Talmud and Markowitz Diversification Strategies: Evidence from the Nigerian Stock Market

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Received: March 26, 2014 Accepted: May 2, 2014 Online Published: May 8, 2014

doi:10.5430/afr.v3n2p145 URL: http://dx.doi.org/10.5430/afr.v3n2p145

Abstract

The object of this study is to investigate Talmud and Markowitz diversification strategies using stocks quoted on the Nigerian Stock Exchange. The essence is to determine how each of these strategies compare with one another in terms of generating superior performance based on maximizing returns and minimizing risks. In addition, it examines the applicability of diversification to the Nigerian stock exchange regarding risk reduction and return maximization. This involved data on quarterly closing prices of 17 assets (companies) drawn from the Nigerian stock exchange for 17 years, equivalent to 68 periods. The three hypotheses formulated in the course of this study were tested using the difference between independent sample means (t – test). The null hypotheses of the three hypotheses were accepted. By implication this means that diversification can diversify away a reasonable amount of risk. Hence we recommend that Nigerian investors should apply Talmud diversification strategy since diversification is applicable to the Nigerian stock market. We further recommend that more sophisticated investors could still adopt Markowitz strategy since they possess the skills to do so. Investors should exercise caution by seeking the opinion of experts before committing their funds in the market.

Keywords: Markowitz diversification strategy, Talmud diversification strategy, Nigerian Stock Exchange, Risk, Return

1. Introduction

Investment in stocks and the associated expected return from such investment is usually fraught with risk. We invest to earn a return by channelling money or other resources in the expectation of reaping future benefits. The concern of most investors is how to maximize returns while minimizing risk**.** This is not unconnected with the natural tendency for man to loath risk. In other to achieve this, Markowitz in his path breaking study initiated the idea of portfolio diversification as a strategy for dealing with the concerns of investors about risk and returns. The difficulty with Markowitz diversification is the level of sophistication and tedious computations involved in selecting assets for inclusion in portfolios. This is because Markowitz diversification involves the combining of assets that are less than perfectly positively correlated in order to reduce risk without sacrificing any of the portfolio returns.

Talmud, which is a variant of Naïve strategy, offered a simple rule for diversification otherwise known as 1/N rule. As in Pflug et al(2012), the 1/N investment strategy involves splitting assets uniformly among available suitable investment possibilities. They went further to say that, an asset allocation strategy as simple as the rule to divide available capital evenly among some (or even all) investment opportunities falls short of sophistication of modern portfolio theory which in broad terms states that a portfolio should strike optimal balance between prospective return of an investment and the possible risks of investing. The optimal decision depends on the risk preferences of the investor. For instance, Markowitz says, he used 1/N rule himself on psychological ground when he answered the question on how he manages his own funds by saying: "*my intention was to maximize my future regret. So I split my contribution fifty*-fifty *between bonds and equities*" (Zweig, 1998).

Given the sophistication of Markowitz diversification strategy, it would be expected that it should outperform the so called naïve strategy. The problem therefore that the study investigated is; if Markowitz is superior to the Naïve strategy using Talmud as a proxy, then to what extent will Markowitz strategy outperform Talmud strategy when subjected to empirical analysis? The major objective of this study is to empirically investigate the performance of the Talmud and Markowitz diversification strategies in the Nigerian stock market. In order to achieve this objective, the study will attempt to determine which of the two strategies will perform better in the Nigerian stock market and also explain whether diversification is capable of reducing risk and enhancing return of portfolio of securities in the Nigerian stock market.

2. Literature Review

The process of spreading an investment across asset through the vehicle of constructing portfolio is called diversification. According to Chance et al (2011), diversification is one of the most important lessons from capital market theory. Although endless theoretical and empirical debates have occurred over whether beta and other factors drive asset returns, there is little disagreement that diversification is a worthwhile activity.

According to Chandra (2005), investment decisions are influenced by various motives. Some people invest in a business to acquire control and enjoy the prestige associated with it. Some people invest to display their wealth. Most investors however are largely guided by the pecuniary motives of earning a return on their investment. For earning returns, investors have to invariably bear some risk.

According to Bodie et al (2004) when we control the systematic risk of the portfolio by manipulating the average beta of the component securities, the number of securities is of no consequence. But in the case of non systematic risk, the number of securities involved is more important than the firms – specific variance of the securities. Sufficient diversification can virtually eliminate firm-specific risk. Understanding this distinction is essential to understanding the role of diversification in portfolio construction.

Ross et al (2008) are of the view that the process of spreading an investment across assets (and thereby forming portfolio) is called diversification. They went further to say that the principle of diversification tells us that spreading an investment across many assets will eliminate some of the risk.

As it could be observed, an investor can reduce portfolio risk simply by holding instruments which are not perfectly correlated. Thus, investor can reduce their exposure to individual asset by holding a diversified portfolio of assets.

Zulkifli et al (2008), assert that 15 stocks are enough to diversify away a satisfied amount of diversifiable risk. A sample for constructing portfolios is constructing equally weighted portfolios.

In a study conducted by Gupta and Khoon (2001), diversification benefits are available up to about 27 securities. The size of the well diversified portfolio for the borrowing investor is found to be 30 while that for the lending investor at 50 stocks.

Al-Qudah et al (2004), investigated the effects of diversification on the portfolio riskiness in ASE, and the methodology based on the Markowitz model (1952). The results proved the existence of a significant reduction. Yet, the t-test stated that the significant reduction benefits of diversification were virtually exhausted when a portfolio contains 10-15 stocks. Furthermore, investors should implement marginal analysis in order to determine the number of stocks required in a well diversified portfolio.

Ong (1982) mentions that diversification can reduce the overall portfolio risk. However, the possibility for the risk reduction depends on the correlation coefficient and the proportion of the total funds invested in each share.

Several studies have revealed that the 1/N rule outperform several sophisticated strategy in terms of risk structure. For instance, Duchin and Levy (2009) posit that the 1/N strategy for individual portfolios outperforms another renowned strategy for portfolio selection called Markowitz's mean-variance rule.

Ahuja (2011) in his study posit that 10 securities can bring significant reduction in risk. He went further to assert that after the first 10 securities the portfolio standard deviation kept increasing and decreasing. And also that portfolio of equally weighted 10 securities can diversify away significant amount of risk for the investors of Karachi stock exchange.

According to Chan, Karceski and Lakonishok (1999), in a similar study conducted posit that it is hard to find an investment policy that consistently outperforms the uniform investment strategy.

As in Tu and Zhuo (2011), there is an important problem with the 1/N rule. It makes no use of sample information and will always fail to converge to the true optimal rule when it does not happen to be equal to it. If it has a large difference from the true optimal rule especially when the data generating process is complex and when the market portfolio is far from efficiency, its performance must be poor.

Evidence of the prominence of the 1/N rule could also be found in Benartzi and Thaler (2011) when they said that consistent with the diversification heuristic, the experimental and archival evidence suggests that some people spread their contributions evenly across the investment options in the plan. One of the implications is that the array of funds offered to plan participants can have a strong influence on the asset allocation people select; as the number of stock funds increases, so does the allocation to equities. They also went further to say that suppose that people do engage in naïve diversification strategies, as the result of this study suggest. There are two ways in which such behaviour could be costly compared to an optimizing strategy. First, investors might choose a portfolio that is not on the efficient frontier. Second, they might pick the wrong point along the frontier. The cost of the first type of error is almost certainly quite small. Even the naïve 1/N strategy will usually end up with a well-diversified portfolio that is reasonably close to some point on the frontier.

Pflug et al (2012), showed that the uniform investment strategy or 1/N rule is a rational strategy to follow to stochastic portfolio decision problems where the distribution of asset returns is ambiguous, and the decision maker adopts a worst case approach taking into account all measures in an ambiguity set.

As it could be observe, optimality of Uniform portfolio rule in the face of model uncertainty explains the good performance of 1/N strategy in comparative studies, such as Tu and Zhuo (2011), Demiguel et al (2009), Pflug et al (2012).

As in Chance et al (2011), the assertion that the number of securities required for a fully diversified portfolio is somewhat small is supported by numerous studies in which securities are randomly selected. First a one-security portfolio is constructed. Then the second security is added and the funds reallocated, usually to maintain equal weights. Then a third security is added with the fund allocated equally. This process continues until the portfolio contains a pre-specified number of securities.

Evans and Archer (2010) were the first to investigate the relationship between portfolio size and risk reduction. By examining the rate at which the variation of returns for a randomly selected portfolio reduced as a function of the number of securities included in the portfolio. This examination was based on the managerial reduction in portfolio variation resulting from successive increases in the number of securities held in the portfolio.

Although the naïve 1/N rule is quite simple, Demiguel, Garlappi and Uppal (2009), among others show that it can perform remarkably well under certain conditions. Indeed, when the asset returns have equal means and variances and when they are independent, 1/N is the best one with suitable risk aversion adjustment.

Banerjee and Hung (2013) in their study discussed the merit of 1/N and momentum strategies. They compared the performance with the different out-of-sample estimation windows and ultimately find no significant statistical or economic profits to be realized by following a momentum strategy over a passive 1/N strategy.

Jobson and Korkie (1981) is of the view that naïve 1/N diversification can outperform the Markowitz rule out-of-sample, due to the inability to reliably predict the portfolio's mean and correlation structure; failure of Markowitz's second condition.

Reckoning with naïve diversification which Talmud is a type, investors should be cautious about the extent of the diversification process. For instance, is the investment portfolio inadequately diversified or over diversified? The upshot of over diversification is known as superfluous diversification. The final result of this may lower the net return if the portfolio's management expenses are deducted.

As in Markowitz (1952), the relevant characteristics of a security for portfolio formulation are the security's return, risk and covariance with other securities. He argued that investors prefer returns and hate risks. He also argued that the assets to be included in a portfolio should most preferably have returns which covary negatively with each other. Since such assets are usually difficult to find, the next preferred option are assets with low positive covariance or correlation coefficients of returns.

Al Suqaier and Al Ziyud (2011) in their study implemented Markowitz model in determining the portfolio variance of randomly selected stocks, assuming equally weighted portfolio. The results obtained in this paper emphasized the role of diversification in Amman Stock Exchange (ASE), and advocated that investors can eliminate great part of risk by diversifying among different stock holding. They went further to show that (15-16) stocks are required to capture most of the benefits associated with diversification however, substantial benefits occur by diversifying across as few as (10) stocks. This result proved the hypothesis generated and assures the existence of a negative and significant relationship between the number of stocks in the portfolio and the portfolio risk also, the result verify the second hypothesis, which stated that the benefit from diversification increases at a decreasing rate.

As in Chow et al (1999), Markowitz introduced an efficient process for selecting portfolios. His landmark innovation, mean-variance optimization, requires financial analysts to estimate expected returns, standard deviations and correlations. In that, Markowitz show how analysts could use this information to combine assets optimally so that, for a particular level of expected return, the resulting portfolio would offer the lowest possible level of expected risk, usually measured as the standard deviation or variance.

According to Ellis (1971), in a pioneering study, Markowitz showed that a portfolio was quite different from the sum of its parts. In particular, a portfolio constructed from two stocks could be superior to either. He argued that portfolio performance should be measured in terms of both rate of return and the variance in the rate of return. Hence, if both stocks are held in a portfolio their year-to-year fluctuation will be less than their separate fluctuation. A portfolio comprised of these two stocks would have less variance than either stock alone and yet have an equally high long run return.

Abankwa et al (2013) differ from the suggestions of naïve investment proponents as they see that Markowitz optimization strategies of all types add significant value under varying market conditions in all but the smallest size portfolio.

Markowitz diversification strategy explains sophisticated method of diversification which considers both risk and return of the portfolio simultaneously. This portfolio risk depends on the correlation between two securities. Hence, the extent of the benefit of portfolio diversification is a function of the correlation between returns on securities.

Reckoning with the orientation, objective and the literature review of this study, we formulate the following hypotheses:

H_{01}: There is no significant difference between the return of Talmud diversified portfolio and Markowitz diversified portfolio.

H_{02}: There is no significant difference between the risk of Talmud diversified portfolio and Markowitz diversified portfolio.

$H_{03:}$ There is no significant difference between the mean performances of Talmud and Markowitz strategies based on Sharpe's index.

3. Methodology

This study covers a period of 17 years. That is from January 1995 to December 2011. The quarterly closing prices of Stock of quoted companies on the Nigerian Stock Exchange were used to compute the returns over the study period and in generating other data. However, ten (10) portfolios were formed ranging from two (2) assets to seventeen (17) assets portfolios.

All the equities quoted on the Nigerian stock exchange as at 1995 to 2011 forms the population of this study. The simple random sampling technique was used to select the securities used in this study. The basic sources of data used are secondary data.

The data analytical tools employed in this study are the mean, variance, standard deviation, coefficient of variation, beta coefficient, covariance of return and the Sharpe's index. The difference between mean as approximated by the student's t-distribution was used to determine and evaluate the three (3) hypotheses ($Ho_{1,}$ Ho_2 and Ho_3). The various tools are as follows:

The rate of return on individual assets is calculated using

$$r_1 = \frac{P_t - P_{t-1} + D_1}{P_{t-1}} \quad \text{.........(1)}$$

Where P_t = Price of common share at a time t

D_1 = Dividend received on the share within the time t

P_{t-1} = Price of the share at time t-1

Then reckoning with the portfolio expected return, it is calculated using equation (2)

$$E(rp) = W_A r_A + W_B r_B + \cdots + W_N r_N \quad \text{-------------------- (2)}$$

Where E(rp) = Expected return on portfolio

W_N = Weight of nth asset

r_N = Return on nth asset

The portfolio risk of Markowitz and Talmud are computed using equation (3) and (4) .

$$\sigma_{p_2} = \sqrt{W_A^2\sigma_A^2 \ + W_B^2\sigma_B^2 \ + 2W_AW_B\sigma_A\sigma_B\rho_{AB}} \qquad \text{---------------(3)}$$

Where σ_{p_2} = Portfolio risk

W_A = Weight

σ_A^2 = Variance of security

ρ_{AB} = The correlation coefficient between the ith and j assets.

Note: the above formula is for a two (2) assets portfolio.

Using the Talmud or equal weight, the formula becomes;

$$\sigma_p = \sqrt{(1/N)_A^2\sigma_A^2 \ + (1/N)_B^2\sigma_B^2 \ + 2(1/N)_A(1/N)_B\sigma_A\sigma_B\rho_{AB}} \qquad \text{.........(4)}$$

Where 1/N =equal weight

All other variables are defined as in equation (3)

The covariances of returns are computed using the following formula:

$$\mathrm{Cov}(r_{A,}r_B) = (r_A - \bar{r}_A)(r_B - \bar{r}_B) \qquad \text{---(5)}$$

Where $\mathrm{Cov}(r_{A,}r_B)$ = Covariance of asset A and B

$(r_A - \bar{r}_A)$ = Variance of A

$(r_B - \bar{r}_B)$ = Variance of B

The statistical tool used in testing the three (3) sets of hypotheses was the difference between. This was used since the sample sizes are less than 30 each and the sampling distribution of difference between means is approximated by the student's t-distribution. Thus, it is denoted by;

$$t = \frac{\bar{x}_1 + \bar{x}_2}{\sqrt{\frac{Sp^2}{n_1} + \frac{Sp^2}{n_2}}} \qquad \text{--(6)}$$

where
$$Sp^2 = \frac{(n_1-1)S_1^2 + (n_2-1)S_2^2}{n_1 + n_2 - 2} \qquad \text{---(7)}$$

where;

$n_1 + n_2 - 2$ = degree of freedom

Sp^2 = the pooled variance

$\bar{x}$ = sample mean

n = number

s = standard deviation

The Sharpe's performance index, Treynor's Index and the Jensen's were used as further checks of the relative performance of the two strategies. They are denoted by equation (8), (9) and (10) respectively as follows:

$$S_i = \frac{E(rp) - Rf}{\sigma_p} \qquad \text{...(8)}$$

Where

S_i = Sharpes index

E(rp)= expected rate of return on portfolio

σ_p = standard deviation of portfolio or total risk.

R_f= risk free rate

$$Ti = \frac{E(rp - \mathrm{Rf})}{Bi} \qquad \text{...(9)}$$

Where

T_i = Treynor's index

E(rp) = Expected rate of return

β_i = Beta coefficient of the portfolio

R_f = Risk free rate

$$\alpha_J = R_i - [R_f + \beta_{iM} . (R_m - R_f)] \ldots\ldots (10)$$

Where

α_J = Jensen's alpha

R_f = Risk free rate

β_{iM} = Beta coefficient of the portfolio

R_i = Portfolio Return

4. Result Analysis

The following tables give an insight of the various computations done in order to give a robust evaluation of both Talmud and Markowitz strategies.

Returns and Risks of the ten (10) sets of portfolios

Portfolio Size	Return on Talmud Portfolio	Return on Markowitz Portfolio	Risk of Talmud Portfolio	Risk of Markowitz Portfolio
2	7.80	6.68	22.62	25.59
4	11.95	9.70	15.63	14.93
6	12.66	14.59	13.75	12.97
8	12.07	13.99	13.66	12.05
10	13.87	13.99	14.92	12.98
12	14.46	13.17	14.78	11.02
14	17.44	13.20	15.09	11.22
15	17.10	13.20	15.28	11.79
16	17.17	13.89	15.26	11.51
17	17.10	14.02	14.94	11.50

Sharpe's Index, Treynor's Index and Jensen's Measure for the portfolios

Portfolio Size	Sharpe's index of Talmud Portfolios	Sharpe's index of Markowitz Portfolios	Treynor's Index of Talmud Portfolio	Treynor's Index of Markowitz Portfolio	Jensen's measure of Talmud Portfolio	Jensen's measure of Markowitz Portfolio
2	-0.097	-0.130	-0.0190	-0.0359	3.8779	1.5269
4	0.125	-0.020	0.0191	-0.0048	7.3040	2.9912
6	0.193	0.354	0.0340	-0.0202	6.7557	8.6783
8	0.151	0.331	0.0263	0.0571	6.1883	7.6531
10	0.260	0.307	0.0388	0.0488	9.1009	8.2769
12	0.302	0.288	0.0447	0.0562	9.6841	6.1270
14	0.493	0.285	0.0658	0.0488	13.3670	6.6368
15	0.465	0.306	0.0612	0.0457	13.1761	6.8704
16	0.470	0.338	0.0615	0.0528	13.2809	7.7464
17	0.475	0.349	0.0620	0.0543	13.1004	7.8989

Based on the result obtained from our analysis using difference between independent sample mean, our interpretation is strictly based on the provision of the decision rule. Hence, for the first hypothesis the mean of the return of Talmud diversified portfolio (M= 14.1620, SD=3.14875 was statistically not significantly different (t=1.161, df=18, two tailed P=.261) from the return of the Markowitz diversified portfolio (M=12.6840,SD=2.50767). since the calculated value (t_{-cal}) of 1.161 is less that the tabulated value (t_{-tab}) of 1.96, we accept the null hypothesis. By accepting the null hypothesis, it means that there is no significant difference between the return of Talmud diversified portfolio and Markowitz diversified portfolio. Reckoning with this result, it implies that both Talmud and Markowitz diversification strategies are capable of maximizing portfolio expected return. Hence, based on these results, no one of the strategies is superior to the other.

Reckoning with the second hypothesis, the mean of the risk of Talmud diversified portfolio (M= 15.5930, SD= 2.54985) was statistically not significantly different (t=1.270, df=18, two tailed P=.220) from the mean of Markowitz diversified portfolio (M= 13.5560, SD= 4.38518). Since the calculated value (t_{-cal}) of 1.270 is less than the tabulated value (t_{-tab}) of 1.96, we accept the null hypothesis. By accepting the null, it means that there is no significant difference between the risk of Talmud diversified portfolio and Markowitz diversified portfolio. Reckoning with this result, it implies that both Talmud and Markowitz diversification strategies are capable of minimizing portfolio risk. Hence, based on these results, no one of the strategies is superior to the other.

Finally, the result for hypothesis three shows that the mean of the Sharpe's index of Talmud diversification portfolio (M= 0.3031, SD= 0.16021) was not statistically significantly different (t=5.983, df=9, two tailed P=.069) from the mean of the Sharpe's index of Markowitz diversified portfolio (M= 0.2708, SD= 10901). Since the calculated value (t_{-cal}) of 0.527 is less than the tabulated value (t_{-tab}) of 1.96, we accept the null hypothesis. By accepting the null hypothesis, it means that there is no significant difference between the mean performance of Talmud and Markowitz diversified portfolio based on Sharpe's index. However, based on the results of the group statistics we could say that Talmud strategy performed better than Markowitz strategy. For instance, Talmud portfolio of 14 assets which is the best amongst all the portfolios formed using Talmud strategy with a Sharpe's index value of 0.493 outperformed the Markowitz best performed portfolio of 17assets with a Sharpe's index value of 0.349. This result also agrees with the postulation of Pflug et at (2012), Chan, Karceski and Lakonishok (1999) and Demiguel, Garlappi and Uppal (2009).

Visual inspection might give the impression that Talmud diversification generates superior returns to Markowitz diversification. In the same vein, Visual inspection of the risk also creates the impression that Talmud possess more risk than Markowitz which is consistent with theory.

Subjecting the two strategies to statistical test of difference between independent sample mean reveals no statistically significant difference between the mean value of the risk and return from both strategies.

Although, it was gathered that the difference in their risks and returns are not statistically significant, there are evidenced that deduced the fact that Talmud strategy performed better (superior) than the Markowitz strategy.

For instance, the Treynor's index shows that Talmud strategy portfolio of 14 assets which is the overall best amongst the Talmud sets of portfolios with an index of 0.0658 performs better than the Markowitz overall best with an index of 0.0571. However, using the Jensen' measure, we observed that Talmud also performed better with an alpha of value of 13.3670 against Markowitz value of 8.6783. Despite these observations, the results obtained from the three (3) hypotheses formed shows that statistically speaking, Markowitz cannot be said to be superior to Talmud based on the available evidence from the Nigeria stock market ceteris paribus.

5. Recommendation

- Investors should diversify their investment by using the Talmud diversification strategy in order to minimize risk and maximize returns.
- Investors should seek for appropriate information about prospects before making investment decision.
- Investors are advised to seek the opinion of experts before committing their funds in the market.
- This study is also recommended to other researchers in order to broaden knowledge in this area of study.
- More sophisticated investors could still adopt Markowitz strategy since they possess the skills to do so.
- Portfolio managers are expected to make use of the knowledge gathered from the study to enhance the quality of services they render to their clients.

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