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Does Voracious Behavior favor Efficient Market Hypothesis? Role of Performance Measures

Attayah Shafique[*], Usman Ayub[**], Muhammad Shariq[***], Muhammad Ashfaq[§]

Abstract

Greed plays an important in the fluctuations of stock prices because investors want profits irrespective of the risk taken by them. This study aims to determine, whether, in times of rising trends in the market, greediness is good for the investor or not. Secondly, investors can get high profits by beating the market or not. The already formed deciles portfolios of listed companies on NYSE, AMEX, and NASDAQ based on size and book to market value are taken from the Kenneth R. French data library from Dec 1994 to Dec 2021. Sharpe, Treynor, and Sortino ratios are used as the measure of the performance of portfolios. Ordinal logistic regression is used to calculate the probability at different benchmark levels to determine, whether the investor gets the profit by beating the market or not. The results show that the investor who used the Sharpe ratio has an average 85% probability of getting a profit of more than 75% of the benchmark of S&P-500 in all periods. Thus, the investors' greediness is good in the long run if the investor considers total risk and can beat the market. By using the Sortino and Treynor ratio, there is an average 50% probability of achieving the profit up to the benchmark which is S&P-500. This means that the investors are not able to beat the market thus, support the efficient market hypothesis by considering the downside and market risk.

Keywords: greed; benchmark; efficient market hypothesis; performance measures.

JEL classification: C58, G17.

1. INTRODUCTION

The term 'greed' derives from the Old English term "græd" or " grædig", meaning hungry, voracious, or eager to get (Harper, 2016). According to the definition, greed is an

[*] Department of Communication and Management Sciences, Pakistan Institute of Engineering and Applied Sciences, Pakistan; e-mail: *attayah.shafique@pieas.edu.pk* (corresponding author).
[**] Department of Management Sciences, COMSATS University Islamabad, Pakistan; e-mail: *usman_ayub@comsats.edu.pk*.
[***] Nust Business School, National University of Sciences & Technology, Pakistan; e-mail: *muhammad.shariq@nbs.nust.edu.pk*.
[§] Department of Business & Management, IU International University of Applied Sciences, Germany; e-mail: *muhammad.ashfaq@iu.org*.

overwhelming or insatiable desire to have something. Although most people accept that greed requires a deep desire to have something, often people disagree with the definition of greed. Another word used for greed is Philargyria, which gives a more conventional definition of greed as a financial appetite. Greed is conceptualized as an emotion or motivation. Human behavior is also determined by both emotions and motivations. According to (Zeelenberg & Pieters, 2006), emotions are important because it guides people to deal with specific situations. If greed is considered as an emotional state of an individual then it means that it is an emotional experience of wanting something or wanting more, which will help people to reach their goals. But greed is also considered a more stable motivation. Most people have taken greed as a hybrid of both emotion and motivation.

Another point of view is that greed is innate in human nature and that to some degree, all men are greedy (Williams, 2000). Some claim that greediness is vital to human welfare because if people try to earn more and more, they will ultimately become prosperous. But on the other side, since the financial crisis of the late 2000s, greed has gained substantial media coverage and it is frequently claimed that greed is the cause of the actions of the bankers responsible for the crisis (Zandi, 2008). The behavior of the investors' changes with the fluctuations in the market if the market must experience a downfall in the market, the investors react differently as compared to the rise in the market. This is because of the emotions involved in the process of decision making.

If the market shows rising trends in the stock prices, the investors tend to be greedy, and, in this greediness, they may start buying more and more stocks. It is observed that in the long run it is not a good strategy and investors need not be greedy in any situation. So, the purpose of this study is to investigate the greedy behavior of an investor. If there is a rising trend in the market, then is it possible for the investor to get returns or gains more than the specific benchmarks? Moreover, it guides the investors in terms of probabilities that what strategy they make in the time of rising trends in the market, whether the investors buy, hold, or sell the stocks. The novelty of this study is using, quantifying, and linking the concept of greediness with the efficient market hypothesis. In this regard, different performance measures are used.

The performance of US portfolios is measured by using the performance measures because it gives a two-dimensional analysis, of both risk and returns. This study used three performance measures which are the Sharpe ratio (Sharpe, 1966), Treynor ratio (Treynor, 1965), and Sortino ratio (Sortino & Price, 1994) based on total risk, market risk, and downside risk respectively. The performance of portfolios is evaluated monthly and if there is a rising trend in the market, there are chances that investors get abnormal returns or profits. This means that the market is inefficient, and investors can beat the market, which is the opposite to the efficient market hypothesis[1].Now the question is, how much the probability of getting higher profits or gains above the benchmark by beating the market and is it good for the investors to be greedy during this time horizon? This present study also contributes to the research in portfolio theory and behavioral psychology by linking the performance of portfolios with the investor’s greedy behavior.

Following this first introductory section, the paper is organized as follows: Section 2 presents the literature review, Section 3 presents the methodology, which comprises different steps. Section 4 gives the results and discussions finally; Section 5 concludes the paper.

2. LITERATURE REVIEW

The literature review is divided into two parts. The first part is related to the Investor's behavior and the Efficient market hypothesis. The second part is related to portfolio performance measures.

2.1 Investor's behaviour and efficient market hypothesis

There is a general observation in the market that if investors invest in stocks, they want returns or gains too quickly. For the sake of more gains and profits, the investors try to beat the market. According to the EMH, the investors act rationally and there is no room for them to earn abnormal gains. Heller (2000) states the words of Warren Buffet: "we only attempt to be fearful when others are greedy and greedy when others are fearful". This means that greed and fear are two important emotional states which play a crucial role in making decisions by the individual investor. Greedy people want to be rich in a very short span so they make excessive investments in stocks, on the other side, fear restricts the individual not to make risky investments. Therefore, fear and greedy behavior sometimes restricted an individual to achieve the investment objectives (Bailey & Kinerson, 2005).

The major purpose of investors is to earn more and more profits in the stock market. For the sake of profit, they try to beat the market. But according to the efficient market hypothesis, it is unable for investors to get returns above a specific benchmark. The efficient market hypothesis proposed by Malkiel and Fama (1970) states investors are unable to beat the market even if upward trends are observed in the market because in the long run the prices are again adjusted back to their previous position. Fama (1965) clearly explains the phenomenon in the 'Random Walk Theory' that price change cannot follow any path, thus prices are randomly changed and unpredictable over time. The random walk theory[2]is also linked with the Efficient Market Hypothesis. Empirical studies related to the efficient market hypothesis highlight the two schools of thought. One school of researchers believes that it is unable to beat the market and the second school of thought believes that the efficient market hypothesis and random walk theory are not followed by the financial markets.

Empirical studies show mixed results, some studies support the efficient market hypothesis and random walk theory and others do not. Malkiel (2005) found that specialist investment fund managers are not able to beat the benchmark and thus conclude that stock prices reflect all the information effectively. Kim and Shamsuddin (2008)[3] study the efficient market hypothesis in Asian markets and conclude that Hong Kong, Japanese, Korean and Taiwanese markets are efficient, and Singaporean and Thai markets are efficient after the crisis. On the contrary, Hamid *et al.* (2017) conclude that Asian pacific countries do not follow the random walk hypothesis.

Islam and Khaled (2005) investigate the Dhaka stock exchange and concludes that the Dhaka stock exchange is inefficient, and investors can earn abnormal profits. Likewise, Lee *et al.* (2010) also rejected the efficient market hypothesis and shows the presence of profitable arbitrage opportunities in 32 developed and 26 developing countries for Jan 1999 to May 2007. On the contrary, Al Janabi *et al.* (2010) test the efficient market hypothesis in GCC countries from 2006 to 2008. The empirical results support the efficient market hypothesis. Borges (2010) applied an efficient market hypothesis and get mixed results Portugal, Greece,

France, and the UK reject EMH due to the autocorrelation and mean reversion in the data while Germany and Spain support the EMH.

2.2 Portfolio performance measures

The assessment of portfolio overall performance is pivotal in portfolio management (Caporin *et al.*, 2014). It guides the investors about the investment that either the investment is worthy or not relative to the risk. Initially, the investors view the risk and return separately and consider the success in the portfolio. But this concept has been drastically changed since 1960. The investors start viewing risk and return simultaneously before making any investment. In financial literature, there are 101 performance measures are proposed and discussed by different researchers for the evaluation of portfolio performance (P. Cogneau & Hübner, 2009). Most performance measures are based on Portfolio Theory (Markowitz, 1952). In this study, three performance measures are used namely, Sharpe ratio, Treynor ratio, and Sortino ratio.

2.2.1 Sharpe Ratio

Sharpe ratio is proposed by Sharpe (1966) by determining the explicit relationship between the recent developments in Capital theory[4]and alternative models of mutual fund performance. Sharpe ratio is defined as "*the ratio of the excess returns to the risk (standard deviation) of that return".* The ground theory for the Sharpe ratio is the mean-variance theory which makes it more valid for quadratic preference or normal investment. The return in Sharpe ratio is calculated via arithmetic returns. In contrast, the geometric mean is favored when it comes to asset returns over time as it eases autocorrelated and other statistical properties of returns that are not independent and identically distributed [5] (Ziemba, 2005).

The Sharpe ratio is widely used by investors and managers for the evaluation of portfolio performance. Many studies show Sharpe ratio is an accurate evaluator and gives ranking order to the stocks if other performance measures are used with it. Eling (2008) confirmed that the Sharpe ratio gives the same ranking order as the other performance measures predict. This is also confirmed by Auer and Schuhmacher (2013). This means that the Sharpe ratio is used for comparison across the different investments by taking the assumption of the normal distribution of returns, as it has been observed that the Sharpe ratio did not work if the returns are negative (McLeod & Van Vuuren, 2004). Pilotte and Sterbenz (2006) used the GARCH model [6] on U.S Treasury securities of different maturities to examine the movement of the Sharpe ratio over the business cycle. Afza and Rauf (2009) used the Sharpe ratio to measure the fund performance of MUFAP. Johnston *et al.* (2013) use the Sharpe ratio to measure the performance of large and small company stocks along with corporate bonds over different holding periods in the USA.

The Sharpe ratio is presumed to have a solid theoretical foundation but is still criticized for some undesirable technical properties. Miller and Gehr (1978) assuming the normality of returns, detected a sample size biasness in the estimator of the Sharpe ratio. This biasness does not disturb the ranking of investment funds with equal time-series length but it results in an overestimation of the absolute value of the Sharpe ratio. Farinelli *et al.* (2006) criticize the Sharpe ratio based on the normal distribution of returns and proposed a more general risk-reward ratio suitable to compare skewed return distribution concerning the benchmark.

Schuster and Auer (2012) state that high (low) returns distortion of the Sharpe ratio. They especially show that an exceptionally high (low) return that exceeds a certain limit can decrease (increase) a fund's Sharpe ratio.

2.2.2 Treynor Ratio

Treynor (1965) gives Treynor Ratio which distinguishes between total risk and systematic risk. It is defined as "*the ratio of the excess returns to the systematic risk (beta)"*. Smith and Tito (1969)[7] use the Sharpe ratio, Treynor ratio, and Jenson alpha to estimate the performance of the portfolio of 34 mutual funds and conclude that the Treynor ratio gives more favorable results than the Sharpe ratio.

Shah Aamir *et al*. (2005)[8] use the Treynor ratio to study the performance evaluation of selected open-ended mutual funds in Pakistan. The analysis of the study shows that only 3 mutual fund schemes have performed better than the benchmark. Scholz and Wilkens (2006) find that the Treynor ratio gives appropriate orientation and decision guidance for investors who are unwilling or unable to carry out a complete portfolio optimization. Gupta (2014) and Dash (2015) use the Treynor ratio for measuring the performance of stocks on the Indian Stock Exchange.

2.2.3 Sortino Ratio

Bawa and Lindenberg (1977) suggested that a more appropriate measure of risk should only be concerned with the underperformance of the fund manager relative to the benchmark. Sortino and Van Der Meer (1991) claimed that the distribution of returns is anything but normal. Thus, the Sortino ratio is proposed by Sortino and Price (1994). It only penalizes falling below the target returns. It can be used as an alternative to the Sharpe ratio when we must measure the risk-adjusted return.

Unlike the Sharpe ratio, the Sortino ratio doesn't assume normal return distribution and focuses on the probability of not meeting the target return that is below it (Kaplan & Knowles, 2004). Chaudhry and Johnson (2008) inspected the sustainability of existing performance measures under the assumption of a clearly defined benchmark in Australia and shows results in favor of the Sortino ratio. P Cogneau and Zakamouline (2011) use a lower partial moment as a downside risk to capture the abnormal behavior of the return and more accurate results are obtained. Rollinger and Hoffman (2013) explore that the Sortino ratio gives more favorable results when the return distribution shows positive skewness.

3. DATA AND METHODOLOGY

3.1 Data

This study aims to determine the greediness of an investor during rising trends in the market by taking the investment horizon of one month. Portfolios are used for analysis because investments are best preferred when done in portfolios rather than in individual companies. An investment portfolio can bring many advantages if adapted by the investor. Portfolios help an individual to protect his underlying venture as well as develop that funding to levels that it would not generally have accomplished. The additional fruit of having a

portfolio is diversification. If there is any risk tangled in a portfolio, there is also a control that it provides to the investor over money in the future. Thus, already formed deciles portfolios [9]of listed companies on NYSE, AMEX, and NASDAQ based on size and book to market value are taken from the Kenneth R. French data library[10] from Dec 1994 to Dec 2021. For benchmark S&P 500 is used. Six months T-bills are used as a risk free rate of return.

3.2 Methodology

The performance of these portfolios is measured by using the performance measures. This study tries to incorporate all three major types of risk in the form of performance measures. In the Sharpe ratio, the standard deviation is used as the total risk likewise beta and semi variance are used as the proxy of market and downside risk and used in the Treynor and Sortino ratio respectively. The Sharpe ratio is calculated by using the following formula:

$$\textbf{Sharpe Ratio} = \frac{\bar{\mathbf{R}}_\mathbf{p} - \mathbf{R}_\mathbf{F}}{\boldsymbol{\sigma}_\mathbf{p}} \quad (1)$$

where: $\overline{R_p}$ is the portfolio's expected return, R_f is the risk-free rate and σ_p = portfolio's risk using Standard.

Similarly, Treynor and Sortino ratio is calculated by using the following formulas;

$$\textbf{Treynor Ratio} = \frac{\bar{\mathbf{R}}_\mathbf{p} - \mathbf{R}_\mathbf{F}}{\boldsymbol{\beta}_\mathbf{p}} \quad (2)$$

where: $\overline{R_p}$ is the portfolio's expected return, R_f is the risk-free rate and β_p = portfolio's risk using Beta.

$$\textbf{Sortino Ratio} = \frac{\bar{\mathbf{R}}_\mathbf{p} - \mathbf{R}_\mathbf{F}}{\textbf{semivariance}_\mathbf{p}} \quad (3)$$

where: $\overline{R_p}$ is the portfolio's expected return, R_f are the risk-free rate and $semivariance_p$ is the portfolio's risk using semi-variance.

Once the performance of the size and book to market value-based portfolios are calculated by using the different performance measures then plot the performance of these portfolios against the benchmark. Graphical representation helps to visualize the points where the performance of the portfolios is higher than the benchmark, thus depicting rising trends in the market. Normally, if there is an upward moment in the market, the investor by showing greedy behavior starts buying more and more stocks because they assume that in the future, they get more returns by selling. But in the long run, it is not a good strategy because stock prices reverse back to their mean position.

Before doing robust analysis, forecasting is done by using different forecasting measures for each category of the dependent variables. Mean forecasting error (MFE) is used in this respect. If the mean forecasting error is closer to zero, the forecast is classified as accurate, and the opposite is true if MFE is not close to zero (Kimes, 2003). The formula used for calculating the mean forecasting error is as follows:

$$\mathbf{MFE} = \frac{\sum_{\mathbf{i=1}}^{\mathbf{n}} \mathbf{e_i}}{\mathbf{n}} \quad (4)$$

where: *e* denotes error and *n* denotes the number of observations.

The value of the mean forecasting error is used in absolute terms. If the value is closer to zero, it means, better is the forecast. After the calculation of the mean forecasting error, the statistical significance of this mean forecasting error at each level is determined by using the t-test. It entails the observed test statistic to some cutoff value, called the "critical value." In this case, the t-test is two-tailed and there are two critical values, one for the left-tail denoted -t (α/2, n - 1) and one for the right-tail denoted t (α/2, n - 1). Therefore, critical value of t-distribution at $t_{(0.01)} = 2.576$, $t_{(0.05)} = 1.96$ and $t_{(0.1)} = 1.645$ for significance level of α at 0.01, 0.05 and 0.1.

The equation used for the t-test is as follows:

$$\boldsymbol{t} = \frac{\overline{\boldsymbol{x}} - \boldsymbol{\mu_o}}{\boldsymbol{s}/\sqrt{\boldsymbol{n}}} \quad (5)$$

where: $\bar{x}$ is mean forecasting error for the sample, μ_o represents the population error means which is zero, *s* is the sample standard deviation and *n* represents the number of observations.

In the end, the probability of getting gains up to the benchmark and above the benchmark is calculated. If there are more than 50% chances of getting higher returns, then the greedy behavior shown by the investors is good in this respect and they may purchase stocks for future investments. In this study, we consider one month as an investment horizon. After one month, the investors evaluate the performance of the portfolios. During the rising trends in the market, what is the probability of getting returns in one month? The return is up to the benchmark which means that investors are not able to get abnormal returns, thus supporting the efficient market hypothesis. The other three benchmarks are based on the quartiles (Brav & Mathews, 2011; Judd & Kennedy, 2011; Bouamara *et al.*, 2017)) introduced for greedy investors which are 25% above the benchmark, 50% above the benchmark, and 75% above the benchmark.

Data is used in the form of panels. The panel data gives a more clear and more accurate analysis as compared to cross-sectional or time-series data separately and its ability to deal with heterogeneity [11] makes it superior. Due to the lack of homogeneity in the data set, the analysis and results of the studies are biased (Baltagi, 2008). Panel data also enable the researcher to deal with a large number of observations and get better predictions (Dougherty, 2011). Then this panel data is divided into different windows that are 1995-1999, 2000-2004, 2005-2009, 2010-2014, and 2015-2021.

After setting the data, the probability on each benchmark level is calculated by using the Ordinal logistic regression[12].

$$\mathbf{P_i} = \frac{\mathbf{e^{Zi}}}{\mathbf{1} + \mathbf{e^{zi}}} \quad (6)$$

where: P_i indicates i^{th} case probability of the event, Z_i indicates the i^{th} case value for the explanatory variable.

The value Z_i indicates odd ratio which is computed as follows:

$$\mathbf{Z_{i=}\alpha_i + \sum_{i=1} \beta_i x_i} \quad (7)$$

where: X_i Indicates X no of predictor for the i^{th} case, β_i Indicates the i^{th} beta coefficient that is category-invariant and α_i Indicates intercepts of the i^{th} case which are category-specific and satisfy the constraints.

Individual probabilities are calculated by taking the difference between the cumulative probabilities. Once the alpha and betas are calculated, these values are used in the following equation for Sharpe, Treynor, and Sortino ratios.

$$\mathbf{Profits_{it} = \alpha_i + \beta_i(Sharpe_{it}) + \mu_{it}} \quad (8)$$

$$\mathbf{Profits_{it} = \alpha_i + \beta_i(Treynor_{it}) + \mu_{it}} \quad (9)$$

$$\mathbf{Profits_{it} = \alpha_i + \beta_i(Sortino_{it}) + \mu_{it}} \quad (10)$$

where: $ProfitsS_{it}$ is i^{th} Profits at time t, $Sharpe_{it}$ is Sharpe ratio of *the* i^{th} case for time t, $Treynor_{it}$ is Treynor ratio of *the* i^{th} case for time t, $Sortino_{it}$ is Sortino ratio of *the* i^{th} case for time t and β_{it} is the beta coefficient at time t.

4. RESULTS AND DISCUSSIONS

4.1 Graphical representation of performance of stock portfolios versus performance of market index

The performance of stock portfolios is determined by using the different performance measures which are the Sharpe ratio, Sortino ratio, and Treynor ratio. Figures no. 1 to no. 6 show the fluctuations in the movement of the stock performance based on the Sharpe, Sortino, and Treynor ratio against the benchmark (S&P-500) for the period of 1995-2021. The horizontal axis shows the period, and the vertical axis shows the performance of the stock market index. There are some common trends observed in all-stock portfolios by using three different performance measures like from March to November 2001, the performance of the stock portfolios is decreasing, which is due to the recession which affects the European Union and the United States also. Then in 2007-2009, a downward trend is observed in the US economy, which is most probably due to the global financial crisis and market crash. Graphical representation also shows that in developed markets like the US, the performance of the stock portfolios is fluctuating over the period, thus investors have the chance of getting high profits.

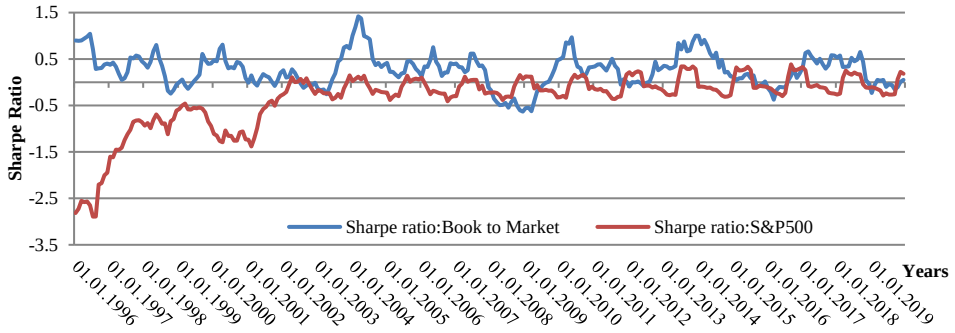

Figure no. 1 – Graph of Sharpe ratio of a Book to Market value stocks vs S&P-500 Sharpe ratio

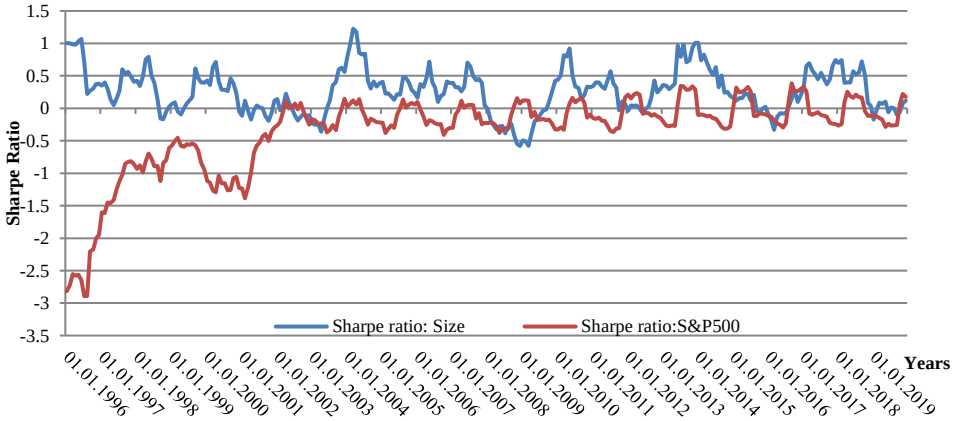

Figure no. 2 – Graph of Sharpe ratio of Size stocks vs S&P-500 Sharpe ratio

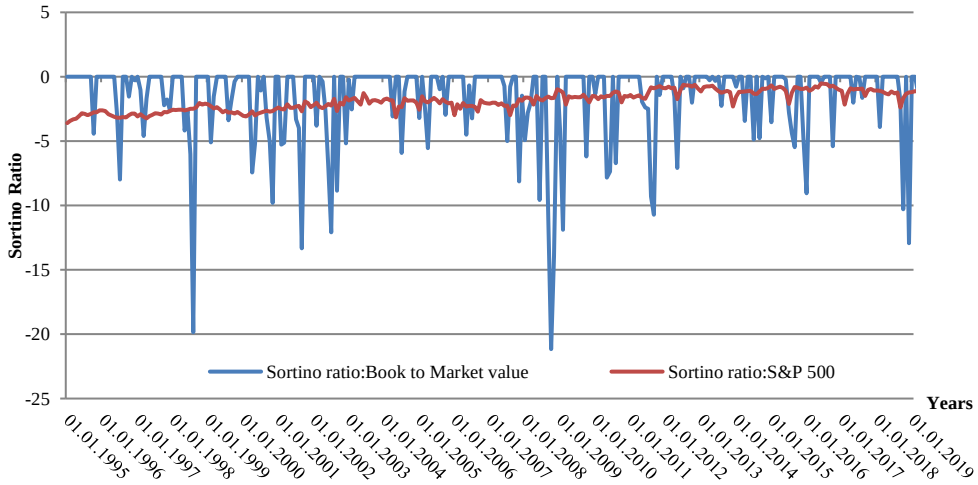

Figure no. 3 – Graph of Sortino ratio of Book to Market value stocks vs S&P-500 Sortino ratio

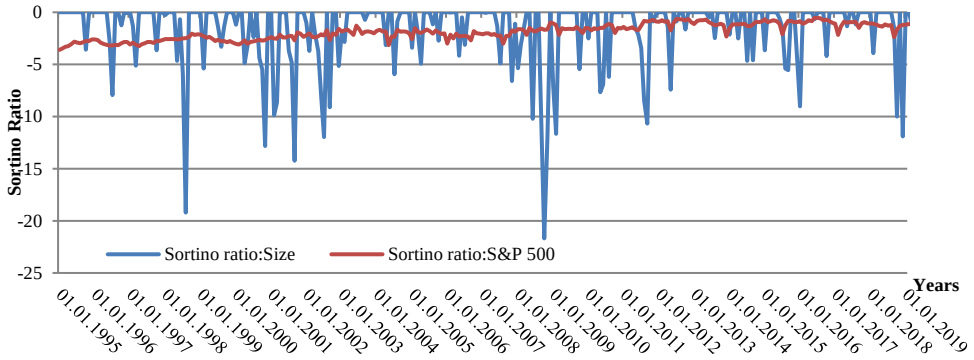

Figure no. 4 – Graph of Sortino ratio of Size stocks vs S&P-500 Sortino ratio

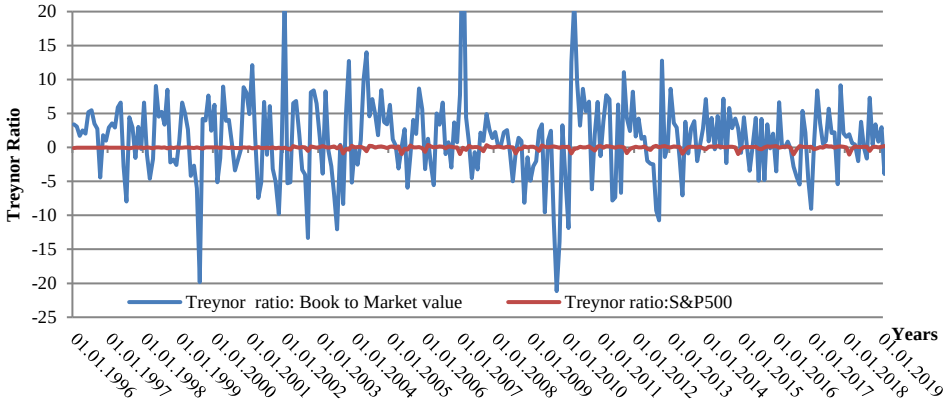

Figure no. 5 – Graph of Treynor ratio of Book to Market value stocks vs S&P-500 Treynor ratio

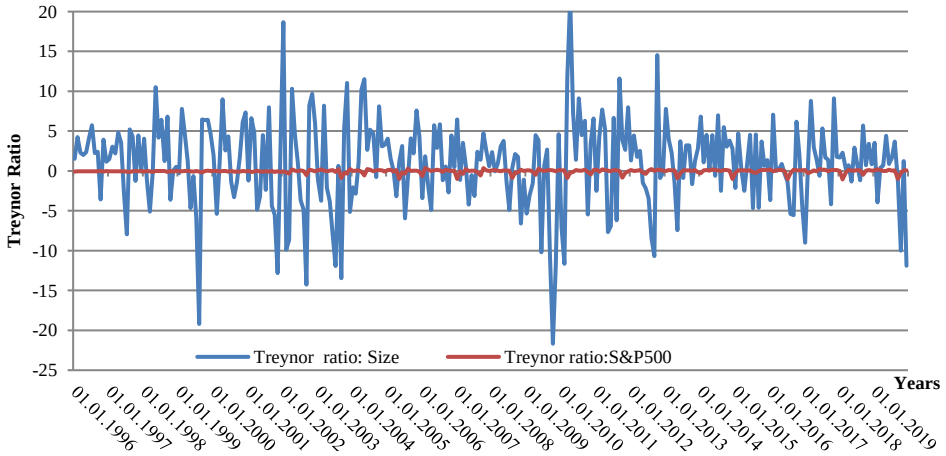

Figure no. 6 – Graph of Treynor ratio of size stocks vs S&P-500 Treynor ratio

Table no. 1 shows the mean forecasting error of the rising level of Sharpe ratio for size and Book to market value-based portfolios. The mean forecasting error of size and book to market based portfolios at the benchmark is 0.00050 and 0.0111, at 25% above the benchmark is 0.0028 and 0.0188, at 50% above the benchmark is 0.0005 and 0.0044 and at 75% above the benchmark is 0.0002 and 0.0156 respectively. Then the t-statistics of mean forecasting error are calculated. The observed value of t-distribution at $t\alpha/2=2.609$, $t\alpha/2=1.976$, and $t\alpha/2=1.655$ for a significance level of α at 0.01, 0.05, and 0.1 respectively, and 300 degrees of freedom. For size and book to market value based portfolios, the t-statistics of mean forecasting error at benchmark are 1.130 and 1.231, at 25% above the benchmark is 0.437 and -0.582, at 50% above the benchmark is 0.455 and -1.480 and at 75% above the benchmark is -1.000 and 0.290 respectively.

Table no. 1 – Mean forecasting error and t-stats of mean forecasting error of Sharpe ratio

Portfolios	**MFE at benchmark**	**MFE at 25% above the benchmark**	**MFE at 50% above the benchmark**	**MFE at 75% above the benchmark**
Size	0.00050	0.0028	0.0005	0.0002
Book to market value	0.0111	0.0188	0.0044	0.0156
Portfolios	t-stat at benchmark	t-stat at 25% benchmark	t-stat at 50% above the benchmark	t-stat at 75% above the benchmark
Size	1.130	0.437	0.455	-1.000
Book to market value	1.231	-0.582	-1.480	0.290

Table no. 2 shows the mean forecasting error of the rising level of Treynor ratio for size and Book to market value based portfolios. The mean forecasting error of size and book to market based portfolios at the benchmark are 0.0046 and 0.0013, at 25% above the benchmark is 0.0018 and 0.0001, at 50% above the benchmark is 0.0020 and 0.0008 and at 75% above the benchmark is 0.0060 and 0.0010 respectively. The observed value of t-distribution at $t\alpha/2=2.609$, $t\alpha/2=1.976$, and $t\alpha/2=1.655$ for a significance level of α at 0.01, 0.05, and 0.1 respectively, and 300 degrees of freedom. For size and book to market value based portfolios, the t-statistics of mean forecasting error at benchmark are 0.740 and 1.320, at 25% above the benchmark is 0.002 and -0.512, at 50% above the benchmark is 0.024 and -1.412 and at 75% above the benchmark is -0.680 and 0.301 respectively.

Table no. 3 shows the mean forecasting error of the rising level of Treynor ratio for size and Book to market value based portfolios. The mean forecasting error of size and book to market value based portfolios at the benchmark is 0.0066 and 0.012901, at 25% above the benchmark is 0.0019 and 0.0092, at 50% above the benchmark is 0.0000 and 0.0002 and at 75% above the benchmark is 0.0050 and 0.0145 respectively. The observed value of t-distribution at $t\alpha/2=2.609$, $t\alpha/2=1.976$, and $t\alpha/2=1.655$ for a significance level of α at 0.01, 0.05, and 0.1 respectively, and 300 degrees of freedom. For size and book to market value based portfolios, the t-statistics of mean forecasting error at benchmark are 0.805 and 1.041, at 25% above the benchmark is -0.653 and 1.001, at 50% above the benchmark is 0.234 and -1.169 and at 75% above the benchmark is -1.379 and 0.001 respectively.

Table no. 2 –Mean forecasting error and t-stats of mean forecasting error of Treynor ratio

Portfolios	MFE at benchmark	MFE at 25% benchmark	MFE at 50% above the benchmark	MFE at 75% above the benchmark
Size	0.0046	0.0018	0.0020	0.0060
Book to market value	0.0013	0.0001	0.0008	0.0010
Portfolios	t-stat at benchmark	t-stat at 25% benchmark	t-stat at 50% above the benchmark	t-stat at 75% above the benchmark
Size	0.740	0.002	0.024	-0.680
Book to market value	1.320	-0.512	-1.412	0.301

Table no. 3 – Mean forecasting error and t-stats of mean forecasting error of Sortino ratio

Portfolios	MFE at benchmark	MFE at 25% benchmark	MFE at 50% above the benchmark	MFE at 75% above the benchmark
Size	0.0066	0.0019	0.0000	0.0050
Book to market value	0.0129	0.0092	0.0002	0.0145
Portfolios	t-stat at benchmark	t-stat at 25% benchmark	t-stat at 50% above the benchmark	t-stat at 75% above the benchmark
Size	0.805	-0.653	0.234	-1.379
Book to market value	1.041	1.001	-1.169	0.001

The overall results of mean forecasting error of size and book to market value based portfolios by using Sharpe, Treynor, and Sortino ratio show that all values of MFE at each level are closer to zero. Then the t-statistics of these mean forecasting errors are determined. The results show that calculated t values at each benchmark level are less than the critical value of t- distribution $t_{\alpha/2}$=2.609, $t_{\alpha/2}$=1.976, and $t_{\alpha/2}$=1.655 for a significance level of α at 0.01, 0.05, and 0.1 respectively and 300 degrees of freedom. Thus, it is concluded that the model appears to fit the data reasonably well and there is not much difference between estimated and actual values which makes our forecasting reasonably accurate.

4.2 Results for the probability of profit by using Sharpe, Sortino, and Treynor Ratio

Different performance measures are used for the evaluation of portfolios during a particular period. In this study, three performance measures are used by considering the three different categories of risk. Panel A and B of Table no. 4 show the predicted probabilities by using the Sharpe ratio and give results that if the investors consider total risk by making investments, then it is good for the investor to be greedy or not. Predicted probabilities are estimated for different periods i.e., 1995-1999, 2000-2004, 2005-2009, 2010-2014, and 2015-2021. Different benchmark levels are introduced to determine the greediness is good for the investor during this period or not. The first benchmark is the S&P 500, the second benchmark

is 25% above the S&P 500, the third benchmark is 50% of the S&P 500, and the fourth or last benchmark is 75% of the S&P 500. Investors want to get higher profits by beating the benchmark by considering the higher trends in the market. More than 50% probability of getting profit is used as a cutoff point to identify whether the greedy behavior of investors is good or bad. Moreover, greedy behavior of an investor supports the efficient market hypothesis or not? If the predicted probability is higher than the cut-off point for any portfolio performance, investors should be better to show greedy behavior. If the predicted probability is less than the specified cut-off point then it is better for the investors, not to be greedy in this case.

Table no. 4 – Profit Probabilities for Sharpe ratio of Two Types of Stocks for Different Time Periods

Panel A: Profit probabilities for Sharpe ratio of Size based Portfolio Above Benchmark Profit (%)				
Year	**Benchmark**	**25**	**50**	**75**
1995-1999	5.03	2.76	4.60	87.61
2000-2004	0.05	0.16	1.54	98.25
2005-2009	3.96	3.74	6.23	86.07
2010-2014	0.02	0.27	8.22	91.50
2015-2021	2.38	0.14	1.37	96.11

Panel B: Profit probabilities for Sharpe ratio of Book to Market value based Portfolio Above Benchmark Profit (%)				
Year	**Benchmark**	**25**	**50**	**75**
1995-1999	6.36	3.17	6.17	84.31
2000-2004	0.14	0.17	0.86	98.83
2005-2009	8.92	3.61	5.03	82.45
2010-2014	1.20	7.68	38.91	52.21
2015-2021	2.02	0.30	1.18	96.50

Panel A gives the results of size based stocks portfolio. The probability of achieving profits by more than 75% is 87.61%, the other three benchmarks have a probability of less than 5% in all periods. Likewise, the investors have the opportunity of getting more than 75% benchmark which is S&P 500 in this case in all periods by showing the probability of 87.61%, 98.25%, 86.07%,91.50%, and 96.11% for 1995-1999, 2000-2004, 2005-2009, 2010-2014 and 2015-2021. the predicted probability of the other three levels is less than 10%, which doesn't give suitable for investors.

Panel B shows the results of portfolios based on the Book to Market value by using the Sharpe ratio. In 1995-1999, the predicted probability of achieving the benchmark is 6.36% which is the S&P 500 in this case. 3.17% predicted probability of achieving the 25% more than the benchmark.6.17% probability of getting 50% more than the benchmark and 84.31% predicted probability of getting more than the benchmark. From 2000-2004, the predicted probability of achieving the benchmark is 0.14% which is the S&P 500 in this case. 0.17% predicted probability of achieving the 25% more than the benchmark.0.86% probability of getting 50% more than the benchmark and 98.83% predicted probability of getting more than the benchmark. In 2005-2009, the predicted probability of achieving the benchmark is 8.92% which is the S&P 500 in this case. 3.61% predicted probability of achieving the 25% more than the benchmark.5.05% probability of getting 50% more than the benchmark and 82.45% predicted probability of getting more than the benchmark. In 2010-2014, the predicted probability of achieving the benchmark is 1.20% which is the S&P 500 in this case. 7.68% predicted probability of achieving the 25% more than the benchmark.38.91% probability of getting 50% more than the benchmark and 52.21% predicted probability of getting more than the benchmark. In 2015-2021, the predicted probability of achieving the benchmark is 2.02% which is the S&P 500 in this case. 0.30% predicted probability of achieving the 25% more than the benchmark.1.18% probability of getting 50% more than the benchmark and 96.50% predicted probability of getting more than the benchmark.

Panel A and B of Table no. 5 give the results of the predicted probability of profit by using the size and book to market value portfolio by using the Sortino ratio. The probability of getting profit up to the benchmark is 86.70%,93.39%, 81.42%, 85.28%, and 83.22% for the time of 1995-1999,2000-2004,2005-2009,2010-2014 and 2015-2021 respectively. The probability of getting 25% more profit than the benchmark is 1.95%, 1.24%, 2.97%, 2.22%, and 3.26% for the time of 1995-1999, 2000-2004, 2005-2009, 2010-2014 and 2015-2021 respectively. The probability of getting 50% more profit than the benchmark is 2.42%, 2.88%, 3.28%, 1.94% and 2.42% for the time of 1995-1999, 2000-2004, 2005-2009, 2010-2014 and 2015-2021 respectively. The probability of getting 75% more profit than the benchmark is 8.93%, 2.49%, 12.34%, 10.56%, and 11.11% for the time of 1995-1999, 2000-2004, 2005-2009, 2010-2014 and 2015-2021 respectively.

According to Panel B, the probability of getting profit up to the benchmark is 89.18%,91.73%, 79.95%, 79%, and 83.09% for the time of 1995-1999,2000-2004,2005-2009,2010-2014 and 2015-2021 respectively. The probability of getting 25% more profit than the benchmark is 1.94%, 2.04%, 1.82%, 2.30%, and 2.95% for the time of 1995-1999,2000-2004,2005-2009,2010-2014 and 2015-2021 respectively. The probability of getting 50% more profit than the benchmark is 2.40%, 2.04%, 3.60%, 4.20%, and 3.56% for the time of 1995-1999, 2000-2004, 2005-2009, 2010-2014 and 2015-2021 respectively. The probability of getting 75% more profit than the benchmark is 6.49%, 4.18%, 14.63%, 14.50%, and 10.40% for the time of 1995-1999, 2000-2004, 2005-2009, 2010-2014 and 2015-2021 respectively.

Table no. 5 – Profit Probabilities for Sortino ratio of Two Types of Stocks for Different Time Periods

Panel A: Profit probabilities for Sortino ratio of Size based Portfolio Above Benchmark Profit (%)				
Year	**Benchmark**	**25**	**50**	**75**
1995-1999	86.70	1.95	2.42	8.93
2000-2004	93.39	1.24	2.88	2.49
2005-2009	81.42	2.97	3.28	12.34
2010-2014	85.28	2.22	1.94	10.56
2015-2021	83.22	3.26	2.42	11.11

Panel B: Profit probabilities for Sortino ratio of Book to Market value based Portfolio Above Benchmark Profit (%)				
Year	**Benchmark**	**25**	**50**	**75**
1995-1999	89.18	1.94	2.40	6.49
2000-2004	91.73	2.04	2.04	4.18
2005-2009	79.95	1.82	3.60	14.63
2010-2014	79.00	2.30	4.20	14.50
2015-2021	83.09	2.95	3.56	10.40

Panel A and B of Table no. 6 give the results of the predicted probability of profit by using the size and book to market value portfolio by using the Treynor ratio. The probability of getting profit up to the benchmark is 93.00%, 96.28%, 92.00%, 86.79%, and 94.03% for the time of 1995-1999, 2000-2004,2005-2009,2010-2014 and 2015-2021 respectively. The probability of getting 25% more profit than the benchmark is 0.41%, 0.83%, 0.67%, 0.55%, and 0.65% for the time of 1995-1999, 2000-2004, 2005-2009, 2010-2014 and 2015-2021 respectively. The probability of getting 50% more profit than the benchmark is 0.21%, 0.41%, 0.67%, 0.83%, and 1.13% for the time of 1995-1999, 2000-2004, 2005-2009, 2010-2014 and 2015-2021 respectively. The probability of getting 75% more profit than the benchmark is 6.38%, 2.48%, 6.66%, 11.83%, and 4.19% for the time of 1995-1999, 2000-2004, 2005-2009, 2010-2014 and 2015-2021 respectively.

According to Panel B, the probability of getting profit up to the benchmark is 94.46%,94.63%, 90.56%, 86.36%, and 94.15% for the time of 1995-1999, 2000-2004, 2005-2009, 2010-2014 and 2015-2021 respectively. The probability of getting 25% more profit than

the benchmark is 0.00%, 1.17%, 0.33%, 0.55%, and 0.48% for the time period of 1995-1999,2000-2004,2005-2009,2010-2014 and 2015-2021 respectively. The probability of getting 50% more profit than the benchmark is 0.82%, 0.38%, 0.50%, 1.10%, and 0.32% for the period of 1995-1999, 2000-2004, 2005-2009, 2010-2014 and 2015-2021 respectively. The probability of getting 75% more profit than the benchmark is 4.71%, 3.82%, 8.61%, 11.99%, and 5.05% for the time of 1995-1999, 2000-2004, 2005-2009, 2010-2014 and 2015-2021 respectively.

Table no. 6 – Profit Probabilities for Treynor ratio of Two Types of Stocks for Different Time Periods

Panel A: Profit probabilities for Treynor ratio of Size based Portfolio Above Benchmark Profit (%)				
Year	**Benchmark**	**25**	**50**	**75**
1995-1999	93.00	0.41	0.21	6.38
2000-2004	96.28	0.83	0.41	2.48
2005-2009	92.00	0.67	0.67	6.66
2010-2014	86.79	0.55	0.83	11.83
2015-2021	94.03	0.65	1.13	4.19

Panel B: Profit probabilities for Treynor ratio of Book to Market value based Portfolio Above Benchmark Profit (%)				
Year	**Benchmark**	**25**	**50**	**75**
1995-1999	94.46	0.00	0.82	4.71
2000-2004	94.63	1.17	0.38	3.82
2005-2009	90.56	0.33	0.50	8.61
2010-2014	86.36	0.55	1.10	11.99
2015-2021	94.15	0.48	0.32	5.05

5. CONCLUSION

Fear and Greed are two important emotions that drive the financial market and allow earning abnormal returns. When there are raising trends observed in the financial market, investors want to get more profit by buying more and more stocks. The buying of stocks during the upward trend is sometimes not a good strategy for the investor, thus greedy behavior is a curse for the investor in these situations. This study aims to determine whether greediness is good when there are rising trends in the market and investors can earn abnormal returns by beating the market. Normally investors consider three types of risk that are total risk, downside risk, and market risk for the evaluation of performance. Thus, three performance measures are used to calculate the probability of profit during a particular period.

The two types of stock portfolios are used to determine the greedy behavior of an investor in terms of probability by using the Sharpe, Sortino, and Treynor ratio. Four different levels of probability of profit are discussed in this study. The first level of profit is up to the benchmark which is equal to the S&P-500, the second level is 25% above the S&P-500, the third level is 50% above the S&P-500 and the fourth level is 75% above the S&P-500. The results indicate that the investors who evaluate the performance of both size and book to market value portfolios based on the Sharpe ratio having an average 85% probability of getting a profit of more than 75% of the benchmark in all periods. Thus, the investor's greedy behavior is encouraged while evaluating the portfolio performance. Secondly, the investors can get abnormal returns by beating the benchmark of S&P-500, therefore rejecting the efficient market hypothesis.

The results for both stock categories that are size and book to market value by using the Sortino and Treynor ratio indicate that there is more than a 50% probability of achieving the profit up to the benchmark which is S&P-500. This means that the investors who consider downside risk and market risk in the evaluation of portfolio performance are not able to beat the market thus supporting the efficient market hypothesis. Thus, investors need not be greedy. Under these situations, the investors should hold their investment for the higher gains

up to a certain level, after that they must revise their investment strategy. Another conclusion drawn from this study is that, if the investors consider total risk, they may get higher profits, and it favors greediness while making investment decisions. If the investors consider one-sided risk, the chances of getting gains decrease above the benchmark so under these conditions; one must keep calm and don't be greedy.

The main recommendations and policy implications for the policymakers, government, investors, brokers, and managers are extracted from the result of this study to properly be managed the risk while investments and, in every situation, greedy behavior did not work for getting higher returns in the market. Furthermore, this study is also helps in making policies that result in an increase in the efficiency of the market. The study also provides some useful insights for financial intermediaries who are keen to introduce innovation in their strategies. This study has some limitations: 1. the frequency of data used in the study is one month; 2. only three performance measures were used out of 101 performance measures; 3. benchmarks were made based on quartiles; 4. only the Mean forecasting error technique was used for forecasting purposes; 5. due to time constraints, the study is limited only to the New York stock exchange. Future research may be extended by using other performance measures, considering the other developed and emerging markets, by introducing different benchmarks. Moreover, future researchers may also use different forecasting techniques to enhance the results of the study.

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Notes

[1] According to the efficient market hypothesis, the investors are unable to beat the market, thus unable to achieve the abnormal returns.
[2] Blakey (2006) also study random walk-in prices.
[3] For further detail see Lim and Liew (2007) and Chiang *et al.* (2010)
[4] Capital Market Theory tries to explain and predict the progression of capital (and sometimes financial) markets over time based on the one or the other mathematical model. The capital market theory is a generic term for the analysis of securities.
[5] Independent and identically distributed i.e., each random variable has the same probability distribution as the other and all are mutually independent.
[6] GARCH stands for generalized autoregressive conditional heteroscedasticity.it is the measure of the volatility.
[7] In this study instead of simple Jensen measure, modified Jensen measure is used because of the inclusion of the beta in this performance measure also shows the better estimates than the Jensen measure.
[8] In this study, KSE 30 has been used as a benchmark to examine the comparative performance of selected open-ended mutual funds in Pakistan. The study period comprises of years 2013 & 2014.
[9] Deciles portfolios are also formed and used by Shafique *et al.* (2019).
[10]Visit: https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html, https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/Data_Library/det_port_form_sz.html, https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/Data_Library/det_form_btm.html.
[11] Also, see Hsiao (1985)
[12] Also, see (Ohlson, 1980; Zavgren, 1985) for ordinal logistic regresiune.

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