PERFORMANCE MEASUREMENT OF INVESTMENT COMPANIES WITH LOSS AVERSION IN TEHRAN STOCK EXCHANGE

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Abstract

This study measures the portfolio performance of listed investment companies in Tehran Stock Exchange (TSE) based on prospect theory. The criterion is measured by the ratio of gain to loss, to reflect risk-aversion in gains and risk-seeking in losses. The sample consists of 15 listed investment companies registered in TSE during 2003-2013. Research variables consist of portfolio return, market return, risk-free return, systematic risk, Treynor and Loss Aversion index. Hypotheses have been tested with Spearman correlation coefficient. The results show that Loss Aversion can be used as a new index for measuring portfolio performance.

Keywords: Investment Companies, Performance Measurement, Prospect Theory, Loss Aversion

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1. Introduction

During past 13 years, investors experienced some turbulent episodes, including two of the worst equity bear markets in U.S. history. Historically, chaotic events and market volatility have influenced investors' behavior. For instance, U.S mutual fund flow data show that the investors have tended to reduce their investment in equities in market downturns, and reinvest more capital into equities once the market picks up (Hofschire, et.al. 2013).

Advantages of centralized money in funding firms on the growth of economy lead researchers to seek for a way to attract trust of individual Investors. One of proposed solution is to promote investment companies (as a safe place to invest) by increasing competition among them in portfolio return and transparent reporting.

Achieving this goal makes researchers to create evaluating tools to rank the investment companies.

For the first time, the performance evaluation model for the investment portfolio was introduced by Sharpe in 1966. Sharpe in his article "Mutual Fund Performance" introduced Sharpe ratio. The Sharpe ratio is calculated by subtracting the risk-free rate from the rate of return for a portfolio and dividing the result by the standard deviation of the portfolio returns. In later years, economist, Treynor, developed an index which used beta as the risk measure. The higher result means that the greater "excess return per unit of risk" being generated by the portfolio.

Most of the proposed evaluation criteria assume that investors tend to maximize the expected utility of a decision. Although the expected Utility theory has been a popular theory for a long time, this theory has failed in predicting human behavior systematically (at least in unreliable condition). For this reason, Kahneman and Tversky (1979) developed an alternative theory which is called "prospect theory".

According to this theory, investor maximize the weighted sum of a value function, where the value function is calculated in terms of gains or losses rather than final wealth and weights are subjective (rather than objective) probabilities (Kahneman and Tversky, 1979).

In this paper a new measure of portfolio performance based on prospect theory is proposed which is the ratio of profits to losses. Risk-aversion is reflected by profit and risk-taking is reflected by loss. Then the criteria are adjusted based on House Money effect. We rank the performance of investment companies with three Loss Aversion indexes and compare the results by Treynor index.

2. Literature

The main solution to the selection of the optimal portfolio is the use of reliable measurement model. This model helps the investors to evaluate portfolios and try to improve it or chose investment companies with optimal portfolios.

Evaluating the performance of investment companies and rating them are important because of their effect on fund raising from non-professional investment (buy, sell or hold shares of investment companies). Naturally, stock turnover of investment companies with higher return are higher.

As explained above, because of the importance of investment companies in attracting the investors' confidence for accumulation of unprofessional people's saving money and converging them on a true investment opportunity, scholars search for a model to rate them, conduct investors and avoid future crises. One of the main problems in assessing the performance is the human tendency to focus on portfolio returns and not paying sufficient attention to the risks associated with the acquisition of the desired output (Strong, 2000).

Total return is considered as a proper criterion for measuring total investment gain. It encompasses a component of dividends and capital gains (Jahankhani and Parsayian, 1997). Sharpe and Traynor ratios measure returns earned in excess of risk free investments per each unit of market risk. They are basically developed on the assumption of "the capital asset pricing model". Their difference is in market risk concept. In Sharpe ratio standard deviation is considered as risk measurement which covers total profit and in Traynor ratio, beta of the portfolio is considered as the risk. These ratios are used in portfolio ranking which means that they are relative ratio not the absolute ones.

Zadeh Far, Shams, and Reza Zadeh (2010) evaluated the performance of investment companies based on five models in the TSE. The results indicate that performance of companies which is calculated by Treynor, Jensen. M2, and Sharpe indexes and Appraisal ratio weren't better than the average performance of the market. The results show that the model ranking were not similar (test shows that Sharpe and M2 index and appraisal ratio and Jensen index have most correlation). These results are different from Redman, Gullet (2000) and Jayadev (1996) researches (Zadeh Far. Shams and Reza Zadeh, 2010).

In the late 80's, financial research about the suitability of the efficient market hypothesis with the econometric evidence on the time series of price, gains and dividends of stock reached the peak. Exceptions can be detected as a deviation from the basic facts of the EMH (For example Calendar Effect). It implies that at least some changes in the prices of securities are independent from mentioned fundamental factors in EMH and probably dependent on factors outside of the model.

Behavioral finance is a field that proposes psychology-based theories to explain stock market anomalies. Within behavioral finance, it is assumed that the information structure and the characteristics of market participants systematically influence individuals' investment decisions as well as market outcomes. Therefore, it concentrates on behavioral characteristics that influence investors' decision making. Nowadays researchers believe that behavioral finance can capture gap in models based on perfect investor rationality. In this paradigm, typically the factors and different structures that shape investors' behavior are studied. The importance of this is to suggest that investment decisions are not only influenced by economic indicators and rationality, but also dependent on behavioral factors such as investment horizon, risk tolerance, and investors' confidence on the process of investing in security market. Generally psychological issues shape investor style. That's why this study focus on the performance evaluation models based on behavioral finance.

Kahneman and Tversky (1991) sought to provide a theory that describes how decision-makers actually behave when confronted with choices under uncertainty.

The value function shows the sharp asymmetry between the values that people put on gains and losses. This asymmetry is called loss aversion. This can also be expressed as the phenomena in which people will tend to gamble in losses. This is due to the fact that the value function (differ from utility function in the expected utility theory) under the prospect theory is the upward slope for different wealth levels under each individual's reference point and downward slope for wealth levels after the mentioned point. Prospect theory also predicted that investors will be risk averse in wealth levels after their reference point (Johnsson, Lindblom, and platan, 2002).

As mentioned above, an interesting feature of investors is that they tend to take greater risks when they have experienced recent gains which called "house money effect". Because of the house money effect, it is possible that performance measurement should take account of previous gains and losses as well as current ones (Gemmill, Hwang, and Salmon 2005).

Jensen (1968) drove a risk-adjusted measure of portfolio performance. This studied estimated how much a manger's forecasting ability contributed to the fund's returns. The measurement was based on the pricing of capital assets model by Sharpe (1964), Lintner (1965a), and Treynor (undated). 115 mutual funds have been studied the result indicated not only that those funds were on average not able to predict securities prices well enough to outperform a buy-the-market-and-hold policy, but also there is very little evidence that any individual fund was able to do significantly better than that which they expected from mere random chance.

Jayadev (1996) evaluated the performance of two growth oriented mutual funds (Mastergain and Manum txpress) on the basis of monthly returns and compared to benchmark returns. He applied performance measures suggested by Jenson, Treynor and Sharpe index for evaluating the performance. It was found that, Mastergain had performed better according to Jenson and Treynor measures but it performance was poor based on Sharpe ratio. The results also showed that the performance of Magnum

Express was poor on the basis of all these three measures.

However, Magnum Express was well diversified and had reduced its unique risk where as Mastergain did not. These two funds were founded to be poor in earning better returns either adopting marketing or in selecting underpriced securities. It could be concluded that, the two growth oriented funds had not performed better in terms of total risk and the funds were not offering advantages of diversification and professionalism to investors.

Barberis, Huang, and Santos (2001) studied asset prices in an economy where investors gain direct utility not only from consumption but also from fluctuations in the value of their financial wealth. Investors were loss averse over these fluctuations and the degree of loss aversion depends on their prior investment performance. The framework presented by these scholars can help explain the high mean, excess volatility, and prediction capability of stock returns, as well as their low correlation with consumption growth. The design of this model was influenced by prospect theory and by experimental evidence which investigate the effect of previous outcomes on risky choices.

Genesove and Mayer (2001) collected Data from Downtown Boston in the 1990s. Results showed that loss aversion determined seller behavior in the housing market. Condominium owners subject to nominal losses 1) set higher asking prices of 25-35 percent of the difference between the property's expected selling price and their original purchase price; 2) attained higher selling prices of 3-18 percent of that difference; and 3) exhibited a much lower sale hazard than other sellers. The list price results were twice as large for owner occupants as investors, but hold for both. Findings suggested that sellers were averse to realizing (nominal) losses and helped explain the positive price-volume correlation in real estate markets.

Berkelaar, Kouwenberg, and Post (2004) in their study "optimal portfolio choice under loss aversion" have analyzed the optimal investment strategy for loss aversion investors, assuming a complete market and general processes for the asset prices. The loss-averse investor follows a partial portfolio insurance strategy.

When the investor's planning horizon is short (i.e. less than 5 years), he or she considerably reduces the stock weight of initial portfolio compared to an investor with smooth power utility. The empirical section of the paper estimated the level of loss aversion implied by U.S historical stock market data, using a representative agent model. They found that loss and risk aversion couldn't be disentangled empirically.

Gemmill, Hwang, and Salmon (2005) measured the performance of portfolio based on prospect theory, which captures not only risk and return but also reflects differential aversion to upside and downside risk. The measure was a ratio of gains to losses, with the gains and losses weighted (if desired), which reflected risk-averse for gains and risk-seeking for losses. It could also be interpreted as the weighted ratio of the value of call option to a put option, with the benchmark as the exercise price. When applying the loss-aversion performance measure to close-end funds, they found that it gives significantly different rankings from those of conventional measure, and gave the expected signs for the odd and even moments of tracking errors.

Zakamouline (2011) considered a loss aversion investor who was equipped with a specific, but still quite general, utility function motivated by behavioral finance.

He showed that under some concrete assumptions about the form of this utility one can derive closed-form solutions for the investor's portfolio performance measure. He investigated the effects of loss aversion and demonstrated its important role in the performance measurement.

Bigus (2014) investigated how different legal regimes affect auditor's effort and investors' investment decisions when the auditor was subject to probability weighting and loss aversion, which were two important characteristics of prospect theory. Probability weighting encouraged an auditor to overrate the audit risk and the likelihood of damages leading to inflated audit fees which could help to explain the BigN audit fee premium. With loss aversion, an auditor was sensitive to the risk of damage compensation and, thus, tends to exert excessive caution which also generates excessive audit fees. Consequently, investors might choose not to hire an auditor and, as a result, might forego an otherwise profitable investment. These effects were more intense with a strict liability regime than with a negligence rule because with the latter, the auditor was not held liable when due care has been exerted.

3. Objectives

This paper evaluates the performance of investment companies in TSE. Then it compares the results in order to rank the companies. Per of recent explanations, we are looking for answers of these two questions below:

1) How is the performance of investment companies by loss aversion index?

2) Are there any differences between ranking by Treynor index or loss aversion index?

Based on the purpose of this study, we chose 15 investment companies which have registered in I'SE from 2003 to 2013.

4. Data

The sample consists of 15 listed investment companies registered in TSE during 2003-2013. The data are seasoned -based and have retrieved from

Tadbir Pardaz professional software. The data have been collected from investor and investee seasonal report, TEDP1X index and bonds returns until 2013.

5. Variables

5.1. Investment companies returns

Since the way of calculating accounting income in investment companies limits income distribution and time of capital gains recognition, we concentrate on quarterly returns of the portfolio which is the weighted average of each stock in the portfolio:

$$r_{pt} = \sum r_i w_i = r_1 w_1 + r_2 w_2 + \cdots + r_n w_n \qquad (1)$$

r_{pt} represents investment companies return at t. r_i shows return of i stock by weight of w_i.

5.2. Market return

Because of market price index insufficiency, price and dividend index are consider here as market return.

$$r_{mt} = \frac{l_2 - l_1}{l_1} \qquad (2)$$

r_{mt} represents market return at t. price and dividend index at beginning and end of the current period show by I_1 and I_2.

5.3. Risk free rate

Risk free rate (r_f) is the theoretical rate of return of an investment with zero risk. The risk free rate represents the interest an investor would expect from an absolutely risk free investment over a specific period of time. In this paper, the rate of Islamic Bonds (in recent 7 years) is considered as the risk free rate.

Table 1. Risk free rate during the period under review

Year	2004-2005	2006	2007-2008	2009	2010	2011-2012	2013
Islamic bonds rate	17%	16%	15.5%	19%	15%	17%	20%

5.4 Systematic Risk

If someone wants to know how much systematic risk of a particular security, fund or portfolio is, he or she can look at its beta, which measures by how volatile that investment is compared to the overall market. A beta of greater than 1 means the investment has more systematic risk than the market, less than 1 means less systematic risk than the market, and equal to one means the same systematic risk as the market. Weighted average of portfolio stocks beta shows the whole portfolio beta.

6. Evaluation of investment companies portfolio performance

6.1 Treynor Index

The Treynor index (T_p) is a measure of risk-adjusted performance of an investment portfolio. It measures a portfolio's excess return per unit of risk, using beta as the risk measure; the higher this number, the greater "excess return" being generated by the portfolio.

$$T_p = \frac{E[r_p - r_f]}{\beta_p} \qquad (3)$$

In the above equation r_p, r_f, and β_p respectively indicate portfolio return, risk free rate and Systematic Risk. The symbol E in numerator is mean.

6.2 Simple Loss Aversion Index

Loss Aversion is the ratio of income to loss. The Numerator is investor's expectation of profit and the denominator shows investor's risk aversion. In the equation below, LA P^s measures performance by loss aversion model.

$$LAP^s = \frac{P * E\left[\left(\left(r_{pt} - r_{mt}\right)^+\right)^{v_1}\right]}{(1 - p) * E\left[\left(-\left(r_{pt} - r_{mt}\right)^-\right)^{v_2}\right]} \qquad (4)$$

In the above equation r_{pt} and r_{bt} has been previously described. The positive sign in the numerator and the negative sign in the denominator show income and loss. v_1 and v_2 enter the Risk aversion in profit and the risk acceptance ratio in loss

to the equation. and are assumed to be positive and smaller than 1. When $v_1 = v_2 = 1$, the investor is risk-neutral with respect to gain or loss. In this paper based on Gemmill, Hwang, and Salmon's (2005) paper, we consider $v_1 = 0.75$ and $v_2 = 0.95$. In the

above equation, gain raised to the power v_1 and loss raised to the power v_2. P is the expectation operator

which measures through the normal number (Z_{rpt}).

$$Z_{rmt} = \frac{E_{(r_{mt})} - \mu}{\delta} \qquad (5)$$

$E(r_{mt})$ is the average of market returns. μ and α are mean and standard deviation of r_{pt} - r_{mt}. Z_{rpt} is a normal number.

Figure 1. Simple Loss Aversion Index
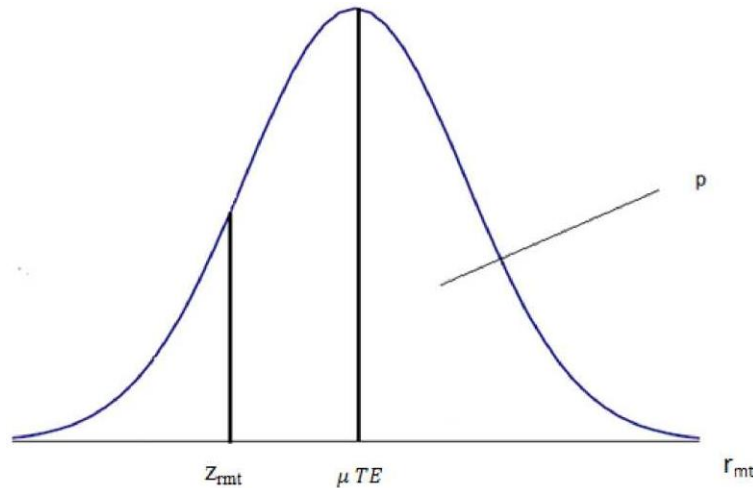
6.3 Evaluating the performance by adjusted loss aversion

We adjust loss aversion model by adding house money effect. The house money effect explains the reduction of risk aversion because of prior gains.

Now we can introduce two new indexes for evaluating performance:

a) When the house money effect is taken into account, the loss aversion coefficient λ_t is a function of previous performance and does not drop out. The revised performance measure becomes:

$$LAP^H = \frac{PE\left[\left(TE_t{}^+\right)^{v_1}\right]}{\lambda_t(1-p).E\left[\left(-TE_t{}^-\right)^{v_2}\right]} \qquad (6)$$

Where TE_t is tracking errors in time t and can be defined as $TE_t = r_p - r_m$. In the above equation $\lambda_t = \beta_0 - \beta_1 TE_{t-1}, \beta_0 > 0$ and $\beta_1 > 0$. As you have realized, λ_t depends on past tracking error. Based on

Gemmill, Hwang, and Salmon's (2005) paper, we assume $\beta_0 = 3$ and $\beta_1 = 15$.

b) Likewise, the measure of performance with exponential weights can be written as LAP^{EW}:

$$LAP^{EW} = \frac{pE[exp(-\rho_t TE_t^+)TE_t^+]}{(1-p)E[exp(-\rho_t TE_t^-)(-TE_t^-)]} \qquad (7)$$

Where $\rho_t = \Psi_0 - \Psi_1 TE_{t-1}, \Psi_0 > 0, \text{and } \Psi_1 > 0$.

The interpretation of these performance measures with the house-money effect is as follows. When there are losses in the previous period ($TE_{t-1} < 0$), the loss aversion coefficient λ_t becomes larger and thus LAP^H shows worse performance than the simpler LAP^S. Therefore previous losses of a fund affect the current evaluation of the fund in a negative way (Gemmill, Hwang, and salmon, 2005).

7. Numerical results and further discussion

Based on the main purpose of the study, the measured performance of each company is shown in table 2. In the next step, Companies are classified according to results.

Table 2. Result of evaluating performance and ranking

Company\model	Tp		LAP^S		LAP^H		Lap^{EW}	
Alborz Investment Corporation	10.65	1	8.8	1	-0.597	15	0.039	4
Tose-e Melli GROUP	0.015	12	0.58	13	0.142	11	0.002	12
Pars Tousheh Investment Corporation	1.991	2	0.81	9	0.243	8	4E-05	14
Piic GROUP	0.072	7	1.18	6	-0.122	14	0.0018	11
Behshahr Industrial GROUP	0.078	6	0.94	7	0.23	9	0.0025	9
Tuka Corporation	0.1	5	2.67	4	0.553	4	0.0022	10
Tamin Pharmaceutical Investment Corporation	-0.05	15	0.72	11	0.137	12	0.0016	13
Rena Investment Corporation	1.281	3	3.85	3	0.378	6	0.0302	5
Sepah Investment Corporation	0.061	8	4.32	2	0.601	2	0.466	1
Sarmayegozari Sandogh Bazneshastegi Keshvari	0.027	11	1.44	5	0.569	3	0.0043	7
Insurance Industry Investment Corporation	6E-04	13	0.53	14	0.451	5	0.1408	3
Oil Industry Investment Corporation	0.395	4	0.84	8	0.623	1	1E-08	15
Industry & Mine Investment Corporation	-0.01	14	0.3	15	0.092	13	0.0067	6
Ghadir Investment Corporation	0.033	10	0.71	12	0.22	10	0.0039	8
National Investment Corporation of Iran	0.037	9	0.8	10	0.334	7	0.1562	2

The results show that profit premium of 11 investment companies was more than market in general based on Treynor index. Tose-e melli GROUP, Tamin Pharmaceutical Investment Corporation, Insurance Industry Investment Corporation, and Industry & Mine Investment are in the downside of the line. Based on this criterion, Alborz Investment Corporation has the best and Tamin Pharmaceutical Investment Corporation has the worst performance.

For more clarification, we compare investment companies return (measure by 3 loss aversion index) with market which is measured as $E(r_m - r_f)/\sigma_m$.

On the basis of simple loss aversion index, all companies have better performance than market. In the ranking, Alborz Investment Corporation has the first place and Industry & Mine Investment Corporation were the last.

The adjusted loss aversion results show that the companies have higher level of return than market. the strange point is that in spite of previous indexes, Alborz Investment takes the 15th place. The first rank is assigned to Oil Industry Investment Corporation.

In general the investment companies haven't had better performance than market except Sepah Investment Corporation and Tose-e Melli GROUP. In this index the first rank is assigned to Sepah Investment Corporation and the last rank goes to Oil Industry Investment Corporation.

For answering the second question of research, we use Spearman Correlation Test. The results are shown in the table below:

Table 3. Correlation coefficients between performance measures

Model	Tp	LAP^s	LAP^H	LAP^{EW}
$T1p$		0.73 (0.01)	0.15 (0.69)	-0.12 (0.76)
LAP^s			0.21 (0.42)	0.24 (0.47)
LAP^H				0.13 (0.72)

As it is obvious, the level of significance level between Treynor and LAPS index is less than 0.05. It shows intensity relationship. It can be stated with 95% confidence that the rating of Traynor and LAPS index are same.

By comparing the other couples of indexes, we realize that their rankings are different.

8. Conclusion

a) By comparing Treynor index with 3 loss aversion indexes by Spearman correlation test, they have different outcomes for ranking except Terynor and simple loss aversion index.

b) By comparing couple indexes, correlation coefficient test confirm their different criteria for ranking.

c) By comparing Treynor and loss aversion index, the results confirm the existence of loss aversion in investment companies.

d) Comparison of LAPS, LAPH and LAPEW show the existence of house money effect among investment companies.

e) Comparison of LAPH and LAPS criteria give the result that loss aversion behavior of investment is influenced by previous period performance.

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