

# Evaluation Performance of 50 Top Companies Listed in Tehran Stock Exchange by SORTINO, EROV and M3

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## Abstract

The aim of this paper is to evaluate the performance of top 50 Companies listed in Tehran Stock Exchange. This study was performed on the companies that were active from 2006 until 2010. The paper applied non-probable method in order to choose companies, which had positive liquidity, high turnover and high effect on the market. With regard to post modern portfolio theory, the researchers used EROV, SORTINO, and M3 ratios. The results of statistical analyzing with ANOVA and POST TOKEY test indicated that the performance of these companies is different, and they didn't have better performance than market. Therefore the researchers suggest applying more financial and economic based factors to choose top 50 companies.

**Keywords:** Portfolio Management, Risk Adjusted Ratios, Performance evaluation, Post Modern Portfolio theory

## 1. Introduction

Rational investors who are looking for an acceptable level of risk are to maximize their return in capital markets. After selection a portfolio, evaluating its performance is obviously very important. The portfolio performance evaluation primarily refers to the determination of how a particular investment portfolio has performed in regard 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 (Reilly and Brown, 2006).The portfolio performance evaluation compares the performance of a managed portfolio with a bench mark portfolio by making use of different measures and ratios (Boshnack, 2003).

Therefore, this question comes to mind whether these companies could obtain the excess return on their investment operation or not? By applying obtained results of this research, investors are able to make the portfolio individually and gain better results than that of the past. It is obvious that each investor tries to gain more return with less risk. So, with respect to the importance of performance evaluation, it is necessary to introduce and employ efficient methods for investment decision. The aim of this research is to assist with a specialized active institution in the market. Other ambitions of the paper are followed as: help to increase the efficiency of the market, help to increase intellectual decision, creation of better opportunity for operational and financial investment. In regard to the financial crisis of previous years, it's importance has been evident more than ever.

This research is going to review the performance of Top 50 companies in Tehran stock exchange. Therefore, we used EROV, SORTINO and M3 measures that had been used by many researchers such as Artikis P. George (2003) and Sorros (2001) in Greece Stock Exchange, Chaudhry and Johnson (2008) in Australian Stock Exchange, Kobadi and Ahmadinia (2011); Rahdari (2009) in Tehran Stock Exchange; Redman and Gullet (2000) in New York Stock Exchange. Finally, we studied the ability of sample companies to control the level of their risk in market in comparison with other companies. For better understanding, the study is divided into seven sections that follow as:

- 1-The First Section: Conceptual Framework and research Background
- 2-The Second Section: Research Method and data
- 3-The Third Section: Results of hypothesis testing
- 4-The forth Section: Conclusion
- 5-The fifth Section: Interpreting Result based on Previous Studies.
- 6-The sixth Section: Restrictions of Research
- 7-The seventh Section: Suggestions for future research

## **2. Conceptual Framework and Research Background**

There are various theories in connection with the performance evaluation of portfolio investment; one of them is Modern Portfolio Theory (MPT) that is a sophisticated investment approach and first developed by Professor Harry Markowitz. Modern Portfolio Theory allows investors to estimate both the expected risks and returns, as are measured statistically, for their investment portfolios. This theory can be explained on the relationship between return and risk. The theoretical assumptions of modern theory are not satisfactory as follows:

- 1 - Return distribution of all securities and assets are normal.
- 2 - Variance of asset returns is an appropriate index for measuring the risk (Rom and Kathleen, 1994) • (Clark, Taylor, 2000).

Contrary to modern portfolio theory, postmodern portfolio theory believes in non normal probability distribution of returns. This method provides a framework that recognizes investors' preferences for upside over downside volatility. Accordingly, the integer indices, semi-variance and semi-deviation to measure risk are considered appropriate. Undesirable adverse risk as an indicator of risk considers negative swings in future economic output. And two methods of "semi-variance under the rate of mean" and "semi-variance under the rate of return" is defined and calculated. If the distribution of asset returns is normal, semi-variance criterion showed the number that is exactly half the variance. It is called semi-variance (Wiesinger, 2010).

Rom and Brain believe that post modern portfolio has progressed in two main areas more than of modern theory of portfolio.

- a) The application of adverse risk instead of deviation criterion as a tool of risk assessment.
- b) Postmodern theory of portfolio includes non normal distribution of return (Rom, Brian M, 2002).

Post-modern portfolio theory (PMPT) was invented originally to improve portfolio optimization and asset allocation. However, it has been increasingly applied to measure the investment performance of portfolios, investment managers and mutual funds. One of the reasons is that modern portfolio theory, which has been used as a basis for portfolio analysis for past four decades, uses standard deviation and assumes normal distribution in fund returns in its analysis (Rom and Ferguson, 2001). PMPT recognizes that investment risk should be tied to each investor's specific goals. Often, the target rate of return is referred to the minimum acceptable return (MAR.). MAR represents the rate of return that must be earned to avoid failing to achieve some important financial objective (Alenius, 2007).

One of the tools that are used by post modern portfolio theory is downside risk. It is measured by target semi-deviation and is termed downside deviation. Moreover, it is expressed in percentages and therefore, allows rankings in the same way as standard deviation (Rom and Ferguson, 2001).

Post-Modern portfolio theory (PMPT), based on the relationship between return and adjusted risk, explain the behavior of an investor and optimal portfolio selection criteria. So based on the new model of adjusted risk and improvements resulting, Post-Modern portfolio theory has been established (Estrada, 2000). Theory of Post-Modern is an appropriate criterion to evaluate the portfolio performance. This theory presents the more accurate criterion by making use of an adjusted risk indicator. In post-modern theory only returns that are lower than the target are considered as a risk (Wiesinger, 2010). Table 1 shows specifications and differences of two theories.

Many studies have been done around this theory. Lohre and et.al, (2008) indicated that if investors employ adverse risk to optimize the portfolio it leads to a portfolio creation that coincide with their perception of risk. Another study (Leela et al, 2008) based on an adverse risk and normal risk model, could have proved the role of adverse risk in portfolio selection and showed that most investors are willing to gain maximum return with control of negative risk. In a research entitled Adverse Risk Criterion: theory and application in portfolio selection and risk management Xie, A (2002) studied three present hypotheses. He randomly selected 50 shares from the U.S. market during his 26 years study from 1974 to 1999. He couldn't reach significant results to prove the superiority of the adjusted beta, adjusted Sharpe ratio and adjusted Treynor index (current period) in comparison to the standard beta, Sharpe ratio and Treynor index (current period). In prediction of mean return of excess shares at next period. Estrada, J. (2002) tested adverse risk factors in non-equilibrium and equilibrium conditions. He suggested that the adverse risk factors define the conditions of developing markets better than any other factors. Estrada in a research on 27 markets (10 markets from Asia, 7 Latin American market and 10 African and Middle Eastern and European markets) proved that Beta comparing with semi- Beta, estimates the amount of risk less and, in fact, semi-beta in comparison with beta is superior. In another study entitled "Risk of adverse in action" Estrada (2006) proved it again. Kolbadi and ahmadinia (2011) studied the efficiency and effectiveness of portfolio management by making use of Sharpe, sortino and Sterling. The acquired result showed that sterling performed better than other ratios. In this regard Chaudhry and 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  $t_{student}$ -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. Another research done by Tarja Joro and Paul Na (2006) introduces a measure for portfolio performance in mean-variance-skewness framework. They extend the mean-variance efficiency analysis by adding a new dimension, skewness. As this method is to open up a new paradigm in portfolio performance measurement which is based on mean-variance-skewness framework and can thus overcome the difficulties of the existing CAPM-based performance measures. They suggest that portfolio efficiency based on mean-variance-skewness is more desirable than the one based on mean-variance. Alexandra Wiesinger (2010), Aragon and Ferson (2006) and Farinelli et al (2008) referred to this point. They suggested new ratios because they were agreed that modern theories can't represent real performance of investment companies. The new ratios could manage investment funds well. They showed that financial institutions are interested to invest not only based on return but based on risk that is expected for companies. Banks incline to act based on performance ratios of adjusted risk when they assess the business. In a research, Mau (2009) 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 use of the framework provides a systematic approach to the management of a risky situation which should lead to improved performance.

In other research 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 from both short run and long run due to the financial crisis.

### 3. Research Methods and Data

Research method is similar to survey method and a correlation type which its main goal is to define the relationship among some quantitative variables. This is an empirical research in the field of comparative studies or the difference between two independent samples. For testing the hypothesis, we use relevant statistic test including Independent Sample Test and ANOVA with Tukey test.

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 2006 when this study beginning is the end of 2010 and to be more precise during the four years. A long research, between 2006 and 2010 were considered. Convenient sampling was the sampling method of choice in this study, thus we just selected the company that during the period their stock was actively traded on the Stock Exchange, and their relevant financial information was available. The Top Prior 50 companies were active in the Tehran Stock Exchange. Of these 42 companies, research sample represents. Data were collected from different research methods. In order to analyze data, we used financial statements of companies and reports of directors that issued by Tehran stock Exchange. All in all, to evaluate the performance of companies, the blow hypotheses are supposed.

### 3.1 First hypothesis

The results of performance evaluation of top 50 companies in the Tehran Stock Exchange through M3, SORTINO, EROV measures are not equal.

### 3.2 Second hypothesis

The mean of calculated return of 50 sample companies in the Tehran Stock Exchange is higher than market by making use of these three indicators.

### 3.3 Models used in this research include

#### 3.3.1 Excess Return on Value-at-Risk (EROV)

Excess Return on VaR is basically a Sharpe Ratio using Value-At-Risk instead of Volatility as the risk measure (Carl R. Bacon, 2004). Assuming normally distributed returns, the VaR of a long-position is calculated as a quantile of the standard normal distribution at a certain confidence level  $\alpha$ , using the expected value – i.e. the mean – and the standard deviation (Jorion, 2006, p. 110).

$$\text{VaR} = - (r + Z_\alpha * \sigma)$$

$\alpha$  ..... Confidence level

$Z_\alpha$ ..... quantile of the standard normal distribution

When VaR is used to assess risk-adjusted performance, the measure Excess Return on VaR (EVaR) emerges. It compares the excess return of an asset to the VaR of the asset. EVaR can be calculated by the following formula (Wiesinger, 2010).

$$\text{EROV} = \{r - r_f\}/\text{VaR}$$

EROV... Excess return on VaR

r... Portfolio returns

$r_f$ ... Risk free rate

VaR ... Portfolio VaR (here: parametric VaR assuming a normal distribution)

#### 3.3.2 Sortino ratio

Sortino ratio is the actual rate of return in excess of the investor's target rate of return, per unit of downside risk. A measure of excess return per unit of risk based on downside semi-variance, instead of total risk (the standard deviation of the portfolio) is used by the Sharpe ratio. Since the Sortino ratio takes into account only the downside size and frequency of returns, it measures the reward to negative volatility trade-off. For the case where the target return is equal to the mean of the distribution, the LPM of order 2 corresponds to the semi-variance (Burkler and Hunziker, 2008). In all other cases it is referred to as downside variance (Bacon, 2008). The second LPM-based performance measure is the Sortino Ratio, which was first introduced by Sortino and van der Meer (1991). It is defined as the ratio of the excess return over a minimum threshold  $\tau$  and the downside deviation  $\delta^2$ . Originally, the Sortino Ratio (SOR) and  $\delta^2$  were calculated by the following expressions (Sortino, 2001).

$$SOR_i(\tau) = \frac{ri^d - \tau}{\delta^2}$$

The Sortino Ratio can be regarded as a modification of the Sharpe Ratio as it replaces the standard deviation by downside deviation which only considers the negative deviations from the mean or a minimum return threshold. Similar to Omega, downside deviation can be interpreted as the square root of the LPM (Kaplan and Knowles, 2004).

$$SOR_i(\tau) = \frac{ri^d - \tau}{\sqrt[2]{LMP_2(\tau)}}$$

Where:

$r_i$  : single return realization

$\tau$ : minimum return threshold

$LPM_2$  : lower-partial moment of degree 2

or:

$$SOR = \frac{(\bar{r}_p - \bar{r}_f)}{\sigma_{down}}$$

Where:

$\bar{r}_p$ : Asset or portfolio return

$\bar{r}_f$ : Risk free rate

$\sigma_{down}$ : Downside deviation

Negative deviations from the return threshold are more strongly weighted due to the LPM of order 2 and thus, express a higher risk-aversion of the investor (Poddig, Dichtl and Petersmeier, 2003).

### 3.3.3 M3 measure

This measure evaluated effect of adjusted- correlation between factors contained in portfolio, without regard to the portfolio of investment is an active, inactive or invest in securities without risk. With the M3 measures, returns are correlation-adjusted by leveraging the fund with active, passive and risk-free funds so that the resulting volatility equals benchmark volatility and the TE equals the Target TE. M3 adjusts for absolute as well as relative risks. (Muralidhar, 2000) •(Cogneau and Hubner, 2009). It is calculated as follows:

$$M3 = a * \text{avr}(\text{Portfolio}) + b * \text{avr}(\text{benchmark}) + (1-a-b) * r_f$$

With:

$$a = v(\text{benchmark}) / v(\text{Portfolio}) * \sqrt{\{1-tc^2\} / \{1-c^2\}}$$

$$b = tc - c * \sqrt{\{1-tc^2\} / \{1-c^2\}}$$

$$tc = 1 - tTE^2 / \{2 * v(\text{benchmark})^2\}$$

Where:

avr (.): average returns

rf: risk free rate

v (.): volatilities

tc:target correlation between portfolio and benchmark

c: actual correlation between portfolio and benchmark

tTE: target tracking error

Measure of M3 surveys factors of effectiveness based on the benchmark risk. For insisting of this criterion to a number of factors, this model describes correlation-adjusted of factors in investment funds with regard to the active portfolio management style. This measure could be a suitable measure for the portfolio structure establishment. If no systematic risk exists, then the results of M3 are equal to the M2 measure (Aragon and Ferson, 2006).

M3 is preferred to all other measures of risk-adjusted performance as:

- (i) It includes investments in all assets, including cash and the passive benchmark, to produce the highest risk-adjusted return for a tracking error target;
- (ii) It is the only measure that ranks portfolios (measured over the same time period) identical to rankings based on the confidence.

Two investment opportunities will typically have different variances and correlations to the benchmark, in turn leading to different tracking errors relative to the benchmark. This is a difficult comparison with too many moving parts. In order to compare the two, it is recommended that the investor needs to invest in the active strategy, the risk-less asset and benchmark to ensure: (a) the volatility of this composite is equal to that of the benchmark (Modigliani and Modigliani, 1997); and (b) the tracking error of this composite is equal to the target tracking error (Muralidhar, 2000). The second is achieved by ensuring that the newly created composite portfolio has a correlation equal to a target correlation (derived from the fact that there is a target tracking error and that the volatility of the benchmark and that of the composite are equal).The M3 measure extends Modigliani and Modigliani (1997) by recognizing that the investor has to consider basis points of risk-adjusted performance after ensuring that correlations of various funds versus the benchmark are also equal, thereby ensuring that the tracking errors are equal (Muralidhar, 2001).

M3 is ‘volatility-risk- and-correlation-risk’ -adjusted-performance.

M3 rankings differ from M2 and rankings.

If no target tracking error exists, a = 0 and M3 will equal M2.

M3 can be used in a forward-looking sense: It can provide ex ante guidance how to structure portfolios with TE restrictions (Andreas Steiner, 2001) and (Muralidhar, 2003a). In this study analysis M3, SORTINO, EROV measures and in Table 2 compares their characteristics together.

In this study, VaR, variability of reduction return, benchmark and portfolio risks and efficiency compound annual returns are considered as an independent variables and M3, SORTINO, EROV measures are considered as dependent variables. Each of the variables has 168 times of observation during a year.

#### 4. Results of Hypothesis Testing

##### 4.1 First hypothesis

The results of evaluating the performance of top 50 Companies in the Tehran Stock Exchange stock management through M3, SORTINO, EROV measures are not equal. To answer this hypothesis, the average of management performance of three indicators is compared.

$$\begin{cases} H0: MEAN_{erov} = MEAN_{sor} = MEAN_{m3} \\ H1: ALL \ MEANS \ NOT \ EQUAL \end{cases}$$

$$F_{(df:2,501)} = 48.182 \quad p = .000 \quad p_{ob} < p_{CR}$$

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 them the means tukey test is used. Based on tukey test mean of management performance of companies the EROV ratio is significantly greater than mean for M3 measure and Sortino ratio. To conclude we can say a meaningful difference exists between result of performance evaluation by using of EROV, Sortino and M3 in sample companies. The tables 3 and 4 showed the result of tests.

##### 4.2 Second hypothesis

The mean of calculated return of top 50 Companies in the Tehran Stock Exchange stock by three indicators is higher than market. To answer this hypothesis, the average of management performance of three indicators and market is compared.

$$\begin{cases} H0: MEAN_{erov} = MEAN_{sor} = MEAN_{m3} = MEAN_{bazar} \\ H1: ALL \ MEANS \ NOT \ EQUAL \end{cases}$$

$$F_{(df:3,668)} = 74.821 \quad p = .00 \quad p_{ob} < p_{CR}$$

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. Therefore a meaningful difference exists between calculated Return of companies by three measures and return of Market. And for compare each of the indicators with market indicator, Tukey test is used. Based on Tukey test, Performance Evaluation of top 50 Companies doesn't show a meaningful difference with the market indicator by making use of EROV. Moreover, evaluated performance of top 50 Companies by using of Sortino and M3 show a meaningful difference with the market indicator and mean of performance evaluation of companies is smaller than market. Consequently Second hypothesis isn't accepted. The tables 5, 6 and 7 represent the result of tests.

#### 5. Conclusion

Since the evaluation of portfolio performance, is important for investors and may lead them to a better performance in the capital market. The knowledge of the efficient and accurate criteria for investment seems to be necessary. So we must seek mechanisms that help us to achieve our objectives in the current economic and market conditions.

The result of evaluation the performance of top 50 Companies based on M3, SORTINO, EROV measures were not the same, therefore, according to the theory of post-modern portfolio (1987) which uses EROV and Sortino ratios and M3 measure; we can say it considers the difference between the two types of the risks (downside and upside risk). Now this theory has shown its differences in the statistical research. Therefore based on the research of Aragon and Ferson (2006) and Zakamouline and Koekebakker (2008), ratios related to post-modern portfolio theory would better define the performance of the companies. And the performance evaluation criteria based on post-modern portfolio theory (1987), counsel the professional management of portfolio performance. The EROV ratio shows better performance in comparison with Sortino and M3.

Researchers such as Lohre and et.al (2008) and Leela et al (2008) that emphasized the use of an adverse risk and normal risk model, could prove role of adverse risk in portfolio selection and showed that most investors can gain maximum of return with control of negative risk. As a result, averagely these companies can avoid from unwanted adverse risk of their portfolio and gain a good performance.

The results of performance evaluation by Sortino and EROV ratios and M3 measure presented weaker performance for top 50 companies comparing with the market; it is probable to say, there are other effective factors that influence the evaluation of performance, which in this case, we could refer to the research carried out by Zhang and Racher (2004). It is recommended to use the different methodology associated with different risk assessment criteria. Of course the research of Muralidhar (2002) and Farinelli et al (2008) be justified to use risk-adjusted performance evaluation measures, because these measures have more robustness in comparison with traditional measures and they aren't consider normality in return distribution and are compatible with market term.

## **6. Interpretation of the Results Based on Previous Study**

This paper indicated that EROV ratio is a suitable measure for performance evaluation. Contrary to other researches such as Kolbadi and Ahmadiania (2011) that recommended Sterling ratio for evaluation the performance of companies. Also Sortino ratio is achieved middle position among three ratios of performance evaluations. This result is in the same direction with the results of other researchers like Chaudhry and Johnson (2008) and Kolbadi and Ahmadiania (2011).

Current thriving markets are looking for fluctuations and fluctuations can only be ignored in the stagnant market. Moreover, it is clear that more people are risk averse. In other words, risk is not symmetrical, and has highly skewness (slant) that is to be adjusted. So based on Estrada (2002), Estrada (2006), Chaudhry and Johnson (2008) ,and Tarja Joro and Paul Na, (2006) the model that is presented in this study to evaluate the portfolio performance is good, because investors notice more to the lower fluctuation of target return rate.

There are some reasons that explain why some companies couldn't perform better than market, for instance we should note that the research was done when the world was experiencing a financial crisis. Marimuthu (2010) referred to short and long impacts of financial crisis. Amour and Pergent, (2010) suggested investment companies use a more optimized structure in the portfolio. In order to diminish leading factors that cause to increase the level of risk and in order to be more efficient in this case, Mau (2009) suggested specific strategies to control the level of systematic risks.

## **7. Restrictions of Research**

- (1). We didn't consider changes in macroeconomic conditions, political and social changes over the years of study.
- (2). Due to limited statistical community of top 50 companies listed in Tehran Stock Exchange, generalization of results to other economic units should be done with caution.

## **8. Suggestions for Future Research**

- (1) It is suggested to researchers to test portfolio management by other ratios such as Omega, Upside Potential, Omega-Sharpe and Prospect ratios.
- (2) It is also suggested that test Portfolio Management on other statistic sample group by these Ratios.

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Table 1. characteristics in Modern Portfolio Theory and Post-Modern Portfolio Theory

Title	MPT	PMPT
Risk measure	Standard deviation	Risk-adjusted, semi-variance, semi-deviation
Assumption of return distribution	Normality distribution	Asymmetrical distribution
Skewness	Don't calculate Skewness	calculation Skewness
Value of up and down Moments	equivalent	Unequal
Risk Explanation	The risk as deviance in mean of return	The risk as deviance in mean of special target
Performance Measure	Sharpe ratio	Sortino ratio

Table 2. characteristics in EROV, SORTINO and M3

Title	EROV	SORTINO	M3
Risk measure	Value-At-Risk	downside deviation	Portfolio and benchmark risk
Type of distribution	All of distributions	For Asymmetrical distribution	All of distributions
Focus of attention	Extreme of expected loss	Deviations of return adverse	factors of effective on the benchmark risk
Type of Stock	Species of financial tools	Species of investment portfolio	Species of portfolio
Application	determination of asset sufficiency	Calculate Excess return on total volatilities	Forecast events ahead of investment

Tables 3. The results of First hypothesis testing by ANOVA

Variable and Group		Sum of Squares	df	Mean Square	F	Sig.
Performance Evaluating of Stock Management	Between Groups	111.750	2	55.875	48.182	.000
	Within Groups	580.987	501	1.160		
	Total	692.737	503			

Tables 4. Comparisons of performance evaluation measures by Tukey HSD

Variable	index	Number	Ranking at the .05 error level		
			M3	Sortino	EROV
Performance Evaluating of Stock Management	M3	168	-1.1603		
	Sortino	168		-0.8389	
	EROV	168			-0.0403
	Error level		1.000	1.000	1.000

Tables 5. The results of Second hypothesis testing by ANOVA

Variable and Group		Sum of Squares	df	Mean Square	F	Sig.
Performance Evaluation	Between Groups	197.237	3	65.746	74.821	0.000
	Within Groups	586.976	668	0.879		
	Total	784.213	671			

Tables 6. Comparisons of performance evaluation measures by Tukey HSD

Variable	index	Number	Ranking at the .05 error level		
Performance Evaluation	M3	168	-1.1603		
	Sortino	168		-0.8389	
	EROV	168			-0.0403
	Market	168			0.1439
	Error level		1.000	1.000	0.274

Tables 7. Multiple Comparisons with Groups by Tukey HSD

position(I)	position(J)	Mean Difference (I-J)	Std.Error	Sig.
EROV	Sortino	.79865(*)	0.10228	0.000
	M3	1.12001(*)	0.10228	0.000
	Market	-0.18414	0.10228	0.274
Sortino	EROV	-0.79865(*)	0.10228	0.000
	M3	.32135(*)	0.10228	0.009
	Market	-0.98279(*)	0.10228	0.000
M3	EROV	-1.12001(*)	0.10228	0.000
	Sortino	-0.32135(*)	0.10228	0.009
	Market	-1.30415(*)	0.10228	0.000