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Portfolio management and performance evaluation ratios

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Abstract

The purpose of this present research is to examine the effectiveness of portfolio management in automotive industries of Iran as a one of the most important industries in Iran, and also in Tehran stock exchange (TSE) during the period between2010 and 2015. In order to examine companies' performance based on different portfolio theories; by using Sharp, Sortino and Sterling ratios. The results show that there is a meaningful difference between our statistical samples of study. Sterling's ratio compare to other ratio showed a better performance. And also, except for Sortino ratio, other ratios showed a better operation of the automotive industries compared to market. Finally, the results of Kruska-Wallis test and the Square Statistic presented that using all the three types of these ratios in ranking the companies have not the similar results.

Keywords: Tehran Stock Exchange (TSE), Portfolio management, Portfolio theories, Performance evaluation ratios.

Introduction

In 2008, there was a fact like a problem about Global Economy. The fact was about global crisis and was followed by company went to bankruptcy. Nearly the end of the third quarter of 2008, the world economy faced a new round; the collapse of the new global economic stability, as the financial crisis spread to various countries. Recent financial crisis, shows the importance of portfolio management[1] concept more than ever. The portfolio performance evaluation initially refers to evaluate how a particular investment portfolio has performed relative to some comparison criteria. Analysis of portfolio performance is a crucial issue for many reasons. First of all, in investors' viewpoint, portfolio structure is the most effective factor in their financial decisions. The performance must provide useful financial information for them to improve and revise their financial decisions. Second, portfolio manager also needs relevant information about the performance and ways of its improvement[2]. Portfolio evaluation has been concerned with mathematic models.

In the era of globalization, capital markets or exchange markets are important to support economic condition in every country. Capital market activity has an important role in developing the national economy. In order to grow the capital market required the investors to invest their money into particular stock in the market. The lack of investors leads to an obstructed process of economic process in the country, especially for developing country like Iran. The country needs to attract the investors to come and invest their money into the market. This is the obstacles which attract the interest of the investors is not easy. The problem is not just from the return but also from the risk, because the problem like economic crisis explained above can occur any time. The uncertainty of the capital market is the risk which leads to risk averse of the investors. Many investors draw their money to avoid the uncertainty of financial condition. Thus, many measures have been used to evaluate investment performance. Portfolio management is one of the most controversial theories in finance area. In present paper we use two portfolio theories including:

Modern Portfolio Theory (MPT) which is also called "portfolio theory" or "portfolio management theory." Which elaborates how to combine assets into efficiently diversified portfolios[3]. Diversification reduces volatility more efficiently. A diversified portfolio, of uncorrelated asset classes, can provide the highest returns with the least amount of volatility[4].

Post Modern Portfolio Theory (PMPT): Indeed is an expanse version of the traditional modern portfolio theory. Both theories propose how rational investors have to use diversification to optimize their portfolios, and how a risky asset should be priced[5]. 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 (downside risk), d^2 = downside variance, t = the annual target return, r = the random variable representing the return for the distribution of annual returns f(r), f(r) = the three-parameter lognormal.

Research objectives: The purpose of this study evaluated the overall performance of automotive industries in Tehran Stock Exchange (TSE). Thus, present study is aim to helping financial institutions and Banks to be more efficient in investment decisions and also provide better operational and financial

investment. Therefore, the present study reviews the following areas; first of all, it is crucial for shareholders have enough information about components of own portfolio. Second, it helps banks and financial and credit institutions to control risk of financial distress. The purpose of present study is to make an appropriate perspective of the automotive companies. Thus, research hypotheses are proposed as follow:

H1: There is a meaningful difference between automotive industries performance criteria (sharp, sortino and sterling).

H2: There is a meaningful difference between calculated return of automotive industries (ratios and market return).

H3: There is a meaningful difference between the outputs of ratios (sharp, sortino and sterling).

Research background: The log-normal concept is aim to examine the effect of preferences on the market[6]it means Sharpe ratio, price for risk[7]. Risk allotment is the other concept mainstay of researchers; this concept is related to different risk measures and itsattributes[8], as well as risk allotment has a significant role in an investment portfolio in order to evaluate its performance[9]. It should be noted that above methods can help to mitigate the choosing criteria problem[10].

All surveyed approaches can be integrated into the attribution method, which allows the composition of the benchmark portfolio to evolve through time according to the observed portfolio holdings of an asset manager[11]. Among other research can be noted is examine the risk-adjusted returns by using Sharpe's Index, Treynor's Index, and Jensen's Alpha to evaluate the performance of the automotive company's active in Tehran Stock Exchange (TSE)[12].

According to Theoretical view point portfolio performance measure is more related to distribution matter[13]. In other words performance measure explaining the concept of Generalized Sharpe Ratio (GSR)[14]. Evaluation of companies' performance in control and prevention of losses, portfolio insurance techniques are the other benefits are investigating the matter[15]. Other research examines compatibility performance measures methods by using certain criteria[16]. Many criteria are considered consist of Sortino, Sharpe, Student's t-test and a decay rate measure. Thus, the Sharpe Ratio (SR) continues to be one of the most popular portfolio risk adjusted performance measures[17].

Considering the set of financial returns and absence of serial correlation between them, it is the most popular approach for time series investigations, it can cause of higher frequency SR through the square root, when it happens returns can be produced by a GARCH method and its accumulated returns is close to the normal distribution[18]. Previous perspectives into the risk in financial and economics area which has the ability to use in portfolio management are examined by many financial theorists[19]. For example Marimuthu[20]survivedfinancial crisis and its effect on Bumiputera-controlled companies in Malaysia. The results shows statistical sample has suffered during the crisis before it starts.

Methodology

In order to examine statistical data use regression analyses, t-test, Kruskal-Wallis, correlation coefficients analyses including Pearson's coefficient and Spearman's rank. Research statistical data collect from financial reports and financial data released by Tehran Stock Exchange (TSE)[21] from 2010 to 2015. Independent variables are consists of Alpha criteria, variability reduction and efficiency compound annual returns (96 firm-year observation).

Dependent variables are considered as criteria, Sortino and Sterling Sharpe which shown in Table-2. All independent and dependent variables are analysis in Table-3.

Table-1: Results of Descriptive Statistic (Independent variables).

Variables	N	Mean	Std. Dev	Variance	Skewness	Kurtosis	Skewness	Kurtosis
Std. Dev	96	7.42	5.17	20.44	0.74	0.42	2.79	0.72
Arithmetic Mean Excess Return	96	6.14	3.65	10.93	0.91	0.37	2.81	0.63
Mixed Annual Return	96	0.31	3.89	13.64	0.26	0.88	0.84	1.91

Table-2: Results of Descriptive Statistic (Dependent variables).

Variables	N	Mean	Std. Dev	Variance	Skewness	Kurtosis	Skewness	Kurtosis
Sharp	96	-0.02	0.42	0.19	-0.12	0.66	-0.16	0.93
Sortino	96	0.73	3.21	9.43	6.15	39.14	22.41	77.56
Sterling	96	0.52	2.25	4.74	7.53	62.11	32.49	125.44

Table-3: Results of Descriptive Statistic (Market variables).

Variable	N	Mean	Std. Dev	Variance	Skewness	Kurtosis	Skewness	Kurtosis
Sharp Ratio	6	0.26	0.62	0.31	0.07	0.52	0.99	0.42
Sortino Ratio	6	0.73	1.54	1.67	1.75	3.24	1.93	1.74
Sterling Ratio	6	0.42	0.71	0.42	2.33	4.77	2.64	2.39
Sample Std.Dev	6	0.19	0.09	0.02	1.16	1.29	1.37	0.67
Arithmetic Mean Excess Return	6	0.13	0.08	0.04	1.42	0.88	1.66	0.89
Mixed Annual Return	6	0.24	0.12	0.05	1.62	2.64	1.54	1.45

Risk-adjusted performance measures must start with risk measures by the Sharpe Ratio:

$$\text{Sharp Ratio} = \frac{\text{Rp}-\text{Rrf}}{\sigma\text{p}}$$

A natural extension of the Sharpe and Omega-Sharpe ratios is proposed by Sortino[22] as follows:

$$\text{Sortino Ratio} = \frac{Rp-Rt}{\sigma np}$$

Overall risk can replace by downside risk; portfolio managers will not be responsible for rising changes, although it is possible there is a concerns relative to achieve desire returns. The Sterling ratio can be replaces the greatest reduction in capital considering Calmar ratio with the average capital reduction. It should be noted there are many considerable changes in Sterling ratio which shows its application. Deane Sterling Jones is defining as below:

$$\text{Original Sterling Ratio} = \frac{r}{Dlar+10\%}$$

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 suggest the definition is standardized to exclude the 10% but in Sharpe form as follows:

$$\text{Sterling Ratio} = \frac{r-rF}{\left|\sum_{j-1}^{j-d}\frac{Dj}{d}\right|}$$

The *d* variable is related to statistical observations and investor's priorities. By combining two ratio of Sterling and Calmar sense, in order to avoid unnecessary complexity we use following standardized definition[23]:

$$\text{Sterling-Calmar Ratio} = \frac{r-rF}{D\ max}$$

We use the same frequency of data in order to neutralize the impact of different interpretations of the ratios. These financial measures can be classified as shown in Table-4.

Table-4: Ratios classification.

Return and risk Ratio	Type
Sharp	Normal
Sortino	Higher or Lower partial moments
Sterling	Drawdown

Results and discussion

The results of first hypothesis by using three ratios are equal to each other.

$\text{Mean}_{sha} = \text{Mean}_{sor} = \text{Mean}_{ste}$

On the other hand the results of second hypothesis are not same as each other.

$\text{Mean}_{sha} \neq \text{Mean}_{sor} \neq \text{Mean}_{ste}$

According to ANOVA test results, *F* statistics is greater than the critical amounts in statistics table, thus the error is lower than 0.05. Thus, zero hypotheses are rejected at 95% level and our claim in the underlying hypothesis is accepted. Statistical results prove that meaningful levels compared with Sterling, Sharpe and Sortino ratios are lower than 0.05 and they have allocated different negative amounts.

Therefore, should be said that, mean of statistical sample in the Sharp ratio is meaningfully lower than results of mean for the other two ratios. Although meaningful levels of Sterling and Sortino ratio are greater than 0.05 and they have diverse negative quantity. In sum up, based on our analysis it can be said performance evaluation results by using Sterling, Sortino and Sharp have fundamental differences together in automotive companies (Table-5 and 6).

Table-5: Regression results

Test	D.F	Mean Square	F Stat	Std. Dev.
Sphericity Test	2	14.705	5.114	0.025

Table-6: Mean twin group by using L.S.D analysis

Ratio (I)	Ratio (J)	Mean Difference (I-J)	St. Error	Std. Dev.
Sharp	Sortino	-0.742	0.405	0.063
	Sterling	-0.513	0.209	0.029
Sortino	Sharp	-0.712	0.471	0.044
	Sterling	-0.305	0.216	0.316
Sterling	Sharp	-0.554	0.228	0.045
	Sortino	-0.288	0.229	0.371

The second hypothesis can be separated in two parts; first the returns mean is not higher than overall market; second return mean is higher than overall market.

$$\begin{cases} H0: Mean = 0.22 \\ H1: Mean \neq 0.22 \\ t = -5.716, df = 89, p = 0.000 \end{cases}$$

$$\begin{cases} H0: Mean = 0.75 \\ H1: Mean \neq 0.75 \\ t = 0.216, df = 89, p = 0.915 \end{cases}$$

$$\begin{cases} H0: Mean = 0.46 \\ H1: Mean \neq 0.46 \\ t = 0.714, df = 89, p = 0.617 \end{cases}$$

Mean of stock market performance compared to our research sample considering Sharp ratio: we have 89 degrees of freedom in our statistical sample and t-statistics equal to -5.716, 0.216 and 0.714 that these amounts are lower than 1.96.

Therefore, meaningful levels of test are lower than 0.01 and 0.05. Thus, at 99 %, zero hypotheses is rejected and its opposite hypothesis is accepted (Table-7).

The third hypothesis can be separated in two parts; first mean of ranking sample study by three ratios is equal to each other and second; mean of ranking sample study by three ratios is not equal to each other.

The comparison of the average sixteen automotive industry 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 16.443,18.217 and 19.749 is less than statistics table critical with value 29.365 and in other words, the calculated significance level is greater than 0.05.

Thus respectively applying the Sharpe ratio, Sortino ratio and Sterling ratio in performance evaluation of automotive industry 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.

Sixteen 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.

Table-7: Mean ratios of sample compared to market ratios

Test Ratio	Mean Ratio	Market Mean	T Stat	D.F	Std. Dev	Mean Deference	Results
Sharp	-0.0241	0.22	-5.719	96	0.000	-0.212	Difference is significant
Sortino	0.7469	0.75	0.216	96	0.915	0.057	Difference is not significant
Sterling	0.5312	0.46	0.714	96	0.617	0.201	Difference is not significant

Table-8: Comparing of Mean Ranking Ratios

Automotive companies	Sharp	Sortino	Sterling
Zamyad	52.75	51.41	56.43
Bahman Khodro	53.16	56.43	49.29
Saipa	51.13	55.46	52.16
Pars Khodro	52.27	52.53	54.75
Saipa Diesel	54.63	51.52	56.39
Iran Khodro	53.44	57.58	48.41
Vamco	56.12	53.63	46.47
Iapco	54.43	52.49	52.39
MVMCO	52.19	56.37	51.26
Saipa Azin	51.22	53.28	59.17
Niroo Mohareke	58.37	51.16	54.19
Iran Castling	57.69	59.68	53.63
EKS	54.36	50.57	51.71
Khavar Spring	55.17	52.46	57.83
IRCA	51.28	52.58	53.82
Iran Khodro Diese	55.69	53.29	53.11
Kruskal-Wallis test			
19.749	18.217	16.443	K Squire	not meaningful
16	16	16	DF	not meaningful
0.361	0.394	0.557	Std. Dev.	not meaningful

Conclusion

Performance evaluation of automotive industry in TSE considering Sharp, Sortino and Sterling ratios shows different results. Based on recent (modern) portfolio theory which is proposed in 1952and consequently raised Sharp ratio as one of the reliable performance tools and also post-modern portfolio in 1987with a focus on Sterling and Sortino ratios and difference between risk types, both viewpoints shown their differences in results[24].

According to the results of Sharp ratio and its statistical outputs in comparison to Sortino and Sterling and their relation to post-modern portfolio theory, Sortino and Sterling have a better explanatory power of performance in automotive industry. Beside these, the results of automotive companies ranking by using Sterling and Sortino ratios has been better in comparison to Sharp ratio. Although Sharpe ratio show more acceptable performance in our statistical sample compared to overall market; thus, perhaps we do not consider other effective variables which can affect companies performance and also they ignored by Sharpe ratio. It should be noted using Stochastic Discount Factor in Sharpe Ratio can partly solve this problem. Zhang, recommend other statistical approaches related to different risk assessment tools. The summary of results is shown in Table-10.

Table-9: Comparing of Mean Ranking Ratios

Automotive companies	Descriptive Statistic			Friedman rank test		
	Sharp	Sortino	Sterling	N	K Squire	Std. Dev
ZAMYAD	1.06	2.42	2.09	6	1.623	0.449
BAHMAN	1.85	2.31	2.13	6	1.268	0.216
SAIPA	1.23	1.89	2.19	6	5.200	0.369
PARS KHODRO	1.69	1.26	1.35	6	4.529	0.598
SAIPA DIESEL	1.78	2.88	1.29	6	7.601	0.579
IRAN KHODRO	1.09	1.99	2.88	6	6.321	0.165
VAMCO	2.01	2.01	2.67	6	6.756	0.579
IAPCO	1.79	2.64	2.11	6	3.697	0.637
Modiran Vehicle Manufacturing Company	1.46	2.33	2.75	6	4.751	0.129
SAIPA AZIN	1.33	2.45	2.62	6	1.329	0.157
NIROO MOHAREKE	1.49	1.78	1.46	6	8.215	0.339
IRAN CASTLING	1.04	2.13	1.23	6	7.698	0.259
EKS AUTO	2.00	2.19	1.26	6	2.589	0.641
KHAVAR SPRING	1.94	1.45	1.49	6	4.229	0.558
IRCA	1.28	2.18	1.89	6	6.991	0.413
IRAN KHODRO DIESEL	1.65	2.67	1.47	6	7.219	0.127

Table-10: Summary of results

No.	Hypothesis	Hypothesis Test		Results
		Hypothesis 0	Hypothesis 1	
Hypothesis 1	Comparing Performance Ratios	×	✓	✓
Hypothesis 2	Comparing Performance Ratios with Market	×	✓	✓
Hypothesis 3	Comparing Performance Ratios of Companies	×	✓	✓

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