

Test for Investor Rationality for Companies Listed at the Nairobi Stock Exchange

Josiah Aduda, Paul Muimi
University of Nairobi, Nairobi, Kenya

Investors have traditionally been viewed as economically rational individuals who make decisions based on all available information. They have been assumed to use probability functions to arrive at the most optimal decision. More recent studies propose that investors are irrational and systematically overreact to good and bad information events. The concept of the rational investor has been supported by among others Efficient Market Hypothesis and Modern Portfolio Theory. Other studies opposed to the notion of rational investors have identified psychological biases that influence decision making process of an investor, and leading them to make irrational decisions. Several anomalies have been identified that deviate from rational behavior. The objective of this paper was to test for investor rationality for companies listed at the Nairobi Stock Exchange. This paper tested overreaction by investors to news and performance of companies listed at the Nairobi Stock Market as an anomaly that has been proven in other markets. The test involved forming companies into two portfolios, one of extreme good performers and the other of extreme poor performers during the base year. Performance of these portfolios was analyzed for a nine year period from the year of portfolio formation. The results are consistent with the notion of overreaction, showing that investors overreact to both good and bad news. Over the study period the loser portfolio outperformed the winner portfolio by about 35.92%. This confirms that investors are irrational and make decisions based on some biases.

Keywords: investor rationality, overreaction hypothesis, Nairobi Stock Exchange

Introduction

Rationality has been used to describe numerous theories, especially those concerned with truth, reason, and knowledge. Rational behavior implies consistent maximization of a well ordered function such as a utility or profit function (Becker, 1962).

Rational theories are founded on the idea of optimization which refers to the calculation of the maximum (or minimum) of some variable across a number of alternatives or values. For instance, according to a rational theory known as subjective expected utility (SEU) theory, an agent should choose between alternatives (e.g., houses, spouses) by determining all possible consequences of selecting each alternative, estimating the subjective probability and the utility of each consequence, multiplying the probability by the utility, and summing the resulting terms to obtain that alternative's subjective expected utility. Once this computation has been performed for each alternative, the agent chooses the alternative with the highest expected utility. This "subjective" interpretation of SEU has been used to instruct people in making rational choices (Gigerenzer, 2001).

Efficient Market Hypothesis and Modern investment theory are built on the assumption that markets and human beings are rational. These theories assume a status quo of the following conditions: markets are in equilibrium; they are competitive (i.e., there are a large number of small buyers and sellers, each of whom is unable to influence the market price); market participants have the goal of utility maximization and all investors have equal access to the same information set (Adams, Mullins, & Thornton, 2007).

Investors employ available information to make their consumption and portfolio decisions, but whether they process information rationally is still an open question. Simon (1955) doubted the full rationality of human behavior in making decisions and formally defines bounded rationality as “rational choice that takes into account the cognitive limitations of the decision maker—limitations of both knowledge and computational capacity”. This implies that human beings have limited ability to process information and therefore make sub-optimal decisions.

There is a lot of controversy in recent financial literature around the subject on whether investors behave rationally in pricing stocks, or whether they overreact to market information, resulting in prices being too high or too low. Although the efficient market hypothesis states that, with minor exceptions, securities are rationally priced; repeated evidence has been presented of predictable overreactions and under reactions. The existence of overreaction in the marketplace, if it can be proven, is important to both investment decision making and theory, and in more acute cases can be the major cause of financial bubbles and panics (Dreman & Lufkin, 2000).

The context of this study will be companies listed in the Nairobi Stock Exchange (NSE). The main indices in the NSE are: the NSE 20 share index, Nairobi all share index (NASI) and AIG (American International Group) 27 share index (NSE website) The NSE 20 share index is equal-weighted geometric mean of 20 large ordinary stocks traded on the Nairobi Stock Exchange. Companies with stocks listed in the NSE 20 share index include the following: Mumias, Express, Rea vipingo, Sasini, CMC, Kenya Airways, Safaricom, Nation Media Group, Barclays, Equity, KCB, Stan chart, Bamburi, BAT (K), Kengen, Centum, EABL, EA cables, KPLC and Athi River mining company.

Local studies seem to be mixed up with Waweru, Munyoki, and Uliana (2008) in support of market rationality and use of market fundamentals to make investment decisions. Werah (2006) suggested that the behavior of investors at the NSE is to some extent irrational in regard to fundamental estimations as a result of anomalies such as herd behavior, regret aversion, overconfidence and anchoring.

Despite early evidence that the stock market is rational hence efficient, there have been scores of studies that have documented long-term historical anomalies in the stock market that seem to contradict the Efficient Market Hypothesis. Anomalies in the stock market have been put in categories such as fundamental anomalies, technical anomalies, and calendar anomalies among others. Werah (2006) proved irrationality at NSE but overreaction anomaly has not been tested in this market and I believe it could be a key determinant of stock price trends. This paper will thus test overreaction hypothesis (at the Nairobi Stock Exchange) as an anomaly in the stock market.

Literature Review

Investor Rationality

Rational investors, according to Efficient Market Hypothesis (EMH), value securities for its fundamental value (i.e., net present value of its future cash flows, discounted using risk characteristic); quickly respond to

new information and; bid up when news is good, and down when the news is bad. EMH assumes that securities price incorporate all available information almost immediately and price adjust to new levels corresponding to the new present value of cash flow. Rational investors assume that it is impossible to earn superior risk adjusted return (Fama, 1970)

Rational investors will use diversification to optimize their portfolios according to Modern Portfolio Theory (MPT). MPT proposes how a risky asset should be priced. The basic concepts of the theory are Markowitz diversification, the efficient frontier, capital asset pricing model, the alpha and beta coefficients, the capital market line and the securities market line (Sharp, 1964). Most economic and financial models explicitly or implicitly assume that investors are efficient and rational. Investors and consumers are assumed to make the best choices for themselves.

In spite of these arguments, the logic of choice does not provide an adequate foundation for a descriptive theory of decision making. Tversky and Kahneman (1986) argued that the deviation of actual behavior from the normative model are too widespread to be ignored, too systematic to be dismissed as random error, and too fundamental to be accommodated by relaxing the normative system. This is in line with other scholars who have questioned rationality of investors.

Theoretical Framework

(1) Efficient market hypothesis (EMH): Bachelier (1900) was the earliest to correctly model Brownian motion mathematically. In 1900, he defended his thesis “Théorie de la spéculation” about the use of Brownian motion in pricing stock options. He made the connection between random walk and Brownian motion in continuous time. One of the earliest and most enduring models of the behavior of security prices is the random walk hypothesis. Samuelson (1965) showed that properly anticipated prices fluctuate randomly, thus indicating that a random walk in price was not inconsistent with a rational market. The Samuelson proof generalized price processes to martingales that are less restrictive than random walks. Roberts (1967) called this martingale feature of stock price weak-form market efficiency. As a martingale goes, the best forecast of next period’s price is the current period’s price. Thus, a market is efficient in that past prices do not provide any useful information or trading rules upon which to make profits larger than a simple buy-and-hold strategy.

(2) Cognitive dissonance theory: Cognitive dissonance theory was developed by Festinger in 1957. The theory asserted that individuals are distressed by conflicting cognitive elements such as discrepancy between empirical evidence and past choice, and that they alter their beliefs to reduce this discomfort. The key feature of dissonance is that individuals alter their beliefs to conform to their past actions. In the context of investment decision making, cognitive dissonance can be considered a psychological cost that investors seek to reduce by adjusting their beliefs about the efficacy of past investment choices. Cognitive dissonance theory is thus based on three fundamental assumptions: humans are sensitive to inconsistencies between actions and beliefs—according to the theory, we all recognize, at some level, when we are acting in a way that is inconsistent with our beliefs/attitudes/opinions. For example, if you have a belief that it is wrong to cheat, yet you find yourself cheating on a test, you will notice and be affected by this inconsistency; recognition of this inconsistency will cause dissonance, and will motivate an individual to resolve the dissonance; dissonance will be resolved in one of three basic ways: change beliefs, change actions or change perception of action.

(3) Prospect theory: Kahneman and Tversky (1979) reviewed several empirical effects which appeared to invalidate expected utility theory as a descriptive model and presented an alternative account of individual

decision making under risk, called prospect theory. Prospect theory suggests the hypothesis that investors display a disposition to sell winners and ride losers when standard theory suggests otherwise (Shefrin & Statman, 1985). Prospect theory modifies the analytic description of rational risk-averse investors found in standard financial theory (Kahneman & Tversky, 1979). Higher wealth provides higher satisfaction or utility but at a diminishing rate. This gives rise to risk aversion: A gain of shs. 1,000 increases the utility by less than a loss of shs. 1,000 reduces it; therefore investors will reject risk prospects that don't offer a risk premium. Utility depends not on the level of wealth but on changes in wealth from current levels.

(4) The disposition theory: The disposition effect was introduced into the finance literature by Shefrin and Statman (1985) and referred to the tendency of investors to ride losses and realized gains. This runs counter to sound tax planning. The availability of account-level transaction data has made the disposition effect a widely documented behavioral regularity: subsequent to the seminal paper by Odean (1998), several studies found that investors are reluctant to sell assets at a loss relative to the price at which they were purchased. In the presence of disposition-prone investors, stock prices tend to under-react to news, generating short term returns continuation (price momentum) and post-event drift.

(5) Loss aversion theory: "Losing \$100 hurts more than gaining \$100 yields pleasure... The influence of loss aversion on mental accounting is enormous" (Thaler, 1999). "The positive counterpart to regret is pride. While closing a stock account at a loss induces regret, closing at a gain induces pride. The quest for pride and the avoidance of regret leads to a disposition to realize gains and defer losses" (Shefrin & Statman, 1985). However, there is asymmetry between the strength of pride and regret and losses loom larger than gains (Kahneman & Tversky, 1979). Asymmetry between the strength of pride and regret (regret is stronger) leads inaction to be favored over action (Kahneman & Tversky, 1979; Thaler, 1999). Thus, investors who are prone to this bias may be reluctant to realize both gains and losses (Shefrin & Statman, 1985).

(6) Mental accounting theory: Mental accounting is a specific form of framing in which people segregate certain decisions. For example, an investor may take a lot of risk with one investment account but establish a very conservative position with another account that is dedicated to her child's education. Statman (1997) argued that mental accounting is consistent with some investors' irrational preference for stocks with high cash dividends (they feel free to spend dividend income but do not dip into capital by selling a few shares of another stock with the same total rate of return) and with a tendency to ride losing stocks position for too long (because "behavioral investors" are reluctant to realize losses).

(7) Regret avoidance theory: Psychologists have found that individuals who make decisions that turn out badly have more regret (blame themselves more) when the decision was more unconventional. For example buying a blue chip portfolio that turns down is not as painful as experiencing the same losses on unknown start-up firm. Any losses on a blue-chip stock can be more easily attributed to bad luck rather than bad decision making and cause less regret. DeBondt and Thaler (1987) argued that such regret avoidance is consistent with both the size and book-to-market effect. Higher book-to-market firms tend to have depressed stock prices. These firms are "out of favor" and more likely to be in a financially precarious position. Similarly, smaller less well known firms are also less conventional investments. Such firms require more courage on the part of the investor which increases the required rate of return. If investors focus on the gains or losses of individual stocks rather than on broad portfolios they can become more risk averse concerning stocks with recent poor performance, discount their cash flows at higher rate and thereby create a value-stock risk premium.

(8) Representativeness theory: Representativeness holds that people commonly do not take into account the size of a sample apparently reasoning that a small sample is just as representative of a population just as a large one. They may therefore infer a pattern too quickly based on a small sample and extrapolate apparent trends too far into the future. Such a pattern would be consistent with overreaction and correction anomalies. A short lived run of good earnings reports or high stock returns would lead such investors to revise their assessments of likely future performance and thus generate buying pressure that exaggerates the price run up. Eventually the gap between price and intrinsic value becomes glaring and the market corrects its initial error (Chopra, Lashonik, & Ritter, 1992).

(9) Overconfidence theory: People tend to overestimate the precision of their beliefs or forecasts, and they tend to overestimate their abilities. Such overconfidence may be responsible for the prevalence of active versus passive investment management—itsself an anomaly to adherents of the efficient market hypothesis. An interesting example of overconfidence in the financial markets is provided by Barber and Odean (2001) who compared trading activity and average returns in brokerage accounts of men and women. They found that men (in particular single men) trade far more actively than women, consistent with the greater overconfidence among men well documented in the psychology literature.

(10) Conservatism theory: A conservatism bias means that investors are too slow in updating their beliefs in response to new evidence. This means they might initially under react to news about a firm, so that prices will fully reflect new information only gradually. Such a bias would give rise to momentum in stock market returns (Bodie, Kane, & Marcus, 2009).

(11) Framing theory: Decisions seem to be affected by how choices are framed. For example an individual may reject a bet when it is posed in terms of the risk surrounding possible gains, but may accept that same bet when described in terms of the risk surrounding potential losses. In other words, individual may act risk averse in terms of gains but risk seeking in terms of losses. But in many cases the choice of how to frame a risky venture—as involving gains or losses can be arbitrary (Bodie et al., 2009).

(12) The disjunction theory: The disjunction effect is a tendency for people to want to wait to make decisions until information is revealed, even if the information is not really important for the decision, and even if they would make the same decision regardless of the information. The disjunction effect is a contradiction to the “sure-thing principle” of rational behavior (Savage, 1954). Credit is derived from a Latin word “credere” meaning trust. When a seller transfers his wealth to a buyer who has agreed to pay later, there is a clear implication of trust that payment will be made at agreed date. Major causes of serious banking problems are directly related to lax credit standards for borrowers. Poor portfolio assessment or lack of attention to changes in economic circumstances is common in emerging economies. Banks as financial institutions extend credit to their customers in form of loans, overdrafts, off balance sheet activities (i.e., Letter of credit (LC) guarantees, and credit card facilities). Banks grant credit to enhance their revenues streams, maintain a competitive edge, to act as its bargaining power in the industry, as the industry practice as well as to enhance the relationship with their customers.

The fundamental objective of the Bank management is to maximize shareholders wealth (Koch & MacDonald, 2006). This goal is interpreted to mean maximizing the market value of the firm’s ordinary shares. Wealth maximization, in turn, requires that managers evaluate the present value of cash flows under uncertainty with larger, near-term cash flows proffered when evaluated on a risk adjusted basis (Koch & MacDonald, 2006). To obtain higher yields on returns, a bank must either take an increased risk or lower operating costs. Thus

managers must evaluate and balance the trade offs between the opportunity for higher returns, the probability of not realizing those returns, and the possibility that the bank might fail. The banks profitability will vary with the riskiness of its portfolio and operations.

Empirical Studies

Research in experimental psychology suggests that, in violation of Bayes' rule, most people tend to "overreact" to unexpected and dramatic news events. (DeBondt & Thaler, 1985). In a study of market efficiency, DeBondt and Thaler (1985) investigated whether such behavior affects stock prices. They used monthly return data for New York Stock Exchange (NYSE) common stocks, as compiled by the Center for Research in Security Prices (CRSP) of the University of Chicago, for the period between January 1926 and December 1982. An equally weighted arithmetic average rate of return on all CRSP listed securities serve as the market index. The results are consistent with the overreaction hypothesis. Loser portfolios of 35 stocks outperform the market by, on average, 19.6%, 36 months after portfolio formation. Winner portfolios, on the other hand, earn about 5% less than the market, so that the difference in cumulative average residual between the extreme portfolios equals 24.6%. The findings have other notable aspects. First, the overreaction effect is asymmetric; it is much larger for losers than for winners. Secondly, most of the excess returns are realized in January. Finally the overreaction phenomenon mostly occurs during the second and third year of the test period.

Zarowin (1989) tested whether the stock market overreacts to extreme earnings by examining firms' stock returns over the 36 months subsequent to extreme earning years. Portfolios of firms that are characterized by extreme (good versus bad) current period earnings performance are formed and to compare the subsequent stock returns of the poorest earners versus the best earners. CRSP monthly return file and the Compustat Annual Industrial file is the data base for this study. Each year from 1971 to 1981 all firms meeting the following data requirements are included in the sample for that year: availability of the six consecutive prior years and the current year of earnings before extraordinary items and discontinued operations; December 31 fiscal year end and availability of price per share and number of shares outstanding on the CRSP monthly file at year end. To examine whether the stock market overreacts to extreme earnings news, the excess returns of the two extreme earnings portfolios over the 36 months subsequent to the extreme earnings year are compared. Results presented fail to support the overreaction to earnings hypothesis. Although the poorest earnings performers outperform the best earnings performers by a statistically significant 16.6% over the 36 months subsequent to the extreme earnings year, he argues that this result is due primarily to differences in size between the two groups. Poor earners tend to be smaller firms than good earners. When poor earners are matched with good earners of equal size there is little difference in return behavior. When poor (or good) earners of disparate sizes are compared, small firms outperform large firms, and smaller winners outperform larger losers. Thus the statistically significant differences between the returns of extreme prior period performers appear to be the result not of investor overreaction to earnings but of the size effect. This is in contrast with DeBondt and Thaler (1987) who maintained, "the winner loser effect is not primarily a size effect".

Clare and Thomas (1995) carried out a study on "The overreaction hypothesis and the UK stock market". UK data is used from 1955 to 1990 drawn from a random sample of up to 1,000 stocks in any one year. Portfolios of stocks are formed on the basis of prior period performance. The portfolios are formed using stock return data taken from the London Business School LSPD tapes. The data base consists of the end month dividend adjusted returns on all those stocks listed on the London Stock Exchange since January 1955. Stocks

are ordered into portfolios according to their performance relative to the performance of the market over three separate periods: one, two and three years. Then the market adjusted return for any month is calculated. Regression analysis on means of the winner and loser portfolio returns is done. A t-test is carried out on the significance level. It is found that losers outperform previous winners over a two-year period by a statistically significant 1.7% per annum. On further investigation it is found that such overreaction may in fact be a manifestation of the small firm effect.

Odean (1998) tested the disposition effect, the tendency of investors to hold losing investments too long and sell winning investments too soon, by analyzing trading records for 10,000 active accounts at a large nationwide discount brokerage house from 1987 through 1993. There were two hypotheses to be tested. The first was that investors tend to sell their winners and hold their losers. The second hypothesis was that in December investors are more willing to sell losers and less willing to sell winners than during the rest of the year. The statistical method used is the t-test. These investors demonstrated a strong preference for realizing winners rather than losers. Their behavior did not appear to be motivated by a desire to rebalance portfolios, or to avoid the higher trading costs of low priced stocks. Nor was it justified by subsequent portfolio performance. For taxable investments, it is suboptimal and leads to lower after-tax returns. Tax-motivated selling is most evident in December.

Rozeff and Zamani (1998) carried out a study on overreaction and insider trading to provide evidence on whether market prices reflect investor overreaction. Cash flow and book value data from the annual compustat industrial tape is used over the years 1978 to 1991. The cash flow for year t is divided by the market value of equity at the end of May in year $t+1$. Market value of equity is the product of the number of shares outstanding and the end-of-May stock price, both of which are obtained from the Centre for Research on Security Prices (CRSP) Monthly NYSE-AMEX files. After obtaining a ratio of cash flow to market value of equity each year for each company, the companies are sorted into deciles each year by the CF/P ratio and assigned a value of one to ten. Stocks ranked one have the lowest CF/P ratios and are called the growth stocks. Stocks ranked ten have the highest CF/P ratios and are called the value stocks. Returns of each stock in periods prior to May of year $t+1$ are found. Periods of 12 month and 36 month are examined. The proportion of buy transactions in the insider trades is positively related to the ratio of cash flow to price (as well as book value to price) and negatively related to prior stock return. Outside investors, thus, overvalue growth stocks and undervalue value stocks. Insider transactions are consistent with a well-informed contrarian approach to stock investing. Insider buying climbs as stocks change from growth to value categories. Insider buying is also greater after low stock returns and lower after high stock returns. These findings are consistent with a version of overreaction which says that prices of value stocks tend to lie below fundamental values, and prices of growth stocks tend to lie above fundamental values.

Waweru et al. (2008) investigated the role of behavioral finance and investor psychology in investment decision-making at the Nairobi Stock Exchange with special reference to institutional investors. The population in the study included all the 40 institutional investors operating at the NSE as on 30 June 2004. This covered the banks, mutual funds, pension funds, endowment schemes, investment banks, companies, collective investment schemes, and insurance companies. The study established that behavioral factors such as representativeness, overconfidence, anchoring, gambler's fallacy, availability bias, loss aversion, regret aversion and mental accounting affected the decisions of the institutional investors operating at the NSE.

Moreover, these investors made reference to the trading activity of the other institutional investors and often exhibited an institutional-herding behaviour in their investment decision-making.

Research Methodology

Research Design, Sample Selection and Data Sources

The paper adopted longitudinal survey design. A longitudinal study is a correlational research study that involves repeated observations of the same items over long periods of time (Sekaran, 1992). It involves tracking changes over time on a broad range of population members, which is desirable for comparative purposes. Again, since the given study is largely descriptive (concerned with finding out “by how much”) sample statistics are used to make generalization about population parameters. This study focused attention on the performance of different companies at NSE as well as the movement of their share price to determine whether there was any evidence of the overreaction hypothesis. Portfolios of stocks were formed on the basis of prior period performance as was the case with DeBondt and Thaler (1985), Zarowin (1989), Clare and Thomas (1995), Swallow and Fox (1998) and others. The portfolios were formed using stock return data taken from the Nairobi Stock Exchange. An equally weighted arithmetic average rate of return on all NSE listed securities served as the market index.

The target population of this study was all the companies listed at the Nairobi Stock Exchange (NSE) as at December 2009. As at December 2009, there were 56 companies listed at the Nairobi Stock Exchange. This formed the population of study.

The sampling frame adopted in the study was obtained from the NSE list of listed companies that have been listed since January 2001. This was because the study analyzed stock returns for listed companies over a period of nine years.

The Empirical Model

To determine the returns on the stock, the study used a model used by Swallow and Fox (1998). Clare and Thomas (1995) formed portfolios using stock return data taken from the London Business School LSPD tapes. DeBondt and Thaler (1985) and Zarowin (1989) used monthly return data for New York Stock Exchange (NYSE) common stocks as compiled by the Centre for Research in Security Prices (CRSP) of the University of Chicago. The model used by Swallow and Fox (1998) is shown in Equation (1):

$$R_{it} = \ln (P_{it}/P_{it-1}) \times 100 \quad (1)$$

where R_{it} = the monthly return for stock i in month t ;

P_{it} = the share price for stock i in month t ;

P_{it-1} = the share price for stock i on month $t-1$;

t = the month.

The returns data approximated the monthly percentage increase or decrease experienced by the stock. The arithmetic mean of these returns provided a monthly market return (R_{mt}) that was used for analysis. Once the market return was created, the analysis of the abnormal returns took place. The abnormal returns are worked out by Equation (2).

$$U_{it} = R_{it} - R_{mt} \quad t = 1 \dots n \quad (2)$$

where $n = 1 \dots 12$, or $n = 1 \dots 24$, or $n = 1 \dots 36$;

U_{it} is the abnormal monthly return for stock i in month t ;

R_{it} is the share return on stock i at period t ;

R_{mt} is the return on the market at period t (equally weighted).

The average return (\tilde{R}_i) for stock i is the mean of that stock's U_i over period $t = 1$ to n .

Stocks were grouped into portfolios according to their performance relative to the performance of the market.

On the basis of the \tilde{R}_i each stock was assigned to one of five portfolios: grouping stocks by their \tilde{R}_i 's from low to high, the first quintile of stocks were grouped together to form an equally weighted portfolio of losers, while those stocks in the final quintile were grouped together to form an equally weighted portfolio of winners. Having formed portfolios of winners and losers the average return of the portfolio (\tilde{R}_p) was calculated over the post portfolio formation period (i.e., this was just an average of the \tilde{R}_i 's of the stocks used to form each portfolio).

The averages of the portfolio returns for the winner quintile and the loser quintile were denoted \tilde{R}_p^w and \tilde{R}_p^l respectively.

The test performed on the average portfolio was based upon forming a "difference" portfolio, where \tilde{R}_p^w was subtracted from \tilde{R}_p^l . The test compared the means of the winner and loser portfolio returns by regressing \tilde{R}_p^w and \tilde{R}_p^l against a constant. Spss version 17 was used for data analysis.

$$\tilde{R}_{Dt} = R_{Cp}^l - R_{Cp}^w = \alpha_l \quad t = 1 \dots n \tag{3}$$

where α_l is a constant. A simple t-test on the significance of the constant α_l tells us whether there is a difference in the means of the winner and loser stocks. A significant and positive value for α_l was seen as confirmation of the overreaction hypothesis.

Results and Discussions

Portfolio Formation Analysis

The average return (\tilde{R}_i) for stock i was calculated over period $t = 1$ to 12. Using year 2001 as our base year, average return for all stocks was calculated and stocks grouped into five portfolios according to their performance relative to performance of the market. Stocks were grouped by their average portfolios from low to high and divided into five quintiles. The first and fifth quintiles were used for this study and were as shown in Table 1:

Table 1

First and Fifth Quintile Stocks

Stocks	Year 2001
First quintile	\tilde{R}_i (average return)
Total Kenya Ltd Ord 5.00	-6.55
Express Ltd Ord 5.00	-4.74
Kenya Power & Lighting Ltd Ord 20.00	-4.63
Sasini Tea & Coffee Ltd Ord 5.00	-4.16
Bamburi Cement Ltd Ord 5.00	-4.16
Unga Group Ltd Ord 5.00	-3.85
Limuru Tea Co. Ltd Ord 20.00	-2.48
Diamond Trust Bank Kenya Ltd Ord 4.00	-2.30
Nation Media Group Ord. 5.00	-2.27
Firestone East Africa Ltd Ord 5.00	-2.22
Mean loser portfolio returns	-3.74

(Table 1 continued)

Stocks	Year 2001
Fifth Quintile	\tilde{R}_i (average return)
Standard Newspapers Group Ord 5.00	1.91
Barclays Bank Ltd Ord 10.00	1.92
East African Breweries Ltd Ord 10.00	1.95
E.A.Packaging Ltd Ord 5.00	2.05
C.F.C Bank Ltd ord.5.00	2.13
E.A.Cables Ltd Ord 5.00	2.17
Standard Chartered Bank Ltd Ord 5.00	2.19
Tourism Promotion Services Ltd Ord 5.00 (Serena)	2.46
Pan Africa Insurance Ltd Ord 5.00	2.76
E.A.Portland Cement Ltd Ord 5.00	3.15
Mean winner portfolio returns	2.27

The first quintile of stocks were grouped together to form an equally weighted portfolio of losers (i.e., stocks with lowest return this year), while those stocks in the final quintile were grouped together to form an equally weighted portfolio of winners (stocks with the highest return this year). The average return of the portfolio (\tilde{R}_p) was then calculated. The averages of the portfolio returns for the winner quintile and the loser quintile were denoted \tilde{R}_p^w and \tilde{R}_p^l respectively. Table 2 shows averages of both portfolio returns over the study period.

Table 2

Averages of Portfolio Returns Over the Study Period

	2001	2002	2003	2004	2005	2006	2007	2008	2009
Losers' portfolio									
Total Kenya Ltd Ord 5.00	-6.55	0.75	-0.17	4.71	9.04	-1.27	4.78	6.31	1.76
Express Ltd Ord 5.00	-4.74	-3.45	1.37	10.08	-4.74	13.65	23.64	16.64	10.02
Kenya Power & Lighting Ltd Ord 20.00	-4.63	-1.74	-2.76	4.69	-0.88	12.87	-7.64	-3.06	1.61
Sasini Tea & Coffee Ltd Ord 5.00	-4.16	7.14	6.34	8.21	8.37	12.19	20.43	17.94	11.57
Bamburi Cement Ltd Ord 5.00	-4.16	-2.58	2.63	-3.01	7.83	-2.28	2.50	4.32	-0.26
Unga Group Ltd Ord 5.00	-3.85	0.92	2.74	2.19	-11.77	5.72	10.56	7.78	2.99
Limuru Tea Co. Ltd Ord 20.00	-2.48	4.27	8.16	18.04	11.86	17.69	27.83	22.04	8.95
Diamond Trust Bank Kenya Ltd Ord 4.00	-2.30	1.85	-3.54	1.90	16.76	-0.09	-1.82	-0.73	-0.88
Nation Media Group Ord. 5.00	-2.27	-8.45	-0.63	6.53	1.21	-0.36	4.82	3.33	4.78
Firestone East Africa Ltd Ord 5.00	-2.22	1.28	7.51	1.40	11.17	0.63	6.86	1.61	1.84
Mean loser portfolio (\tilde{R}_p^l)	-3.74	0.00	2.17	5.47	4.88	5.87	9.20	7.62	4.24
Winners' portfolio									
Standard Newspapers Group Ord 5.00	1.91	2.09	4.15	4.78	19.53	7.05	4.37	7.58	2.96
Barclays Bank Ltd Ord 10.00	1.92	0.43	10.04	23.10	19.34	12.66	6.59	6.28	3.67
East African Breweries Ltd Ord 10.00	1.95	2.69	14.80	28.89	7.98	11.73	14.62	14.90	11.33
E.A.Packaging Ltd Ord 5.00	2.05	-1.02	-5.46	1.32	-0.30	1.40	1.54	4.55	2.04
C.F.C Bank Ltd ord.5.00	2.13	-1.11	3.78	8.43	6.13	7.85	14.03	-3.56	-0.50
E.A.Cables Ltd Ord 5.00	2.17	-1.74	-3.56	12.85	-6.28	4.07	3.86	2.79	0.34
Standard Chartered Bank Ltd Ord 5.00	2.19	-0.11	7.59	15.14	0.25	15.48	17.46	19.28	13.03
Tourism Promotion Services Ltd Ord 5.00 (Serena)	2.46	-0.27	-4.18	7.32	7.37	7.95	6.90	6.76	2.92
Pan Africa Insurance Ltd Ord 5.00	2.76	0.09	1.08	5.23	-1.40	10.31	8.94	7.68	3.59
E.A.Portland Cement Ltd Ord 5.00	3.15	-1.04	7.29	4.09	12.13	11.94	12.13	9.69	8.05
Mean winner portfolio (\tilde{R}_p^w)	2.27	0.00	3.55	11.12	6.48	9.05	9.05	7.60	4.74

The average return for winner portfolio was initially higher than that for the loser portfolio. The gap bridged with time and there were instances like year 2008 when the average return for loser portfolio was higher than that for the winner portfolio.

Test for Overreaction

In order to test for overreaction, a cumulative excess return for the two portfolios was calculated over the study period. The difference in returns for the year under consideration and the base year gives cumulative excess returns. Table 3 and Figure 1 illustrate this.

Table 3

Cumulative Excess Returns for Both Portfolios

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	Sum
Cumulative loser portfolio ($Rc_p^{\tilde{}}$)	0	3.74	5.90	9.21	8.62	9.61	12.93	11.35	7.97	69.34
Cumulative winner portfolio ($\tilde{R}c_p^w$)	0	-2.27	1.28	8.85	4.21	6.78	6.78	5.35	2.47	33.42

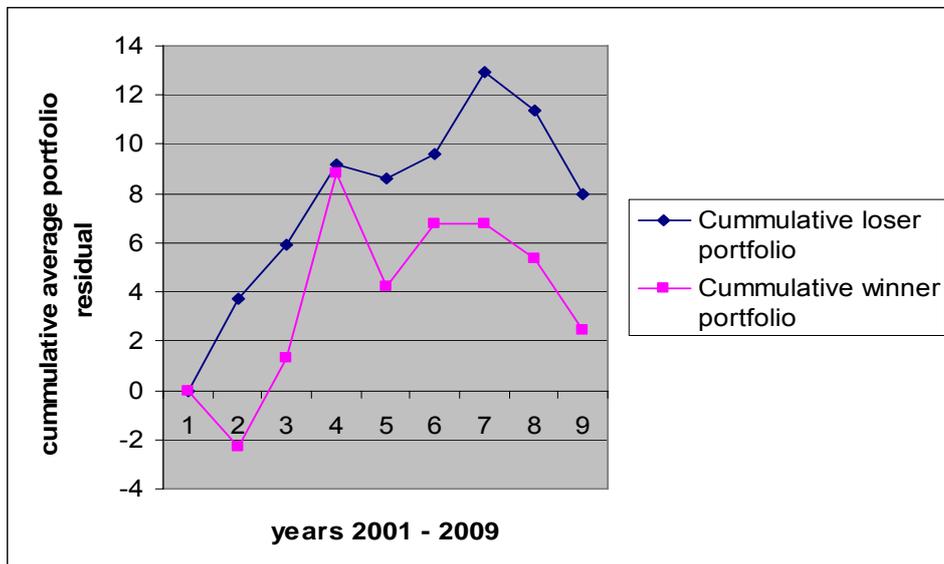


Figure 1. Plot of cumulative portfolio against time.

A “difference” portfolio was formed where $\tilde{R}c_p^w$ was subtracted from $Rc_p^{\tilde{}}$. A cumulative difference portfolio shows the cumulative difference in returns between the winner and loser portfolios over the study period.

The loser portfolio outperformed the winner portfolio cumulatively by 35.92%. From both Table 4 and Figure 2, the difference portfolio (\tilde{R}_{Dl}) is significantly different from zero for eight out of nine years. This could thus be taken as confirmation of the overreaction hypothesis.

Table 4

Cumulative Returns Difference Portfolio

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009
Difference Portfolio (\tilde{R}_{Dl})	0	6.01	4.62	0.36	4.41	2.83	6.16	6.03	5.50
Cumulative diff. Portfolio	0	6.01	10.62	10.99	15.40	18.23	24.39	30.42	35.92

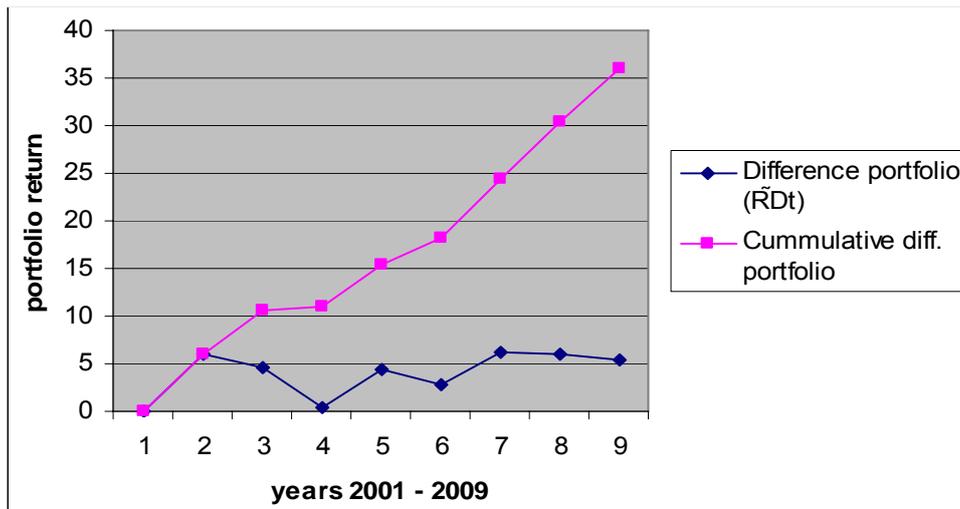


Figure 2. Cumulative returns difference portfolio against time.

Significance Test

The test was simply to compare the means of the winner and loser portfolio returns by regressing cumulative $R\tilde{c}_p^l$ and $R\tilde{c}_p^w$ against a constant:

$$R\tilde{D}_t = R\tilde{c}_p^l - R\tilde{c}_p^w = \alpha_l \quad t = 1, \dots, 12 \tag{3}$$

The regression output was as shown in Tables 5 and 6.

Table 5

Group Statistics

	Winner or loser	N	Mean	Std. deviation	Std. error mean
Portfolio	Looser	9	7.7033	3.96444	1.32148
	Winner	9	3.6922	3.63394	1.21131

Table 6

Independent Samples Test

		Levene's test for equality of variances				T-test for equality of means					
		F	Sig.	t	df	Sig. (2-tailed)	Mean difference	Std. error difference	95% confidence interval of the difference		
										Lower	Upper
Portfolio	Equal variances assumed	0.000	0.997	2.238	16	0.040	4.01111	1.79265	0.21087	7.81136	
	Equal variances not assumed			2.238	15.880	0.040	4.01111	1.79265	0.20854	7.81369	

Table 5 gives mean and standard deviation for both loser and winner portfolio. The means were significantly different with mean for loser portfolio being almost twice that of winner portfolio (i.e., 7.7033 and 3.6922). The two portfolios were observed for a period of nine years as indicated by the N value.

Table 6 gives the results of Levene's test. This tested whether the variance (variation) of scores for loser portfolio and winner portfolio were the same. Since the sig. value was greater than 0.5 (0.997) the first row was considered for analysis. The sig. (2-tailed) value was 0.04 from column 7. As this value was below the required cut-off of 0.05 then it was concluded that there was statistically significant difference in the mean performance

scores for loser and winner portfolios.

Effect size statistic was worked out to provide an indication of the magnitude of the differences between the two portfolios. This was arrived at by calculating the value of Eta squared as follows:

$$\text{Eta squared} = t^2/t^2 + (N_1 + N_2 - 2);$$

Replacing with appropriate values from Table 6.

$$\text{Eta squared} = 2.2382/2.2382 + (9 + 9 - 2);$$

$$\text{Eta squared} = 0.2384.$$

The effect size from this calculation was 23.84% which was an indication of significant magnitude of the difference in means from the two portfolios. A t-test statistic of 2.238 further confirmed that there was significant difference between the means of winner and loser portfolio.

Conclusions and Suggestions for Further Research

Even though data analyzed is in support of overreaction hypothesis, only losers experience significant overreaction; winner portfolios show low abnormal market returns. This is consistent with DeBondt and Thaler' (1985) assertion that overreaction effect is asymmetric (i.e., it is much larger for losers than winners). Investors thus react more adversely to bad or perceived bad news and performance than to good or perceived good news and performance. Over the study period the loser portfolio has outperformed the winner portfolio by about 35.92%. Research in experimental psychology suggests that in violation of Bayes' rule most people overreact to unexpected and dramatic news events.

The results of this study are in support of scholars who have argued against rationality of investors and hence rational or efficient markets. It confirms that investors are irrational and make decisions based on some biases. Overreaction to previous performance of stocks has been proved as a significant bias/influence to investors while making buy, sell and hold decisions. Investors would thus get better value for their money if they would consider overreaction effect when making investment decisions.

After an event or performance to which investors overreact there is observed to be reversal in performance in about two to three years. The market thus seems to correct itself only that it over does it and thus the reversal of returns in the opposite direction. Stocks thus seem to exhibit upward and downward movements spanning between two to three years.

The historical information about stocks provided for in the daily reports by the Nairobi stock Exchange include the previous stock price and the last 12 months high and low price. It has been observed in this study that returns reversal for stocks occur at between two to three years. A provision should be put in place to report stock's high return month (and the month's return) and stock's low return month (and the month's return) for each of the previous three years (36 months). This gives potential investors an idea of the trend a certain stock has taken. More investors will thus make informed decisions and the market is likely to move towards a more efficient one.

Long term graphical performance of stocks should be kept and alerts given where cases of excessive overreaction is evident. Overreaction leads to mis-allocation of resources in the sense that investors may put money in a stock that has had good performance but the stock's today performance is below market return. This means that stocks with above market returns will be starved of money and there will be an overall low market return which in extreme cases can lead to bubbles and financial crisis.

This research paper has looked at overreaction by observing winner and loser portfolios formed over a

period of nine years. Some scholars have argued that winners start recovering from losses made after about three years and losers as well start experiencing lower returns from the third year onward and this reversal continues every three years. A research can thus be carried out with winner and loser portfolios being formed every three years and observed over the same period after which the constituent stocks for loser and winner portfolio are reconstituted. Some scholars have described this as the directional effect.

Some scholars have tried to explain the extreme movements of earnings with size of the firm. They argue that small firms generally exhibit higher than market returns while large firms exhibit normal returns. They thus explain reversals of returns between winner and loser portfolio with size of the firm. Research can be carried out locally to test the validity of this argument.

Overreaction of investors to either bad or news/performance should be studied against other factors affecting price movements to determine its independent effect on stock prices.

References

- Adams, M., Mullins, T., & Thornton, B. (2007). Pedagogical strategies for incorporating behavioral finance concepts in investment courses. *Journal of College Teaching & Learning*, 4(7).
- Bachelier, L. (1900). Theory of speculation. In P. Cootner (Ed.), *The random character of stock market prices*. MIT Press.
- Barber, B., & Odean, T. (2001). Boys will be boys: Gender, overconfidence and common stock investment. *Quarterly Journal of Economics*, 116, 262-292.
- Becker, S. G. (1962). Irrational behavior and economic theory. *The Journal of Political Economy*, 70(1), 1-13.
- Bodie, Z., Kane, A., & Marcus, A. (2009). *Essentials of investments* (8th ed.). McGraw Hill.
- Chopra, N., Lashonik, J., & Ritter, J. R. (1992). Measuring abnormal performance: Do stocks overreact? *Journal of Financial Economics*, 31(2), 235-268.
- Clare, A., & Thomas, S. (1995). The overreaction hypothesis and the UK stock market. *The Journal of Business Finance & Accounting*, 22(7), 961-973.
- DeBondt, W. F. M., & Thaler, R. (1985). Does the stock market overreact? *The Journal of Finance*, 40(3), 793-805.
- DeBondt, W. F. M., & Thaler, R. (1987). Further evidence on investor overreaction and stock market seasonality. *The Journal of Finance*, 42, 557-581.
- Dreman, D., & Lufkin, E. (2000). Investor overreaction: Evidence that its basis is psychological. *The Journal of Psychology and Financial Markets*, 1(1), 61-75.
- Fama, E. (1970). Efficient capital markets: A review of theory and empirical work. *The Journal of Finance*, 25(2), 383-417.
- Gigerenzer, G. (2001). Decision making: Non-rational theories. *International Encyclopedia of the Social and Behavioral Sciences*, 5, 3304-3309.
- Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica*, 47(2), 261-291.
- Koch, T., & MacDonald, S. (2006). *Bank management* (6th ed.). South Western College.
- Odean, T. (1998). Are investors reluctant to realize their losses? *The Journal of Finance*, 53(5), 1775-1798.
- Rozeff, M. S., & Zamani, M. A. (1998). Overreaction and insider trading: Evidence from growth and value portfolios. *The Journal of Finance*, 53(2), 701-716.
- Samuelson, P. A. (1965). Proof that properly anticipated prices fluctuate randomly. *Industrial Management Review*, 6(2), 41-49.
- Savage, L. J. (1954). *The foundations of statistics*. New York: Dover Publications Inc.
- Sekaran, U. (1992). *Research methods for business*. New York: John Wiley & Sons Inc.
- Sharp, W. F. (1964). Capital asset prices: A theory of market equilibrium under conditions of risk. *The Journal of Finance*, 19(3), 425-442.
- Shefrin, H., & Statman, M. (1985). The disposition to sell winners too early and ride losers too long: Theory and evidence. *Journal of Finance*, 40(3), 777-791.
- Simon, H. (1955). A behavioral model of rational choice. *Quarterly Journal of Economics*, 69(1), 99-118.
- Thaler, R. H. (1999). Mental accounting matters. *Journal of Behavioral Decision Making*, 12, 183-206.
- Tversky, A., & Kahneman, D. (1986). Rational choice and the framing of decisions. *The Journal of Business*, 59(4), S251-S278.
- Waweru, N. M., Munyoki, E., & Uliana, E. (2008). The effects of behavioral factors in investment decision-making: A survey of institutional investors operating at the Nairobi Stock Exchange. *International Journal of Business and Emerging Markets*, 1(1), 24-41.
- Werah. (2006). A survey of the influence of behavioral factors on investor activities at the Nairobi Stock Exchange. (Unpublished MBA research proposal, University of Nairobi).
- Zarowin, P. (1989). Does the stock market overreact to corporate earnings information? *The Journal of Finance*, 44(5), 1385-1399.