT, followed by stocks, and little to none in bonds. This is supported by the three-asset efficient frontier in Figure 1, which looked similar to the efficient frontier of a portfolio with only AREIT and stocks. It can then be observed that as the risk-aversion level increased, optimal AREIT weight increased, and stock allocation decreased. Note that for all the risk aversion levels considered, the allocation values for bonds are negative, so we treat the bond weight as zero. This result is supported by the two-asset MVF analysis that indicated a higher allocation for AREIT for higher levels of risk aversion in a portfolio with stocks. Moreover, the two-asset AREIT-bond analysis also advocated investing the majority of one's resources in AREIT when used in a portfolio with bonds. Thus, our supposedly three-asset portfolios contain only AREIT and stocks, with AREIT dominating the portfolios. Adding the AREIT and stock allocation values consequently gives us our portfolio size, and the weight of an asset in that portfolio is the ratio of its allocation value over the portfolio size. Moreover, portfolio returns and standard deviations decreased with risk-aversion, indicating the less risky nature of AREIT when combined with stocks. Additionally, the generated portfolio returns were higher than if you invested solely in a portfolio of bonds, AREIT, and certain indices of stocks. Portfolio risk however was reduced and was only higher than the risk of a portfolio of pure bonds or AREIT.

DISCUSSION

This research focused on studying REIT as a new and potentially lucrative financial instrument in the Philippines. With AREIT – the first Philippine REIT, only being established in Aug. 2020 – and the continuing number of REITs being set up in the country, there is still much room to conduct studies on this relatively new industry. Additionally, Victor and Razali (2019) point to the dearth of REIT studies in emerging markets as a reason for the lack of consumer confidence in these assets. Moreover, the prevailing expectations on REIT behavior and performance in the Philippines are speculative and based on the performance of already established foreign REIT markets like those in America and Australia, where much of the REIT research has been made. In the United States, returns on the NAREIT index and the various REIT sectors have outperformed those of the S&P 500 since the REIT was first introduced in the 1970s (Dilallo 2020). In Australia, the S&P/ASX 200 AREIT Index has consistently outperformed the S&P/ASX 200 Index, with BDO Australia reporting the former outperforming the latter by 6.2% in 2019 (BDO Australia 2019). Similar REIT over stock index outperformance can be seen in Asian countries like Singapore, Japan, and Hong Kong. On the other hand, REITs have also shown to be unpopular among investors and perform poorly in other countries. In South Korea, which also has a relatively new REIT market, REITs are being glossed over in favor of traditional stocks with double-digit yields. In the study of Ong *et al.* (2012) on the performance of Malaysian REITs and Low and Johari's (2014) similar research, Malaysian REITs were discovered to have lower yields than stocks despite Malaysia already having REITs in the 1980s. Using the same metrics, Pham (2011) also concluded that Thai REITs performed worse than stocks and even bonds, highlighting their smaller size and more restrictive regulations in Thailand. Even academic literature on REITs from established markets is not uniform on the asset's general behavior. Thus, generalizing conclusions on REIT returns are difficult to make as REIT performance, and correlation with assets were found to vary with time and their market conditions. These conflicting results from foreign REIT markets point to the importance of understanding the behavior and performance of Philippine REITS and, much more so, their inclusion in more complex financial undertakings like investment portfolios by considering the asset's own specific characteristics and market environment.

In response, this study attempted to determine the risk and reward characteristics of the first Philippine REIT by using various performance metrics from the portfolio theory. From the exploratory analysis, it was observed that AREIT had high returns but also had low risk. This effectively differentiated it from local stocks, where increased yield was offset by increased risk and bonds, which offered low returns for their low risk. For the correlation analysis, it was discovered that AREIT had weak to negligible correlations with stocks and much more so with bonds, suggesting AREIT's diversification potential in a mixed-asset portfolio. Combining these return and volatility characteristics, REITs emerged as the best performing asset for three of the risk-adjusted metrics considered. That is, AREIT gave the best returns in excess of the risk-free rate per unit of risk. For individually assessing REIT performance, the researchers suggest using the Sharpe ratio and M-squared measure, as they are not dependent on beta values, which favor diversified portfolios over single assets. The M-squared measure also has the benefit of being expressed in percentages, which allows the assets to be directly compared with each other. It also makes use of the leverage factor, which can be a decision tool in adjusting exposure to the asset in reference to the market benchmark's risk.

After understanding these characteristics, we proceeded to use mean-variance analysis in constructing portfolios with AREITs and noted their effect on these portfolios. For this experiment, the mining and oil stock index was chosen as the market benchmark representing a portfolio of stocks because of its relatively high return and substantial risk that better-reflected stock performance outside of a pandemic. In generating the efficient frontier of the AREIT-stock portfolio, it was observed that portfolios with AREIT weight ranging from 65–82% maximized the return for the risk incurred compared with other allocations. Portfolio returns also improved when AREIT was included in a portfolio of bonds but consequently increased portfolio volatility. In the three asset portfolios, the GMVP or portfolio with the least risk was dominated by bonds, which had the least risk among the assets, followed by AREIT, with no allocation for stocks. On the other hand, the MVEP was dominated by AREIT, followed by stocks, with no allocation for bonds. Thus, AREIT was still present in the portfolio with the lowest risk due to its low volatility. On the other hand, AREIT still dominated stocks in the portfolio with the best return that maximized the Sharpe ratio.

The efficient frontier only highlighted the general location of the optimal portfolios and did not take into account an investor's risk tolerance. Thus, the mean-variance utility analysis was used to determine the optimal AREIT weight. In the two-asset portfolios with stock, it was observed that optimal AREIT weight increased with risk-aversion. This reduced risk but also decreased portfolio returns. Notwithstanding, the model showed AREIT played the role of a traditional less risky asset that decreased both the yield and return when combined in a portfolio with a

risky asset such as a stock. For two-asset portfolios with bonds, the model suggested investing in a portfolio with purely AREIT. In this case, AREIT played the role of a traditional risky asset that increased both the risk and return in a portfolio of bonds. Finally, in the three-asset case, the computations led to negative optimal weights for the bond component, thus eliminating the asset from the portfolio. This reduced the portfolios into ones containing stock and AREIT only. In this case, optimal AREIT weight increased as risk-aversion increased. Moreover, throughout the scenarios considered, AREIT was observed to be an asset with medium risk and return that can be situated between stocks and bonds. Furthermore, the AREIT was always present in the portfolios in one form or the other and played a dual role in increasing yields and mitigating risks.

COVID-19 Limitations and Post-pandemic Expectations

This study used AREIT data available at the height of the COVID-19 pandemic from Aug. 2020–Apr. 2021 and, as such, were affected by the volatile market conditions at that time. However, the AREIT stock was positively embraced by investors. It was oversubscribed during its first week of offering (Dumlao-Abadilla 2020), and though its stock immediately fell below the IPO price in the succeeding weeks and months, it has been observed to trade higher than its IPO price since November 2020. AREIT prices remained high despite the pandemic due to a number of reasons. First, like any REIT, it provides additional returns due to its tax exemptions under the REIT Act. It was the first REIT in the country and benefitted from being the only asset of its kind at the time. Second, REITs are beneficiaries of low-interest environments that reduce the yield of alternative investments like bonds (Lañeda 2020b). Third, AREIT has disclosed that all of its properties – *sans* its McKinley Exchange office building, which is 98% occupied – are fully occupied, with the majority of the lease agreements still valid for the next 5–10 years and with no exposure to volatile industries like Philippine offshore gaming operators (Sevidel 2020). This ensured a steady income stream for the AREIT despite the constant lockdowns and work-from-home set-ups in place. Thus, AREIT was able to weather the storm of the pandemic, but its end could also spell some challenges for AREIT. There is competition from REITs to be established in the future, with four already going public in 2021, and there being news of non-office space focused REITs, such as those focusing on industry spaces (Valmonte 2021a). However, Valmonte (2021a) also noted sentiments from current Philippine REITs that these developments will only make the Philippine REIT market more established, attractive to investors, and beneficial for the Filipino's financial literacy and understanding of the asset. Moreover, Valmonte (2021b) expressed optimism by REIT analysts that occupancy rates are expected to rise with improving economic and pandemic conditions, which will just further improve REIT valuations.

REFERENCES

AGRRAWAL P, WAGGLE D. 2006. The REIT-Stock Relationship and Optimal Asset Allocations. Journal of Real Estate Portfolio Management 12(3): 14.

AREIT, INC. 2021. SEC Form 17-C. Retrieved from https://edge.pse.com.ph/openDiscViewer.do?edge_no=72ab21576e480bc35d542af6f1e997b9

BDO AUSTRALIA. 2019. BDO A-REIT Survey 2019. Retrieved from https://www.bdo.com.au/en-au/a-reit-survey-2019

BDO SECURITIES. 2022. Stock *vs.* Real Estate. Retrieved from https://www.bdo.com.ph/securities/reits-stocks-versus-real-estate

BHUYAN R, CHIEMEKE C, KUHLE J. 2014. Optimal Portfolio Allocation among REITs, Stocks, and Long-term Bonds: an Empirical Analysis of U.S. Financial Markets. Journal of Mathematical Finance 4(2): 104–112.

[BSP] *Bangko Sentral ng Pilipinas*. 2021. Treasury Bill Rates. Retrieved from https://www.bsp.gov.ph/statistics/sdds/tbillsdds.aspx

DILALLO M. 2020. REITs *vs.* Stocks: What Does the Data Say? Million Acres: a Motley Fool Service. Retrieved from https://www.millionacres.com/research/reits-vs-stocks/

DUMLAO-ABADILLA D. 2021. AREIT to Add P15B worth of Ayala Land Assets to Portfolio. Philippine Daily Inquirer. Retrieved from https://business.inquirer.net/320067/areit-to-add-p15b-worth-of-ayala-land-assets-to-portfolio

DUMLAO-ABADILLA D. 2020. AREIT completes landmark IPO, 2x oversubscribed. Philippine Daily Inquirer. Retrieved from https://business.inquirer.net/304549/areit-completes-p12-33b-ipo-2x-oversubscribed

FRANCIS JC, KIM D. 2013. Modern Portfolio Theory, + Website: Foundations, Analysis, and New Developments. John Wiley & Sons.

LAÑEDA R. 2020a. AREIT, Inc. Declares Php0.59/sh Dividends for 1H2. COL Financial.

LAÑEDA R. 2020b. AREIT, Inc. Attractive yield at reasonable price. COL Financial.

MARKOWITZ HM. 1959. Portfolio Selection: Efficient Diversification of Investments. John Wiley & Sons.

LOW SW, JOHARI A. 2014. Risk-adjusted Performance of Malaysian Real-estate Investment Trusts. Jurnal Pengurusan 41: 3–11.

ONG T, TEH B, SOH P, YAN Y. 2012. Malaysian Real Estate Investment Trusts: a Performance and Comparative Analysis. International Journal of Economics and Finance 4(5).

PHAM AK. 2011. The Performance of Thai-REITs in a Mixed-asset Portfolio. Pacific Rim Property Research Journal 17(2): 197–214.

[PSE] Philippine Stock Exchange. 2021a. AREIT. Retrieved from https://www.pse.com.ph/company-information-AREIT/

[PSE] Philippine Stock Exchange. 2021b. Composite and Sector Indices. Retrieved from https://www.pse.com.ph/composite-sector-indices/

SEVIDEL M. 2020. AREIT New Acquisition Boosts Portfolio. Philippines Equities Research. BPI Securities Corporation.

VALMONTE KCG. 2021a. Executives bullish on Philippine REIT market. Business World. Retrieved from https://www.bworldonline.com/executives-bullish-on-philippine-reit-market/

VALMONTE KCG. 2021b. Market interest in REITs seen to continue in 2022. Business World. Retrieved from https://www.bworldonline.com/market-interest-in-reits-seen-to-continue-in-2022/

VICTOR ES, RAZALI MN. 2019. Macroeconomic Impact on the Excess Returns of Asian REITs. International Journal of Built Environment and Sustainability 6(1–2): 137–145.

S&P DOW JONES INDICES. 2021. S&P Philippines Bond Index. Retrieved from https://www.spglobal.com/spdji/en/indices/fixed-income/sp-philippines-bond-index/#overview

THE LAWPHIL PROJECT. 2009. The Real Estate Investment Trust (REIT) Act of 2009. Retrieved from https://lawphil.net/statutes/repacts/ra2009/ra_9856_2009.html

UNION BANK. 2022. REITs: An Investment Vehicle for Diversifying Your Wealth. Retrieved from https://www.unionbank.com/private-banking/wealth-management-women/reits-an-investment-vehicle-for-diversifying-wealth

WENCESLAO D. 2008. What are the Business and Regulatory Factors for a Successful Philippine REIT Market? [M.S. Thesis]. Massachusetts Institute of Technology. Retrieved from https://dspace.mit.edu/handle/1721.1/58632