Examining Sharp, Sortino and Sterling Ratios in Portfolio Management, Evidence from Tehran Stock Exchange

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Received: October 9, 2010 Accepted: November 15, 2010 doi:10.5539/ijbm.v6n4p222

Abstract

The aim of this study is to evaluate the functionality and effect of portfolio management of investment companies, which have had the active portfolio in Tehran stock exchange from 2005-2010. In order to do so, and assess their performance based on modern and post modern portfolio theories; this has been carried out by using Sharp, Sortino and Sterling ratios. The result obtained through testing the first hypothesis which was done through statistical analysis of variance and two by two average comparison with LSD pre-test, has revealed that the operation of investing companies is partying different from each other according to Sharp, Sortino and Sterling ratios. Sterling's ratio, with a little difference, showed a better performance, though. The second hypothesis of study also analyzed and compared the performance of investing companies to market. In which, except for Sortino ratio, other ratios showed a better operation of the companies compared to market. Finally, the results of Kruskal Wallis test and the Square Statistic presented that using all the three types of these ratios in ranking the companies will have the similar results.

Keywords: Portfolio management, Modern portfolio theory, Post modern portfolio theory, Performance evaluation ratios (Sharp, Sortino and Sterling)

1. Introduction

The portfolio performance evaluation primarily refers to the determination of how a particular investment portfolio has performed relative to some comparison benchmark. The evaluation can indicate the extent to which the portfolio has outperformed or under-performed, or whether it has performed at par with the benchmark. The evaluation of portfolio performance is important for several reasons. First, the investor, whose funds have been invested in the portfolio, needs to know the relative performance of the portfolio. The performance review must generate and provide information that will help the investor to assess any need for rebalancing of his investments. Second, the management of the portfolio needs this information to evaluate the performance of the manager of the portfolio and to determine the manager's compensation, if that is tied to the portfolio performance. (Boshnack, 2003)

Studies on portfolio performance evaluation began in the 1960's along with the development of modern asset pricing theory. After the selection of a portfolio, its performance is evaluated. Portfolio evaluation has been concerned with models, which indicate the type of components of the management process, which contributed to the results. Many measures have been used to evaluate investment performance.

2. Question Expression

The purpose of this study evaluated the overall performance of Investment companies listed in Tehran Stock Exchange in their portfolio management. Portfolio performance evaluation stage can be used as the final step in the Investment Management Process that it can work as an instrument worthy of open and control to make a more effective investment management process. The aim of this research is helping other specialized institutions being active in the market and helping the market more efficient, the possibility of investment decisions, provide better operational and financial investment from companies, encourage more investors to participate in equity investment by these companies reduce the possibility of psychological crisis on the stock market and more stability for the country's economy cited.

3. Important of Research

Observantly to the 2009 financial crisis, the importance of portfolio management has been evident more than ever. Therefore, the present study in this regard reviews the following aspects:

- Since the composition of portfolio is a factor considered by the managers, shareholders and other interested individuals and institutions. Therefore, it is essential for them to recognize and inform of the components of portfolio.
- How to shape the portfolio of the company, its impact on performance and effective at the company, and its relevance with systematic risk of companies is noteworthy for shareholder, financial managers, creditors, as well as competitors of the companies.
- Finally, it is apparent that banks and credit institutions prefer to loan corporations with a convenient portfolio structure that gain suitable return and have reasonable risk. By these limitations, banks and other credit institutions try to decrease their danger of bankruptcy.

4. Research Objectives

The aim of the investment is increasing the value of all or at least protects the financial assets. Therefore, it seems that portfolio assessment is important for investors. If the results are not satisfactory, portfolio performance should be a clear reason to change it. Thus, portfolio performance evaluation is very important. Whether a person individually and evaluate their portfolios or a portfolio company is investigated. The goals of this study can be seen by three ways:

- The perspective of the investment companies: It can be instrumental. If the results show good performance compared to other companies that have earned the market, investors will be tended to buy more shares of these companies.
- The perspective of investors: to maximize wealth and main important factors in investment decisions is considered. In other words, it would be more favorable to shareholders that purchase shares through participation and these companies entered the field of investment, and its expected returns are achieved.
- The stock market and economic perspective: This could be good signs for the stock market and total so that the economy is, on the one hand, the results can increase or decrease public participation, expansion or reduction would be invested in the community.

5. Recent Portfolio Management Background

The background portfolio performance evaluation subject is vast, it cannot exactly be explained completely; therefore, it is attempted to cover the subject as per the demand. The academic history about the measurement of managed fund performance stretches back over 40 years.

5.1

Martin Lettau and Harald Uhlig (2002) used a log-normal framework to examine the effect of preferences on the market price for risk, that is, the Sharpe ratio. In their framework, the Sharpe ratio can be calculated directly from the elasticity of the stochastic discount factor with respect to consumption innovations as well as the volatility of consumption innovations. This can be understood as an analytical shortcut to the calculation of the Hansen–Jagannathan volatility bounds, and therefore provides a convenient tool for theorists searching for models capable of explaining asset-pricing facts. To illustrate the usefulness of our approach, they examined several popular preference specifications, such as CRRA, various types of habit formation, and the recursive preferences of Epstein–Zin–Weil. Furthermore, they show how the models with idiosyncratic consumption shocks can be studied.

5.2

A major problem associated with risk management is that it is very hard to identify the main resource of risk taken, especially in a large and complex portfolio. This is due to the fact that the risk of individual securities in the portfolio, measured by most of the widely used risk measures such as standard deviation and value-at-risk, don't sum up to the total risk of the portfolio. Although the risk measure of beta in the Capital Asset Pricing Model seems to survive this major deficiency, it suffers too much from other pitfalls to become a satisfactory solution. Risk attribution is a methodology to decompose the total risk of a portfolio into smaller terms. It can be applied to any positive homogeneous risk measures, even free of models. The problem is solved in a way that the smaller decomposed units of the total risk are interpreted as the risk contribution of the corresponding subsets of the portfolio. Zhang and Rachev (2004) presented an overview of the methodology of risk attribution, different risk measures and their properties.

5.3

Russ Wermers in 2006 in a survey used portfolio holdings to evaluate the performance of an asset manager. These approaches mitigate the benchmark-choice problem of Roll (1978), as well as providing a much more precise attribution of the sources of manager returns. Although originally developed with U.S. data, recent papers have applied these approaches to European, Asian and Australian equity managers. All surveyed approaches can be integrated into the Brinson, Hood, and Bee bower (1986) attribution method, if they allow the composition of the benchmark portfolio to evolve through time according to the observed portfolio holdings of an asset manager.

5.4

Reza Tehrani, Reza Raei and Arash Faizabad (2007) examines the risk-adjusted returns using Sharpe's Index, Treynor's Index, and Jensen's Alpha to evaluate the performance of the investment companies active in Tehran Stock Exchange (TSE) during the years 2001 to 2005. The benchmark used for comparison is the Total Index of Tehran Stock Exchange. This paper lists the top ten investment companies according to each of the three traditional measures. The results show that there is no significant difference between the rankings of the three traditional ratios. Furthermore, there is a positive correlation between portfolio diversification and risk factor. The relation between risk and return is significantly positive as well. Meanwhile, the managers of the top five investment companies ranked by the Jensen's Alpha do not have superior performance relative to the market.

5.5

Zakamouline and Koekebakker (2008) in a paper present a theoretically sound portfolio performance measure that takes into account higher moments of distribution. This measure is motivated by a study of the investor's preferences to higher moments of distribution within Expected Utility Theory and an approximation analysis of the optimal capital allocation problem. They show that this performance measure justifies the notion of the Generalized Sharpe Ratio (GSR) introduced by Hodges (1998). They present two methods of practical estimation of the GSR: nonparametric and parametric. For the implementation of the parametric method we derive a closed-form solution for the GSR where the higher moments are calibrated to the normal inverse Gaussian distribution. They illustrate how the GSR can mitigate the shortcomings of the Sharpe ratio in resolution of Sharpe ratio paradoxes and reveal the real performance of portfolios with manipulated Sharpe ratios. They also demonstrate the use of this measure in the performance evaluation of hedge funds.

5.6

Annaert, Van Osselaer and Verstraete (2008) evaluated the performance of the stop-loss, synthetic put and constant proportion portfolio insurance techniques based on a block-bootstrap simulation. They consider not only traditional performance measures, but also some recently developed measures that capture the non-normality of the return distribution (value-at-risk, expected shortfall, and the Omega measure). They compare them to the more comprehensive stochastic dominance criteria. The impact of changing the rebalancing frequency and level of capital protection is examined. They find that, even though a buy-and-hold strategy generates higher average excess returns, it does not stochastically dominate the portfolio insurance strategies, nor vice versa. their results indicate that a 100% floor value should be preferred to lower floor values and that daily-rebalanced synthetic put and CPPI strategies dominate their counterparts with less frequent rebalancing

5.7

Dr Ashraf Chaudhry and Dr Helen L. Johnson (2008) investigated the suitability of existing performance measures under the assumption of a clearly defined benchmark. A range of measures are examined including the Sortino Ratio, the Sharpe Selection ratio (SSR), the Student's t-test and a decay rate measure. A simulation study

is used to assess the power and bias of these measures based on variations in sample size and mean performance of two simulated funds. The Sortino Ratio is found to be the superior performance measure exhibiting more power and less bias than the SSR when the distribution of excess returns are skewed.

5.8

Sara Machado Ferreira Pimentel (2009) in her M.A thesis said, more than four decades have passed and the Sharpe Ratio (SR) continues to be one of the most popular portfolio risk adjusted performance measures. She comments on Lo's (2002) results for the time aggregation of SR considering a different approach to deal with the conditional heteroskedasticity of returns. Based on a theorem proposed by Diebold (1986, 1988) we verify, for the series of financial returns with no serial correlation, that the most common method for time aggregation, the product of the higher-frequency SR by the square root of the number of periods contained in the lower-frequency holding period, can still be used in the presence of heteroskedasticity, when higher-frequency returns have been generated by a GARCH process and aggregated returns converge to the normal distribution. In an empirical application based on 65 investment funds, the convergence to normality is illustrated, showing that in 70% of the cases the convergence is held at least when daily returns are aggregated into annual frequency. Moreover, she show that serial correlation tends to disappear when the number of periods in the aggregation process tends to infinity and the most common method of SR time aggregation should not be disregarded as a valid method. The results are in accordance with Lo (2002) who roughly states that when serial correlation is not significant, the time aggregation of SR should be performed with the most common method of time aggregation.

5.9

In a research in 2009 Mau examined the traditional views of risk in the finance and economics literature as applied to portfolio management. His paper demonstrates the inherent weaknesses in such approaches and suggests a process framework as a method for portfolio managers to manage risky situations. The framework incorporates seven considerations which may include both quantitative and qualitative factors which will affect the value of each consideration. The framework logically links the considerations to nine potential strategies for the management of a risky situation. The use of the framework provides a systematic approach to the management of a risky situation which should lead to improved performance.

5.10

Maran Marimuthu (2010) examined the effects of crisis and post-crisis periods on the performance of Bumiputera-controlled companies in Malaysia. A sample of 33 Bumiputera-controlled companies listed on Bursa Malaysia is considered over the period 1996 to 2005. ROE is used as a performance measure and Wilcoxon Signed Ranks Test is used to justify our argument. Results indicate that Bumiputera-controlled companies suffered in both short run and long run due to the financial crisis.

5.11

Chung-Chain Lai in an article (2010) said Building a multifactor excess return model to select portfolio stocks has become a widely used tool for portfolio management. The decision to include return factors in such a model varies widely from practitioner to practitioner. Factor weightings in most models are commonly determined by linear regression. The linear regression approach ranks stocks by expected future returns and then selects a portfolio from among the highest ranked stocks. The regression model related to portfolio construction produces a model that is a "best" historic fit to the returns of every stock. No measure of portfolio return or risk can be considered in determining the regression coefficients. In addition to portfolio risk, restrictions on factor weights, portfolio structure, transaction costs, or turnover cannot be easily incorporated in determining the regression model. This thesis considers the portfolio construction model as a global optimization problem, rather than a curve fitting problem. No assumptions about convexity of optimization function $F(\theta)$ are made and, therefore, it may have several local maxima. To control risk throughout a portfolio construction process, this work considers the model's objective function to maximize return divided by risk - the Sharpe ratio. The model is constructed using a ten-year "moving window" of stock market information and then tested on the next year. He then examines the performance of a simulated annealing search and arbitrage pricing theorem to solve this global optimization problem.

6. Conceptual Framework

Portfolio management is one of the most common theories in finance and in this survey we used of two perspective of portfolio including:

6.1 Modern Portfolio Theory (MPT): is also called "portfolio theory" or "portfolio management theory." MPT is a sophisticated investment approach first developed by Professor Harry Markowitz of the University of Chicago,

in 1952. Thirty-eight years later, in 1990, he shared a Nobel Prize with Merton Miller and William Sharpe for what has become the frame upon which institutions and savvy investors construct their investment portfolios!

Modern Portfolio Theory allows investors to estimate both the expected risks and returns, as measured statistically, for their investment portfolios. In his article "Portfolio Selection" (in the Journal of Finance, in March 1952); Markowitz described how to combine assets into efficiently diversified portfolios. He demonstrated that investors failed to account correctly for the high correlation among security returns. It was his position that a portfolio's risk could be reduced and the expected rate of return increased, when assets with dissimilar price movements were combined. Holding securities that tend to move in concert with each other does not lower your risk. Diversification, he concluded "reduces risk only when assets are combined whose prices move inversely, or at different times, in relation to each other."

Dr. Markowitz was among the first to quantify risk and demonstrate quantitatively why and how portfolio diversification can work to reduce risk, and increase returns for investors. That's why he probably received the Nobel Prize!

Diversification reduces volatility more efficiently than most people understand: The volatility of a diversified portfolio is less than the average of the volatilities of its component parts. While the technical underpinnings of MPT are complex, and drawn from financial economics, probability and statistical theory, its conclusion is simple and easy to understand: A diversified portfolio, of uncorrelated asset classes, can provide the highest returns with the least amount of volatility. (Lettau et al. 2002)

6.2 Post Modern Portfolio Theory (PMPT): (Sortino and van der Meer, 1991) is an extension of the traditional modern portfolio theory ("MPT", which is an application of mean-variance analysis or "MVA"). Both theories propose how rational investors should use diversification to optimize their portfolios, and how a risky asset should be priced**.** Recent advances in portfolio and financial theory, coupled with today's increased electronic computing power, have overcome these limitations. The resulting expanded risk/return paradigm is known as Post-Modern Portfolio Theory, or PMPT. Thus, MPT becomes nothing more than a special (symmetrical) case of PMPT. In 1987(Mutual Fund performance, 1966) The Pension Research Institute at San Francisco State University developed the practical mathematical algorithms of PMPT that are in use today. These methods provide a framework that recognizes investors' preferences for upside over downside volatility. At the same time, a more robust model for the pattern of investment returns, the three-parameter lognormal distribution, was introduced. Downside risk (DR) is measured by target semi-deviation (the square root of target semi variance) and is termed downside deviation. It is expressed in percentages and therefore allows for rankings in the same way as standard deviation. An intuitive way to view downside risk is the annualized standard deviation of returns below the target. Another is the square root of the probability-weighted squared below-target returns. The squaring of the below-target returns has the effect of penalizing failures at an exponential rate. This is consistent with observations made on the behavior of individual decision-making under:

$$d = \sqrt{\int_{-\infty}^{t} (t - 1)^2 f(r)\, dr}$$

Where

d = downside deviation (commonly known in the financial community as 'downside risk'). Note: By extension, d^2 = downside variance.

t = the annual target return, originally termed the minimum acceptable return, or MAR.

r = the random variable representing the return for the distribution of annual returns f(r),

f(r) = the three-parameter lognormal distribution

For the reasons provided below, this continuous formula is preferred over a simpler discrete version that determines the standard deviation of below-target periodic returns taken from the return series.

1. The continuous form permits all subsequent calculations to be made using annual returns which is the natural way for investors to specify their investment goals. The discrete form requires monthly returns for there to be sufficient data points to make a meaningful calculation, which in turn requires converting the annual target into a monthly target. This significantly affects the amount of risk that is identified. For example, a goal of earning 1% in every month of one year results in a greater risk than the seemingly equivalent goal of earning 12% in one year.

2. A second reason for strongly preferring the continuous form to the discrete form has been proposed by Sortino & Forsey (1996):

"Before we make an investment, we don't know what the outcome will be...

After the investment is made, and we want to measure its performance, all we know is what the outcome was, not what it could have been? To cope with this uncertainty, we assume that a reasonable estimate of the range of possible returns, as well as the probabilities associated with estimation of those returns.

In statistical terms, the shape of [this] uncertainty is called a probability distribution. In other words, looking at just the discrete monthly or annual values does not tell the whole story."

Using the observed points to create a distribution is a staple of conventional performance measurement. For example, monthly returns are used to calculate a fund's mean and standard deviation. Using these values and the properties of the normal distribution, we can make statements such as the likelihood of losing money (even though no negative returns may actually have been observed), or the range within which two-thirds of all returns lies (even though the specific returns identifying this range have not necessarily occurred). Our ability to make these statements comes from the process of assuming the continuous form of the normal distribution and certain of its well-known properties.

In PMPT an analogous process is followed:

1. Observe the monthly returns,
2. Fit a distribution that permits asymmetry to the observations,
3. Annualize the monthly returns, making sure the shape characteristics of the distribution are retained,
4. Apply integral calculus to the resultant distribution to calculate the appropriate statistics.

7. Research Hypotheses

In order to do any research we should have some hypotheses and in this paper we considered three hypotheses such as:

Hypothesis 1: There is a meaningful relation between result of performance evaluation in investment companies by sharp, Sortino and sterling ratios.

Hypothesis 2: There is a meaningful difference between calculated Return of investment companies by three ratios and return of Market.

Hypothesis 3: There is a meaningful difference between the rankings by three ratios.

8. Research Methods

Research method is according to survey method and a correlation type which its main goal is to define the relationship among some quantitative variables. We also gather relevant information regarding stocks, such as split, stock and suspended stock. Only actively traded stocks are selected in the observation, so that we can minimize thin trading effect or non-synchronous trading effect, which may result in autocorrelation on stock returns. For testing the hypothesis, we use relevant statistic test including regression analyses, t-test, Kruskal-Wallis, Correlation Coefficients test such as the Pearson's correlation coefficient, Spearman's rank correlation coefficient.

9. Method of Data Collection

Methods to gather data to determine appropriate data and how to collect data and population data and considered as the first step to doing research and hypothesis testing are discussed. The data of different research methods have been collected. Reports published by Tehran Stock Exchange and the financial statements published by companies with stock applications and official sites for gathering information and feeling are used. The main source of research is by specialized software and Denasahm Software (professional software about all information of Tehran Stocks Exchange). General survey method used is descriptive and applied. For this study, two series of data are needed. The first part about companies, investment return period is monthly and yearly gathering of information and data required by this research database is the Tehran Stock Exchange. The second part, about the monthly market index and annually through the stock exchange will be extracted.

10. Place and Time range for this study

Admission to the Stock Exchange as the spatial range is considered because the information about composition and volume of portfolio investment and financial statement items for this group of companies due to the general

obligation to publish them and financial reports, is available within 2005 when this study beginning is the end of 2010 and to be more precise during the five years.

11. Research variables

Independent variables related to Companies: Alpha criteria in this study, variability reduction and efficiency compound annual returns are considered as independent variables. Each of the 90 observed variables for which the company years. Descriptive indices of independent variables in the research study are shown in table 1.

Dependent variables related to Companies: In this study, criteria and Sortino and Sterling Sharpe are considered as independent variables. Each of the 90 observed variables for which the company years. Descriptive parameters dependent variables in the research study are shown in table 2.

Independent and Dependent variables related to market:

This study compared the criteria Sortino, Sterling, Sharp, Alpha, variability reduction and efficiency compound annual returns of the market and the variables studied companies is compared. Each of the five observed variables is annual. Descriptive indicators and related variables related to market are shown in table 3.

12. Models

12.1

Any discussion on risk-adjusted performance measures must start with the grandfather of all risk measures the Sharpe Ratio or Reward to Variability which divides the excess return of a portfolio above the risk free rate by its standard deviation or variability:

$$\textbf{\textit{Sharpe Ratio}} = \frac{r_p - r_f}{\sigma_p}$$

Where:

r_p=portfolio return normally annualized

r_f=risk free rate (annualized if portfolio return is annualized)

σ_p=portfolio risk (variability, standard deviation of return) again annualized if portfolio return is annualized

Most risk measures are best described graphically, a measure of return in the vertical axis and a measure of risk in the horizontal axis as shown on figure 1.

Ideally if investors are risk averse they should be looking for high return and low variability of return, in other words in the top left-hand quadrant of the graph. The Sharpe ratio simply measures the gradient of the line from the risk free rate (the natural starting point for any investor) to the combined return and risk of each portfolio, the steeper the gradient, the higher the Sharpe ratio the better the combined performance of risk and return.

12.2

A natural extension of the Sharpe and Omega-Sharpe ratios is suggested by Sortino (1991) which uses downside risk in the denominator as follows:

$$\textbf{Sortino Ratio} = \frac{(r_p - r_T)}{\sigma_D}$$

Total risk has simply been replaced by downside risk; portfolio managers will not be penalized for upside variability but will be penalized for variability below the minimum target return.

12.3

The Sterling ratio replaces the maximum drawdown in the Calmar ratio with the average drawdown. There are multiple variations of the Sterling ratio in common usage, perhaps reflecting its use across a range of differing asset categories and outside the field of finance. The original definition attributed to Deane Sterling Jones appears to be:

$$\textbf{Original Sterling Ratio} = \frac{r_p}{\overline{DD}_{Largest} + 10\%}$$

The denominator is defined as the average largest drawdown plus 10%. The addition of 10% is arbitrary compensating for the fact that the average largest drawdown is inevitably smaller than the

maximum drawdown. Typically only a fixed number of the largest draw downs are averaged. With apologies to Deane Sterling Jones I suggest the definition is standardized to exclude the 10% but in Sharpe form as follows:

Sterling Ratio = $\frac{r_p - r_f}{\left| \frac{1}{d} \sum_{j=1}^{d} D_j \right|}$

The number of observations d fixed to the investor's preference.

Perhaps the most common variation of the Sterling ratio uses the average annual maximum drawdown in the denominator over three years. A combination of both Sterling and Calmar concepts, to avoid confusion and to encourage consistent use across the industry I suggest the following standardized definition (Bacon, 2008):

Sterling-Calmar Ratio = $\frac{r_p - r_f}{D_{max}}$

Given the variety of Sterling ratio definitions great care should be taken to ensure the same definition is used over the same time period using the same frequency of data when ranking portfolio performance. These measures can be categorized as based on normal measures of risk, regression, higher or lower partial moments, drawdown or value at risk (VaR) as Table 4:

13. Hypothesis testing

The first hypothesis: There is a meaningful relation between result of performance evaluation in investment companies by sharp, Sortino and sterling ratios.

Hypothesis 1a: The evaluated Performance of investment companies by using three ratios is equal to each other.

$$Mean_{sha} = Mean_{sor} = Mean_{ste}$$

Hypothesis 1b: The evaluated Performance of investment companies by using three ratios is not equal to each other.

$$Mean_{sha} \neq Mean_{sor} \neq Mean_{ste}$$

Based on data collected from the sample group and one-way ANOVA test, Calculated F statistics is larger than the critical table of statistics and in other words, the calculated error is smaller than 0.05. Consequently zero hypotheses are rejected at 95 percent confidence and the research hypothesis is accepted as a safe assumption. Because one way ANOVA repeated measures is a general test and it doesn't show result of detailed test, so to compare the differences between the means of two complementary L.E.D tests is used. The results show that calculated significant levels comparing the Sterling ,Sharpe and Sortino ratios are smaller than 0.05 and they have different negative values.

Thus mean of companies in the Sharp ratio is significantly smaller than mean for Sterling and Sortino ratios. But calculated significant levels for comparison Sterling and Sortino ratio are greater than 0.05 and they have different negative values. Therefore although mean of companies by using Sortino ratio is smaller than Sterling ratio but it is not meaning full from statistic perspective. To conclude we can say there is a meaning full different between result of performance evaluation by using Sterling, Sortino and Sharp in investment companies. The tables 5 and 6 showed the result of tests.

The second hypothesis: There is a meaningful difference between calculated Return of investment companies by three ratios and return of Market.

Hypothesis 2a: the mean of calculated return of companies by three ratios is not higher than market.

Hypothesis 2b: the mean of calculated return of companies by three ratios is higher than market.

$$\begin{cases} H0 : Mean = .19 \\ H1 : Mean \neq .19 \end{cases}$$

$$t = -4.898, \quad df = 89, \quad p = .000$$

$$\begin{cases} H0: Mean = .64 \\ H1: Mean \neq .64 \end{cases}$$
$$t = .147, \quad df = 89, \quad p = .883$$

$$\begin{cases} H0: Mean = .33 \\ H1: Mean \neq .33 \end{cases}$$
$$t = .628, \quad df = 89, \quad p = .532$$

1-The result of comparison mean of market performance with Investment Companies by using Sharp ratio: Based on data collected from the sample group with 89 degrees of freedom and t statistics equal -4.898, that this amount is smaller than the critical value -1.96.In other words, according to the degree of freedom and the values observed, calculated significant levels of test is less than 0.01. Considering the negative t statistic, with confidence at 99 percent, zero hypotheses is rejected and the opposite hypothesis regarding the existence of significant differences between the average yield ratio companies and the market ratio as the correct hypothesis is accepted. Therefore we cannot accept that: "There is a meaningful difference between calculated Return of investment companies by Sharp ratio and return of Market".

2- The result of comparison mean of market performance with Investment Companies by using Sortino ratio: Based on data collected from the sample group with 89 degrees of freedom and t statistics equal 0.147, that this amount is smaller than the critical value 1.96.In other words, according to the degree of freedom and the values observed, calculated significant levels of test is less than 0.05. Considering the positive t statistic, with confidence at 99 percent, zero hypotheses is rejected and the opposite hypothesis regarding the existence of significant differences between the average yield ratio companies and the market ratio as the correct hypothesis is accepted. Therefore we cannot accept that: "There is a meaningful difference between calculated Return of investment companies by Sortino ratios and return of Market".

3- The result of comparison mean of market performance with Investment Companies by using Sterling ratio: Based on data collected from the sample group with 89 degrees of freedom and t statistics equal 0.628, that this amount is smaller than the critical value 1.96. In other words, according to the degree of freedom and the values observed, calculated significant levels of test are less than 0.05. Considering the positive t statistic, with confidence at 99 percent, zero hypotheses is rejected and the opposite hypothesis regarding the existence of significant differences between the average yield ratio companies and the market ratio as the correct hypothesis is accepted. Therefore we cannot accept that: "There is a meaningful difference between calculated Return of investment companies by Sterling ratios and return of Market".Test results are shown in Table 7.

The third hypothesis: There is a meaningful difference between the rankings by three ratios.

Hypothesis 3a: The mean of ranking companies by three ratios is equal to each other.

Hypothesis 3b: The mean of ranking companies by three ratios is not equal to each other.

1- The comparison of the average eighteen investment companies by using Sharp ratio: Based on data collected from the sample groups and the nonparametric Kruskal-Wallis test, calculated Chi square statistics with value 15.537 is less than statistics table critical with value 27.587 and In other words, the calculated significance level is greater than 0.05. Thus applying the Sharpe ratio in performance evaluation of investment companies lead to similar ranking results in companies. Test results are displayed in Table 8.

2- The comparison of the average eighteen investment companies by using Sortino ratio: Based on data collected from the sample groups and the nonparametric Kruskal-Wallis test, calculated Chi square statistics with value 17.924 is less than statistics table critical with value 27.587 and In other words, the calculated significance level is greater than 0.05. Thus, applying the Sortino ratio in performance evaluation of investment companies lead to similar ranking results in companies. Test results are displayed in Table 8.

3- The comparison of the average eighteen investment companies by using Sterling ratio: Based on data collected from the sample groups and the nonparametric Kruskal-Wallis test, calculated Chi square statistics with value 18.448 is less than statistics table critical with value 27.587 and In other words, the calculated significance level is greater than 0.05. Thus, applying the Sterling ratio in performance evaluation of investment companies lead to similar ranking results in companies. Test results are displayed in Table 8.

To profound study, we has been compared the average rating performance ratios for each of the companies' separately by using Friedman Rank Test. Eighteen test results have shown that three factors mean rank in

seventeen cases and no significant difference in only one significant difference between the average ratio ratings has been studied. Test results are displayed in Table 9.

14. Conclusion

Since the result of evaluation the performance of investment companies based on Sharp, Sortino and Sterling ratios were not the same, we could say according to modern portfolio theory (1952) which uses Sharp ratio as one of the performance measures and it considers no difference in downside and upside risk when considering the risk of investment; and on the other side the theory of post-modern portfolio (1987) which uses Sterling and Sortino ratios and considers the difference between the two types of the risks, now both theories have shown their differences in the statistical research. According to the weak performance of Sharp in comparison to Sortino and Sterling in relation to investment companies ratios related to post-modern portfolio theory would better define the performance of the companies. Furthermore, the outcomes of ranking the investment companies using Sterling and Sortino ratios has been better than the results obtained with Sharp ratio, and this in itself questions the functionality of standard deviation's historical results in comparison to the ratios using the other unusual distributions and considering the least volatility.

The results of the Sharpe ratio presented better performance for investment companies compared to market, but since this matter was not approved of by Sortino and Sterling ratios; it is probable to say, there are other effective factors that influence the evaluation of performance, which is ignored Sharpe ratio in this case, we could refer to the research carried out by Martin Lettau and Itarad Uhlig (2002) which suggests using Stochastic Discount Factor in defining Sharpe Ratio. Of course in the research of Zhang and Racher (2004) it is recommended to use the different methodology associated with different risk assessment criteria.

We should note that the research was done when the world was experiencing a financial crisis, another reason why the companies couldn't have a better performance compared to market, based on the research results of Marimutha (2010), could be the effects of financial crisis on those companies.

In order to be more efficient in this case Mau (2009) has suggested specific strategies to control the level of systematic risks. The summary of results based on data collected is shown in Table 10.

15. Restrictions of Research

1. We didn't consider changes in macroeconomic conditions, political and social changes over the years of studied.
2. Due to limited statistical community to investment companies listed in Tehran Stock Exchange, distributions of results to other economic units should be done with caution.

16. Suggestions for future research

1 – It be suggested that test Portfolio Management in Investment Companies by Reward to VaR, Conditional Sharpe, Modified Sharpe Ratios and the results be interpreted.

2 - It also be suggested that test Portfolio Management in Investment Companies by other ratios such as Omega, Upside Potential, Omega-Sharpe & Prospect ratios and the results be interpreted.

Acknowledgement

We would like to acknowledge Dr. Wayne E. Ferson at Marshall School of Business, University of Southern California, Los Angeles, California, Dr Farhad Hanifi and Dr Zadalah Fathi as scientific support at Faculty of Management, Tehran central branch, Islamic Azad University.

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Table 1. Descriptive indices of independent variables in the research study

Variable	N	Mean	Std.Dev	Variance	Skewness	Kurtosis	Skewness.Dev	Kurtosis.Dev
Sample Standard Deviation	90	8.76	4.69	21.96	0.62	0.32	2.42	0.63
Arithmetic Mean Excess Return	90	5.52	3.38	11.41	0.88	0.23	3.47	0.45
Mixed Annual Return	90	0.26	3.52	12.38	0.20	0.93	0.79	1.85

Table 2. Descriptive parameters dependent variables in the research study

Variable	N	Mean	Std.Dev	Variance	Skewness	Kurtosis	Skewness.Dev	Kurtosis.Dev
Sharp Ratio	90	-0.01	0.39	0.15	-0.06	0.43	-0.23	0.86
Sortino Ratio	90	0.69	3.02	9.10	5.89	37.17	23.20	73.91
Sterling Ratio	90	0.46	2.01	4.04	7.42	60.99	29.20	121.27

Table 3. Descriptive indicators and related variables related to market

Variable	N	Mean	Std.Dev	Variance	Skewness	Kurtosis	Skewness.Dev	Kurtosis.Dev
Sharp Ratio	5	0.19	0.44	0.19	0.60	0.73	0.66	0.37
Sortino Ratio	5	0.64	1.24	1.54	1.68	3.09	1.84	1.55
Sterling Ratio	5	0.33	0.62	0.38	2.06	4.38	2.26	2.19
Sample Standard Deviation	5	0.16	0.07	0.00	0.99	0.82	1.08	0.41
Arithmetic Mean Excess Return	5	0.09	0.05	0.00	1.29	0.49	1.41	0.25
Mixed Annual Return	5	0.03	0.08	0.01	1.35	2.21	1.48	1.11

Table 4. Types of Ratios

Combined Return and Risk Ratio	Type
Sharpe	Normal
Sortino	Higher or lower partial moments
Sterling	Drawdown

Table 5. Result of Regression Analysis for Mean Ratios

Test	D f	Mean Square	F Stat	Std. Dev.
Sphericity Test	2	11.409	4.673	0.011

Table 6. Result of Mean pair group with using L.S.D Test

Ratio(I)	Ratio(J)	Mean Difference (I-J)	Standard Error	Std. Dev.
Sharp	Sortino	-0.697	0.301	0.023
	Sterling	-0.473	0.196	0.018
Sortino	Sharp	0.697	0.301	0.023
	Sterling	0.224	0.184	0.227
Sterling	Sharp	0.473	0.196	0.018
	Sortino	-0.224	0.184	0.227

Table 7. Result of Mean Ratios of companies Compared with Market ratios

Tested Ratio	Mean Ratio	Market Mean	T Stat	D.F	Std. Dev.	Mean Deference	Result
Sharp	-0.0105	0.19	-4.898	89	0.001	-0.20050	Significant difference
Sortino	0.6868	0.64	0.147	89	0.883	0.04685	Difference is not clearly
Sterling	0.4630	0.33	0.628	89	0.532	0.13295	Difference is not clearly

Table 8. The Result Comparing of Mean Ranking Ratios Separately Companies

Investment company	Sharp	Sortino	Sterling
1	53.30	54.40	50.40
2	36.80	34.40	39.40
3	35.40	37.00	34.40
4	59.80	65.00	63.00
5	18.80	18.60	18.70
6	51.40	58.00	62.60
7	50.20	48.80	48.80
8	50.40	49.00	54.40
9	50.40	50.20	48.80
10	45.60	44.60	45.60
11	57.60	55.80	53.40
12	60.80	60.20	59.20
13	35.40	33.60	33.20
14	32.60	31.00	29.10
15	53.60	51.40	51.40
16	49.50	49.20	50.20
17	34.40	33.60	31.80
18	43.00	44.20	44.60

Result of Kruskal-Wallis				
18.448	17.924	15.537	K Squire	Result: the different between mean ranking of companies is not meaning full
17	17	17	D F	Result: the different between mean ranking of companies is not meaning full
0.361	0.394	0.557	Std. Dev.	Result: the different between mean ranking of companies is not meaning full

ISSN 1833-3850 E-ISSN 1833-8119

Table 9. The Result Comparing OF Mean Ranking Ratios separately Companies

Investment company	Descriptive indicators			Result of Friedman rank test			
	Sharp	Sortino	Sterling	N	K Squire	D F	Std. Dev.
1	1.60	2.40	2.00	5	1.600	2	0.449
2	1.60	2.00	2.40	5	1.600	2	0.449
3	1.20	2.20	2.60	5	5.200	2	0.074
4	1.40	2.20	2.40	5	2.800	2	0.247
5	1.60	1.40	3.00	5	7.600	2	0.022
6	1.40	2.00	2.60	5	3.600	2	0.165
7	1.60	2.00	2.40	5	1.600	2	0.449
8	1.40	2.60	2.00	5	3.600	2	0.165
9	1.60	1.60	2.80	5	4.800	2	0.091
10	1.60	1.80	2.60	5	2.800	2	0.247
11	1.60	2.20	2.20	5	1.200	2	0.549
12	1.40	2.80	1.80	5	5.200	2	0.074
13	2.00	1.40	2.60	5	3.600	2	0.165
14	2.00	1.40	2.60	5	3.600	2	0.165
15	2.00	2.60	1.40	5	3.600	2	0.165
16	2.00	2.20	1.80	5	.400	2	0.819
17	1.80	1.60	2.60	5	2.800	2	0.247
18	1.80	1.80	2.40	5	1.200	2	0.549

Table 10. Hypothesis, Contexts of Hypothesis, Hypothesis Test & Results

Hypothesis Number	Contexts of Hypothesis	Hypothesis Test		Results
		Hypothesis 0	Hypothesis 1	
Hypothesis 1	Comparing Performance Ratios	There is no difference.	There is difference.	Research Hypothesis is Proved.
Hypothesis 2	Comparing Performance Ratio With Market	There Is No difference.	There is difference.	Research Hypothesis is Proved
Hypothesis 3	Comparing Performance Rating Of Companies	There is no difference.	There is difference.	Research Hypothesis is Proved

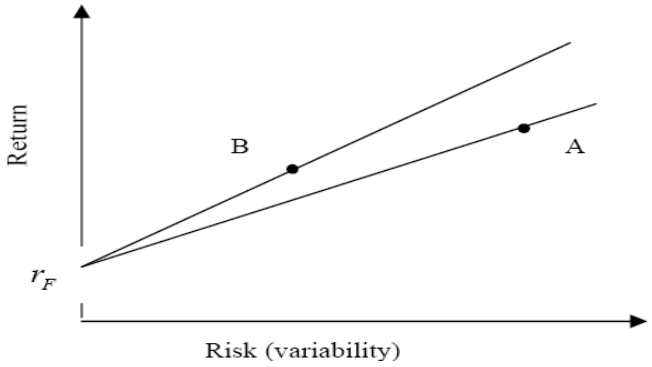

Figure 1. Risk and Return

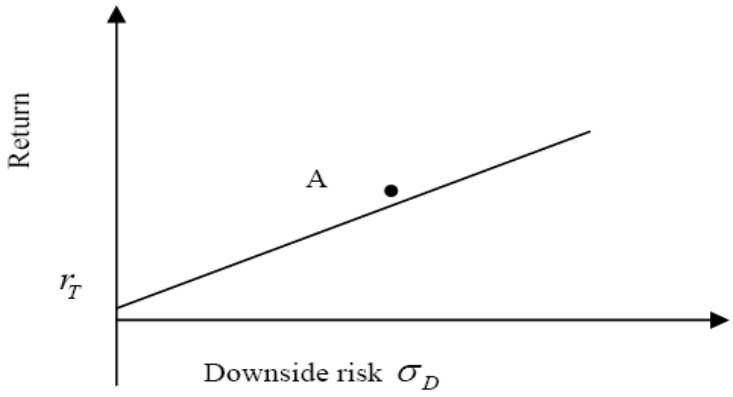

Figure 2. Return and Downside risk