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Exploring Disposition Effect and Overconfidence in Pakistani Investors in KSE Listed Sectors

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Abstract
Financial markets are analyzed by using different models in which investors are "rational". Many traditional theories of varying nature and application have existed and been developed over the past several decades. Investors are thought of as rational individuals, who carefully take all economic decisions every time. But irregularities were noticed in the behavior of investors when economy of the world was shaken by the Financial Crisis of 2008 that started off in the USA and resulted in global recession. The news of international financial crisis affects their investment strategies and help to estimate the shock absorbing abilities of capital market. This arise the need to study this phenomenon in capital market of Pakistan and check what heuristics are used by investors in decision making. Investors use heuristics in their financial decisions whenever they are faced with uncertain situation. For this study we have collected data of ten years (2005-2014) of 229 companies listed in all sectors of Karachi stock exchange. We used Logit regression to find the relationship between disposition effect and overconfidence of investors in Pakistani stock market. We have found that disposition effect is used by Pakistani investors in their financial decision making and it helps them to generate returns. Overconfidence has negative but significant effect on investment returns for the investors. So theory of EMH and CAPM does not hold with all its assumptions in Pakistani capital market.
Keywords: Heuristics, Behavior, overconfidence, disposition effect, EMH, CAPM

Introduction

Behavioral economics and behavioral finance studies the effects of factors like cognitive, social, psychological and emotions on the decisions of individuals and organizations. Market prices, returns on investments and resource allocation are also concern of behavioral economics and finance areas. Bounded rationality of economic agents or individuals is the prime concern and behaviors models are introduced by these two areas. These models incorporate psychology, neuroscience and microeconomic theory. These models help to study the behavior and decision making of individuals and organizations in the market and the mechanism that form their choices. Behavioral finance has three themes:

1. Heuristics: Decisions are based on rule of thumb and not on strict logic.
2. Framing: Individuals depend on stereotype and anecdotes to understand and respond to events.
3. Market Inefficiencies: Irrationality on economic agents and mispricing create market inefficiencies.

Financial markets are analyzed by using different models in which investors are "rational". Many traditional theories of varying nature and application have existed and been developed over the past several decades. Most important of these theories are Efficient Market Hypothesis (EMH) and Capital Asset Pricing Model (CAPM). The rationality of investors is a central theme for all the theories. Rational expectation paradigm says that:

- All investors are identical.
- All investors are utility-maximizers.
- All investors form new beliefs as new information becomes available.
- All investor predictions are accurate.

Expected Utility + Rational Expectations = Market Efficiency

The field of finance has been developed over the past few decades based on the belief that people make rational decisions and that they are neutral in their estimations about the future. Investors are thought of as rational individuals, who carefully take all economic decisions every time.

But irregularities were noticed in the behavior of investors when economy of the world was shaken by the Financial Crisis of 2008 that started off in the USA and resulted in global recession. A great number of economists having significant positions in governments and financial institutions were unaware of this fact and the results of this financial crisis were bankruptcies and defaults. Even after the financial crisis had started, economists and financial experts were not able to analyze its extent or intensity on the theories of the rationality

of the investors and consequently they were questioned about their estimation and forecasting. It is important to understand the impact of global financial crisis on the economy because it helps to understand the overreaction or under-reaction in economic behavior of investors. The news of international financial crisis affects their investment strategies and help to estimate the shock absorbing abilities of capital market. This arise the need to study this phenomenon in capital market of Pakistan and check what heuristics are used by investors in decision making.

Merton Miller and Franco Modigliani portrayed financial specialists as discerning in 1961. Eugene Fama portrayed markets as productive in 1965. Harry Markowitz recommended mean-fluctuation portfolio hypothesis in its initial structure in 1952 and in its full structure in 1959. William Sharpe embraced mean-fluctuation portfolio hypothesis as a depiction of speculator conduct and in 1964 presented the capital resource valuing hypothesis (CAPM). As indicated by this hypothesis, contrasts in expected returns are resolved just by contrasts in danger, and beta is the measure of danger. Behavioral fund offers an option hinder for each of the establishment pieces of standard account. As per behavioral fund, financial specialists are "typical," not reasonable. Markets are not proficient, regardless of the fact that they are hard to beat. Speculators plan portfolios as indicated by the tenets of behavioral portfolio hypothesis, not mean-change portfolio hypothesis. Furthermore expected returns take after behavioral resource valuing hypothesis, in which hazard is not measured by beta and expected returns are controlled by more than danger.

Traditional finance assumes people as “rational” when they make decisions in their lives. It also assumes that markets are efficient. In an efficient market the actual price of a security is a good estimate of its intrinsic value and future value. The Efficient Market Hypothesis (EMH) and Capital Asset Pricing Model (CAPM) are based on this concept and states that financial markets in the real world are efficient. But the EMH and CAPM were challenged on both the empirical and theoretical grounds. Grossman and Stiglitz (1980) stated that it was impossible for efficient markets to exist since information has a cost associated with it and prices will not perfectly reflect available information because there would be no motivation for investors to spend resources to attain it. Investors are expected to act according to what they perceive to be significant information, while this may actually be irrelevant, thus deviating actual prices from its fair value. This phenomena needs to be examined in Pakistani capital market. We need to know whether the Pakistani capital markets following EMH, CAPM and rationality of investors in these markets exists. To the best of our knowledge no quantitative study has been done in Pakistan to explore the impact of overconfidence and disposition effect on investment decision making by investors. The study has examined behavioral heuristics and their impact on investment decisions in Pakistani capital markets. Specifically objective of this study is to empirically investigate significance of overconfidence and disposition effect on investment decision making and exploring the existence of Efficient Market Hypothesis, Capital Asset Pricing Model and rationality of investors in Pakistani capital markets.

Various researches have worked on the behavioral heuristics and explored its effect on financial decision making of investors and corporations. In addition to it, various studies have been conducted in United States, Latin America and Europe but few studies have been conducted with reference to Pakistani capital markets. Past studies have also used surveys and questionnaires to find out about heuristics and cognitive biases in Pakistani capital market. We have used quantitative model to check the existence of heuristics in stock market and their impact on investment decisions of the investors. The aim of study is to enhance the literature with reference to Pakistan and its capital markets. The estimation model applied by our research provides more accurate results in estimation of heuristics as it is based on secondary data and personal biases have been removed. The estimation model is also used first time in this study to date.

This research will be useful to explain and understand the influence of overconfidence and disposition effect on the investor financial decision making in the capital markets of Pakistan. It will also help to know the interesting facts related to Efficient Market Hypothesis, Capital Asset Pricing Model and rationality of investors in Pakistani capital markets.

As we have discussed the importance of heuristics, financial markets, EMH and CAPM, we have formulated the following objectives for our study:

- To identify the impact of various overconfidence and disposition effect on financial decision making of investors.
- To explore significance of overconfidence and disposition affect.
- To empirically study EMH and CAPM in the presence of overconfidence and disposition effect.

Overconfidence is defined as one’s belief to understand the situation perfectly and he/she has complete knowledge of everything. In business world mangers have to make many decisions daily and related to organization’s investments. He/she is also human being and may have thoughts in mind like I know all about this situation or I am the best to solve this problem etc. Managers have positive views about themselves and always think that they make best decisions. They believe that their decisions will bring more profits and generate more revenues to the organization which is not always true. This is called overconfidence bias. Disposition effect is a tendency to sell share whose price rises and hold the ones with decreased price. Investors are less willing to realize loses than gains which show irrational behavior as future returns are not linked with purchase prices. They can

reduce tax on capital gains by selling stocks with fewer prices. According to Odean (1998) December is a month to observe tax motivated selling behavior of the investors in the market but in other months you can see disposition effect.

Literature Review

The models of traditional finance paradigm suppose that investors behave rationally and consider all available information in the decision making process for investment. Therefore markets are efficient and security prices are truly reflected in intrinsic values of the assets. That investors act quickly to new information and update prices correctly in the security market. Investment market returns are believed to follow a random walk pattern therefore these are not predictable. This concept is based on the theory of arbitrage which suggests that rational investors undo price variations away from the original values rapidly and maintain market equilibrium. As prices reflect all available information and there is no investment strategy that can earn excess risk-free rate of return in the market (Fama, 1965). The Modern Portfolio Theory (MPT), Capital Asset Pricing Model (CAPM) and Arbitrage Pricing Theory (APT) are the quantitative models that support theories that are based on rational expectations (Markowitz, 1959; Sharpe, 1964; Ross, 1976). Unluckily there is an extensive research which could not validate this theory according to the available investment data. For example, Fama and French, (1993, 1996) and others have shown that the fundamental facts about the cumulative stock market, the cross-section average returns and individual trading activities are not easily understood by using this framework. The behavioral finance model has surfaced in the response to the problems faced by the traditional model. In essence, it disagree that investment decisions are not always made on the basis of full rationality and it attempts to understand the investment market events by relaxing the two principles of the traditional model that is (1) investors fail to update their information quickly and correctly and (2) there is a regular variation from the normal process of making investment decisions.

Financial decision making as a field of study has been accepted since the mid-1940s. Howard (2103) performed a meta-analysis associated with the gathering of financial decision making knowledge using a 5-paradigm model as shown in following Figure.

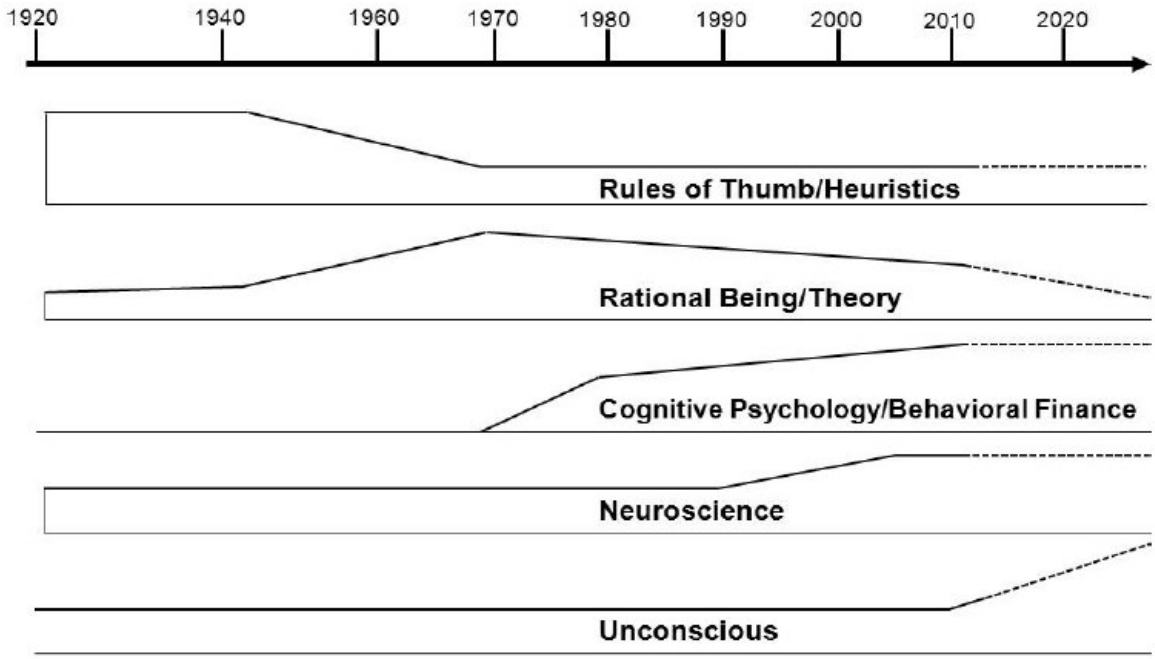


Figure 1. Knowledge accumulation/evolution-financial decision-making.

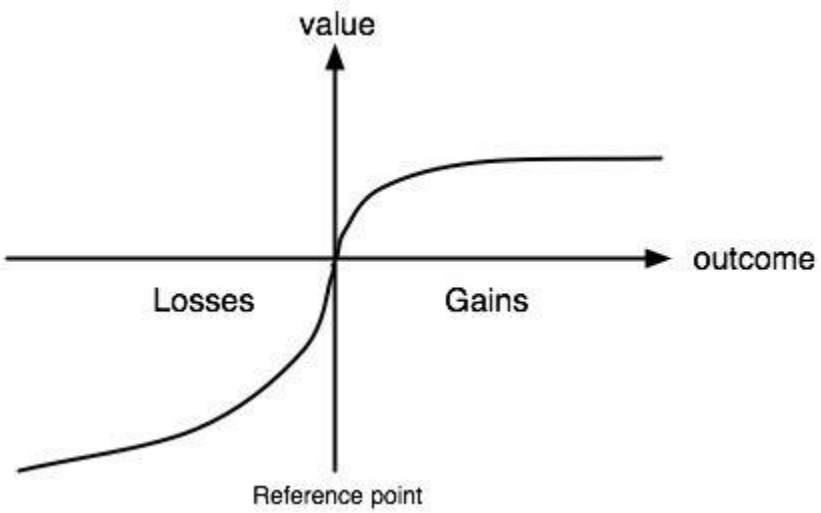
It is adopted from the study on the roles of intuition, heuristics, and impulses on financial decision making by Howard (2013). Starting in the mid-1940s the concept of expected utility (Von Neumann & Morgenstern, 1944) provide the base for the golden age of financial theory. Expected utility assumes that economic or financial decisions are always in harmony with the assumptions of their model and rational. Criticisms of the theory's failure to predict human financial decision making led to the development of behavioral finance in the early 1970s as a new model. Behavioral finance has shed substantial light on the outcomes of biases, heuristics, and framing on financial decision making. Of the five paradigms included in the model, the first four listed are relatively established in their application about financial decision making. The rising paradigm for the future is exploring the unconscious and its role in our decision making. According to neuroscientists up to 90% of our behavior is initiated beyond our understanding in the unconscious (Eagleman, 2011). Each of the above paradigms

excluding the rationality theory recognizes the significance of intuition, heuristics, and impulses to financial decision making outcomes. It is accepted that the unconscious plays an important role because the nature of the unconscious is still not well known; little work has been conducted examining the relationships among intuition, heuristics, and impulses. Masomi and Ghayekhloo (2011) explored the consequences of human behaviors' in economic and the effects of behavioral factors in investment decision making at Tehran stock exchange. By using a sample of 23 institutional investors, the Behavioral factors discussed are: representativeness, overconfidence, anchoring, gambler's fallacy, loss aversion, regret aversion and mental accounting affected the decisions of the institutional investors operating at the TSE. The findings show that behavioral factors do influence the investment decision-making process. Heuristic processes and prospect theory were evident, with heuristics strongly dominating prospect theory in explaining the behavior of institutional investors operating at the TSE. Anchoring and gamblers' fallacy were most prominent. This study supports the view that the behavior of the institutional investors operating at the TSE is affected by various factors. The impact of these factors on the institutional investor decision-making behavior is in varying degrees from very high impact to little or no impact. Market information and the fundamentals of the underlying stocks had the highest impact on investment decision-making.

The theory behind deposition effect is Prospect Theory. It explains the choices of people between probabilities and risk where the probabilities of outcome are known. People based their decisions on the latent value of gains and losses rather than the final outcome. These losses and gains are evaluated by people using heuristics. This model is descriptive in nature and depicts real life choices rather than best possible decisions. It was proposed by Kahneman and Tversky in 1979 in their paper "An analysis of decisions under risk". In this paper they used cognitive psychology to explain decision making process of individuals. Prospect theory is based on two stages: first is editing stage and second is evaluation stage. In first stage complex situations are simplified by using heuristics and in second stage risk options are evaluated by using reference dependence, loss aversion, non linear probability weights and diminishing sensitivity to lose and gains. The formula assumed by Kahneman and Tversky for evaluation stage is as follows:

$$V = \sum_{i=1}^{n} \pi(pi)\, v(xi)$$

Where V is the over utility or expected utility of the product of individual's decisions making, $x_1, x_2, \ldots, x_n$ are the possible outcomes and $p_1, p_2, \ldots, p_n$ are their respective probabilities and v is a function that allocates a value to an outcome. This value function is S shaped and asymmetrical. The phrase prospect referred to a lottery in the novel formulation. The paper of Kahneman and Tversky in 1979 "An analysis of decisions under risk" has been called an influential paper in behavioral economics. According to expected utility theory, the individual cares only about fixed wealth not relative wealth in any given condition.



This theory has explained labor supply curves, asymmetric price elasticity, tax evasions and co movement of share prices and consumption. These concepts were not explained by tradition finance theories. Tversky and Kahneman in 1992 gave revised prospect theory known as cumulative prospect theory. This theory has focused only on second stage and eliminated the first one. Overconfidence, equity premium puzzle, endowment bias, status quo bias, intertemporal consumption and projection bias are part of this theory now.

Barberis and Xiong (2009) in their study on disposition effect on long standing preferences found that annual gains or losses often fail to predict the disposition effect when using prospect theory. When the realized gain or loss model is applied, it gives more reliable results. Investors' trading aspects can be determined by using utility from realized gains and losses. Individual investors are increasingly being regarded as essential to increase liquidity and depth in the financial markets. Comparative to institutional and professional investors, these investors

can effortlessly and rapidly contribute or leave from the markets based on the prevailing market situation. A study was conducted to analyze the relationship between investment decision making of long term and short term Indian retail investors and behavioral traits such as Herding, Social Contagion, Representative Heuristic, Over Confidence, Risk Aversion, Disposition Effect and Cognitive Dissonance. The goal of this research was to explore to what extent long term and short term stock investors share different behavioral characteristics. A structural model was used to compare the qualities of the investors and study how investment decision making and behavioral biases are related. It also compared the relative differences of behavioral biases such as Herding, Social Contagion, Representative Heuristic, Over Confidence, Risk Aversion, Disposition Effect and Cognitive Dissonance. Discovery of behavioral traits commonly connected with investment tenure helped in providing views and preparing trading strategies. The psychological impact of investment decision making among investors was examined through a sampling survey of 318 valid respondents from voluntary individual investors in India between Jan 2012 and May 2012. Based on structure equation modeling (SEM), path analysis was performed on how investment decision making and the proposed behavioral biases were associated. Results indicated that the structural path model strongly fits to the sample data, showing the role of behavioral biases in investment decision making among individuals. The results of the study further showed that long term and short term investors significantly differ in behavioral traits (Lakshami et al, 2013).

Daniel and Hirshleifer (2015) discuss the role of overconfidence in their study. Overconfidence means having mistaken valuations and believing in them too strongly. It may appear that investors in liquid financial markets ought not to be very responsive to overconfidence, since return results are quantifiable, giving broad feedback. However, overconfidence has been reported among experts and professionals, consisting of those in the finance profession. For instance, overconfidence is seen among corporate financial officers (Ben-David, Graham et al. 2010) and among specialized traders and investment bankers (Glaser, Langer et al. 2013). Individuals have a tendency to be overoptimistic about their life prospects (Weinstein 1980), and this optimism specifically influences their financial decisions (Puri and Robinson 2007).

The disposition effect is the propensity to sell assets that have gained value called winners and keep assets that have lost value called losers. Two points of prospect theory explained the disposition effects: the idea that people give importance to gains and losses comparative to a reference point that is the opening purchase price of shares and the tendency to look for risk when faced with possible losses and avoid risk when a certain gain is possible. Experiments were conducted to see if subjects would show signs of disposition effects. Shares were sold by subjects in six risky assets. Asset prices changed in each period. Contrary to Bayesian optimization subjects sold the winners and kept the losers. The disposition effect was very much reduced when the shares were repeatedly sold after each period (Weber and Camerer, 1998).

Recent research findings by a variety of researchers indicate that psychology has strong influence on investors' decision-making and the mere dependence on Efficient Market Hypothesis (EMH), Capital Assets valuation model (CAPM), and the notion of "Homo economicus" to evaluate these decisions may not be enough. The belief that people behave rationally when making economic decisions by considering all information available runs opposite to some observations. When we observe investors' behavior in the stock market, we come across behaviors which are contradictory with those of an economic man. Therefore in recent years, scientists and researchers have increasingly paid attention to the field of behavioral finance, which is a combination of economics and psychology. It tries to give explanation for investors' behaviors which are not often quite logical and biases affect investment decisions of investors. Of these biases is "loss aversion" which represents itself in the form of "disposition effect". Disposition effect shows investors' behaviors through an s-shaped value function. Disposition effect forces investors to sell winner shares too quickly but hold loser shares in excess which result in a decrease in the investors' gains. In contrast, classical financial theories foresee that an economic person would sell those loser shares with no expectation of a rise in their price and invest on those shares with a promising gain and keep the winner shares as long as the company demonstrates good performance. This requires making learned decisions to solve problems and uncertainties faced by investors. These problems may include economic factors such as less earning, an increase risk and the lack of balance in the preferred portfolio. Given the worth and supposed certainty of disposition effect and its impact on investment decisions, factors affecting the disposition effect in the Tehran Stock Exchange were examined by Tehrani and Gharehkoolchian in 2012. Four hypotheses were formed and the data used in the study was collected through availability sampling. One-sample t-test, two-sample t-test and one-way ANOVA were run to examine the data while Pearson correlation test and multiple regressions were used to evaluate relationships among variables in question. The results of the analyses point out that overconfidence and mental accounting were not extensively correlated with disposition effect. Regret aversion had a positive relationship with disposition effect while self control was negatively related. It was also observed that there was a negative relationship between participants' level of education and their disposition effect representing that the higher the level of education, the less the chance of disposition effect. Furthermore, the results of the study show that males enjoyed a higher level of overconfidence than females and 20-30 year-old age groups demonstrated much overconfidence than other age groups.

According to Daniel and Hirshleifer (2015), overconfidence is not only the phenomenon worth considering in behavioral finance, nor that it ought to fill as an all-reason justification for all financial anomalies. But overconfidence appears to be liable to be a key component in financial decision-making. Overconfidence is a psycho logical phenomenon across the board, and is connected with a group of related impacts. For instance, it consists over placement - overestimation of one's rank in a population on some positive measurement - and over precision- overestimation of the precision of one's beliefs. An illustration is overestimation is that how much one can capable to estimate future stock market returns. A cognitive process that helps support overconfident beliefs is self-attribution bias, in which individuals credit their own talents and capacities for past successes, while accusing their failures on bad luck.

Hilary and Menzly (2006) states conventional definition for static overconfidence entails either sever beliefs with respect to some goal standard (such as evaluating 90% likelihood for incidents that happen less regularly) or confidence intervals that are too tight (for example setting 90% confidence intervals such that surprises happen more than 10% of the time). Klayman, Soll et al. (1999) documented that numerous studies have reported that the confidence individuals have in their results surpasses their precision and that overconfidence increases with the difficulty of the task. Overconfidence was found in verbal reports for a numerous attributes and setting but was less often studied for choice behavior. The objective of the study was to provide a reliable measure of the degree of confidence that subjects have in their skill, relative to others and to test it experimentally. The sample size consists of 134 participants, 88 women and 46 men used in the study. LEWITE test presented in Wagner (1999) is applied to test the perceived relative skill influences verbal and choice behavior. Choice behavior varies from overconfidence to under confidence when the task varies from easy and familiar to non-familiar. This effect is significant when monetary payments are at stake and weak when they are not (Hoelzl and Rustichini 2005).

Another study conducted by Hilary and Menzly (2006) in a new viewpoint about the accuracy of individuals expectations and its connection to deviations from agreement. Existing experimental literature has studied these two attributes, but not in a combined framework. They concentrate on short term cyclical variations though past studies has generally considered either experts' fixed attributes or long terms trend. The analyst forecast data are obtained from the Zacks database and cover the period from the last quarter of 1980 to the last quarter of 1997. In order to test the estimates regression analysis has been done. The results demonstrates that after making a short series of exact forecasts, experts will probably be erroneous than their ability and environment would anticipate. They also take extra risk by variation deviating from the consensus estimate on their later forecast. This phenomenon is both statistically and economically significant. The outcomes are strong to the utilization of various econometric methods and to various control variables.

Moore & Healy (2008) display a reconciliation of 3 different ways in which the research literature has characterized overconfidence: (a) overestimation of one's real execution, (b) over placement of one's execution in respect to others, and (c) excessive exactness in one's beliefs. Evidence reveals that reversal of the first 2, when they happen, have a tendency to be on various sorts of tasks. On difficult tasks, individuals overestimate their real execution additionally erroneously trust that they are worse than others; on simple tasks, individuals underestimate their actual performances but mistakenly trust they are superior to anything others. They offer a clear hypothesis that can clarify these irregularities. Over precision seems, by all accounts, to be more persistent than both of the other 2 sorts of overconfidence; however its presence decreases the extent of both overestimation and over placement.

The study presents a theory of asset pricing in which the cross section of expected security returns is established by the risk and investor misevaluation. In equilibrium, expected returns are linearly related to both risk and mispricing measure. The investigation gives a conceptual basis for choosing between substitute measures of mispricing as indicators of future returns. The standard size and book/market impacts do not take after from arbitrary requirement of investor irrationality. Rather, they are consistent with the overconfidence, an information processing bias reported by study on the psychology of the individual (Daniel, Hirshleifer et al. 2001). Kelley and Tetlock (2013) propose and build a structural model of market trading that incorporates informed rational investors and in addition uninformed investors who exchange either for hedging reasons or to make an (overconfident) bet on observed information. They assess this model utilizing information set on trades, prices, and information releases for US traded firms and conclude that, without overconfidence-based trading, volumes would be smaller by a factor of 100. The finding demonstrates that modest overconfidence can facilitate clarify stark patterns in stock market activity.

Kengatharan and Kengatharan (2014) investigate in their study the behavioral factors influencing individual investors' decisions at the Colombo Stock Exchange. They also examined the relation between these factors and investment performance. Behavioral factors include such as Heuristic Theory, Prospect Theory, market and Herding Effect. The data has been collected from the individual investors of Colombo Stock Exchange (CSE) by sending Questionnaires to them through stratified random sampling. Data has been processed and analyzed by SPSS. Heuristics factor is composited within the combinations of variables of over confidence and anchoring.

The evidence revealed that among all behavioral factors only three variables are found which influence the investment performance. Overconfidence from heuristics factor has negative significant influence of investment performance whereas anchoring has positive significant influence on investment performance. On the basis of above literature following model is proposed including behavioral heuristics and their impact on financial decision making of investors.

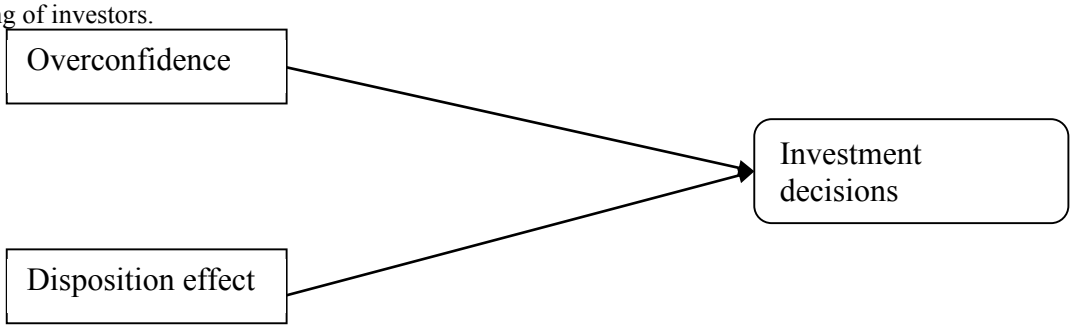


Figure 2.2: Heuristics and their impact on investment decisions in capital markets of Pakistan

From above figure we have derived following hypotheses:
H1= Overconfidence heuristic has negative impact on decision making of investors in KSE listed companies
H2= Disposition effect has positive impact on decision making of investors in KSE listed companies

Methodology
For the study author has collected data through secondary sources. Data was gathered from the stock exchange related to stock returns and market capitalization. We have collected the data from Karachi stock exchange listed companies. Time period for this study is 2005-2014. We have taken daily stock end of day daily prices data of the listed companies at Karachi stock exchange. There are total 577 companies registered with Karachi stock exchange and out of which 458 companies were registered before or on year 2005. Out of these 458 companies we have chosen 229 companies with complete data. This data has shown variability in different years. We have dropped other companies with incomplete data or with zero ar less variation. The reason for this is that we want to see the increase and decrease in investment cause by changes in returns. So sample size for this study was 229 companies from all sectors listed with Karachi stock exchange. Unit of analysis is the entity under investigation for measuring the variables of the study (Neuman, 2003). The unit of analysis for this study was the individual company in each sector of Karachi stock exchange.

Method for statistical analysis was Logistic regression which is a binary dependent variable model. It is advance statistical model of Maximum Likelihood and it is also called Logit model for non linear data. Binary Dependent Variable Models have been used in this study. In this class of models, the dependent variable, may take on only two values zero and one. When binary dependent variable, y, takes on values of zero and one, a simple linear regression of y on x is not appropriate because the implied model of the conditional mean places inappropriate restrictions on the residuals of the model. Furthermore, the fitted value of y from a simple linear regression is not restricted to lie between zero and one. That is why the model employed in this study adopted a specification which is designed to handle the specific requirements of binary dependent variables. This model is appropriate when response takes one of only two possible values representing success and failure, or more generally the presence or absence of an attribute of interest. The first order conditions for this maximum likelihood are nonlinear. Thus, obtaining parameter estimates requires an iterative solution. Each of the binary responses represents an event with the coding of y as a zero-one variable. The Logit is based upon the cumulative distribution function for the logistic distribution. For this model, we have computed dummy variables for disposition effect, availability heuristic, representative heuristic and investment decisions. The parameters of this model are estimated using the method of maximum likelihood.

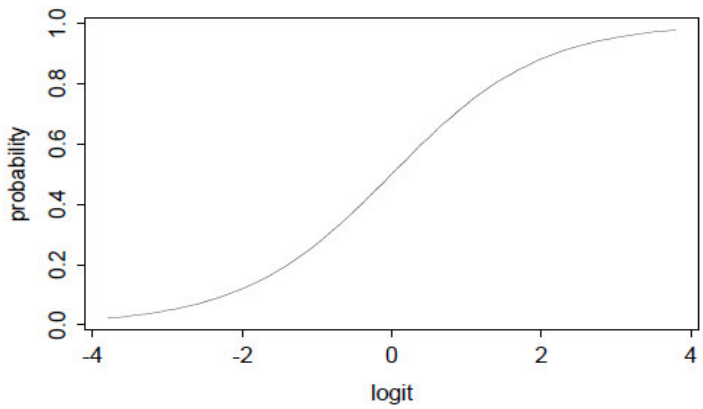


FIGURE 3.1: The Logit Transformation

Figure 1.2: The Logit Transformation

For this study, the Logistic regression model is as follows:
ln (Instd) = α - β_1 (ovrcnf) + β_2 (Dispa) + μ------- (Eq.1)
α = Constant
Instd = refers to investment decisions
Ln= natural logarithm
Ovrcnf = refers to Overconfidence
Dispa= refers to Disposition effect
μ = Residual error

- For calculation of overconfidence GARCH 1,1 variance series is used to determine the overconfidence. After calculating the series we will take the square root of it to get a better picture of the variations. If the investment is increasing despite the increase in sigma σ that clearly indicate the overconfidence of the investors. Calculation of data of both market and individual securities is included in it.
- For the calculation of disposition effect, change in price has been calculated i.e $\frac{P2-P1}{P1}$. Positive change is equal to 1 and negative change is equal to zero where 1 indicates investors' disposition to sell and zero to represent retain or buy.
- For the calculation of investment decisions, we have used market capitalization data. We have taken differential log of change in market capitalization data where D=1 where differential log is positive and zero otherwise. For differential log of change in market capitalization= $dln(\frac{mc2}{mc1})$.

These variables were computed quantitatively by various researchers (Uygur and Tas; Husler et al 2013; Tariq and NaeemUllah; Boussaidi, 2013; Kliger and Kudryavtsev, 2010; Shumway and Wu, 2006; Barberis et al., 1998) in their research studies.

Adel and Mariem (2013) in their research "The impact of overconfidence on investors' decisions" used stock prices, trading volume and market capitalization data. They used daily stock data from Tunis Stock Market to check the effect of overconfidence on investors' decisions. They find out that stock returns effect the investment outcomes. Trade volume and market capitalization reflect the reality of direct employment of shares traded daily and variations in outstanding securities of the company when capital increases.

According to Kayle and Wang (1997), Kahneman and Riepe; Benos and Odean (1998) proposed that increased trading volume shows that investors in the market are overconfident. Barber and Odean (1998), Barber and Odean (2000), Gervais and Odean (2001), Glaser and Weber (2009), Hoffman et al. (2010) and Garaham et al. (2009) proved that overconfident investors are involved in more trade. They used portfolio riskiness as measure of overconfidence and they used stocks' liquidity and market capitalization (high and low) as proxies of portfolio riskiness.

Disposition effect was calculated as realized gains and losses on selling and holding of stocks by Odean (1998). Grinblatt and Keloharju (2001) used logit regression to estimate the decision to sell or hold a stock by investors. There are few drawbacks when using the method for identifying the reasons of the disposition effect but this method is perfectly usable for the purpose of documenting the disposition effect on the investor base as a whole. This method has strong logic and foundation and has been extensively used in academia. Barberis and Xiong (2009), Locke and Mann (2005), Frazzini (2006) have used Odean (1998) or a comparable method in their papers.

Data Analysis

By applying Logit model, we get following results:

Table 1.1: overconfidence and disposition effect in KSE listed Sectors

Dependent Variable: INSTD				
Method: ML - Binary Logit (Quadratic hill climbing)				
Date: 03/15/16 Time: 17:39				
Sample: 1 562829				
Included observations: 562829				
Convergence achieved after 6 iterations				
Covariance matrix computed using second derivatives				
Variable	Coefficient	Std. Error	z-Statistic	Prob.
DISPA	10.85308	0.042663	254.3933	0.0000
OVRCNF	-0.002887	0.000834	-3.462912	0.0005
C	-4.758042	0.024137	-197.1287	0.0000
McFadden R-squared	0.957109	Mean dependent var		0.620256
S.D. dependent var	0.485324	S.E. of regression		0.067684
Akaike info criterion	0.056964	Sum squared resid		2578.344
Schwarz criterion	0.057024	Log likelihood		-16027.63
Hannan-Quinn criter.	0.056981	Deviance		32055.25
Restr. deviance	747367.9	Restr. log likelihood		-373684.0
LR statistic	715312.7	Avg. log likelihood		-0.028477
Prob(LR statistic)	0.000000			
Obs with Dep=0	213731	Total obs		562829
Obs with Dep=1	349098			

This table is showing independent and dependent variables. Total number of observations are mentioned which are 562829. Convergence of data is achieved after 6 iterations and coefficient covariance is computed using second derivative. The regression coefficients are estimated by using maximum likelihood estimation. Unlike linear regression with normally distributed residuals, it is not possible to find a closed form expression for the coefficient values that maximize the likelihood function, so that an iterative process must be used instead, for example Newton's method. It is also known as Newton–Raphson method. This process begins with a tentative solution, revises it slightly to see if it can be improved, and repeats this revision until improvement is minute, at which point the process is said to have converged. When convergence is achieved with less or minimum iterations then model is said to be reliable.

In our case this model is achieved after 6 iterations so it is reliable model. All independent variables have significant effect on investment decisions at less than 5% level of significance. The coefficient of "DISPA" has positive value of 10.85308 and is highly significant at less than 5% level of significance. This is indicating that there is probability that positive increase in disposition effect will increase the value of investment and returns for investors. If investors use this effect then their chances of getting good returns will increase. The "OVRCNF" (overconfidence) has negative value -0.002887 of coefficient that is significant at less than 5% level of significance. This tells us that there is a chance that when investors will be overconfident in making their investment decisions then they will lose money and returns. So overconfidence has negative impact on returns for investors. It generates risk taking attitude for investors when they are overconfident about any situation in the market. They also believe that they have complete information about the securities market. They think that their analysis and information is reliable and this leads them into taking risk on their investments. So form our findings we can also conclude this fact that overconfidence can lead investors to negative returns.

When analyzing data with a logistic regression, an equivalent statistic to R-squared does not exist. The model estimates from a logistic regression are maximum likelihood estimates arrived at through an iterative process. They are not calculated to reduce variance, so the OLS approach to goodness-of-fit does not apply. However, to evaluate the goodness-of-fit of logistic models, several pseudo R-squared have been developed. These are "pseudo" R-squared because they look like R-squared in the sense that they are on a similar scale, ranging from 0 to 1 (though some pseudo R-squared never achieve 0 or 1) with higher values indicating better model fit. McFadden R-squared has value of 95.71% and it shows soundness of our estimated model. So our dependent variables are causing 95.71% variation to dependent variable.

Akaike's Information Criterion (AIC) is defined as an index used in different areas as support in choosing between competing models. It is a measure of the relative quality of statistical models for a given set of data. It estimates the quality of each model, relative to each of the other models and provides a means for model selection. The preferred model is the one with the minimum AIC value. It takes into account both the statistical goodness of

fit and the number of parameters that have to be estimated to achieve this particular degree of fit by imposing a penalty for increasing the number of parameters. Lower values of the AIC indicate the preferred model, that is, the one with the fewest parameters that still provides a sufficient fit to the data. In our case value of AIC is 0.056964 and it shows that our model is preferred one and it has statistical goodness of fit. The Schwarz Criterion (SC) is a measure to help in the selection between different models. Using this criterion, the best model is the one with the lowest SC. This criterion takes into account both the closeness of fit of the points to the model and the number of parameters used by the model. In our case its value is 0.057024 which is less and again it shows fitness of our estimated model. The Hannan–Quinn information criterion (HQC) is also criterion for model selection. Again lowest value of HQC indicates best model. In our case the value of HQC is 0.056981 and it is showing the reliability of our model.

A likelihood ratio test or LR statistics is a statistical test used to compare the goodness of fit of two models. The test is based on the likelihood ratio, which expresses how many times more likely the data are under one model than the other. This ratio, or equivalently its logarithm, can then be used to compute a *p*-value, or compared to a critical value to decide whether to reject the null model in favor of the alternative model. The likelihood ratio test rejects the null hypothesis if the value of this statistic is too small. Low values of the likelihood ratio mean that the observed result was less likely to occur under the null hypothesis as compared to the alternative. In our study we have value of LR statistic which is highly significant at less than 5% level of significance. So we can say this that we accept the alternative hypotheses that disposition effect and overconfidence affect investment decisions of investors in capital markets of Pakistan. In Pakistani capital markets investors are irrational and they use heuristics in their investment decisions. This also leads us to the conclusion that Efficient Market Hypothesis and Capital Assets Pricing Model do not exist in Pakistani capital markets in their full form. Investors do not have complete information and knowledge of market and its changes.

According to Copland and Weston (1988) capital market is tool to access the financial health of an economy and it is important part of financial sector. It provides a platform where funds are transferred from lenders to borrowers. Funds are mobilized to public and private sector by means of debt and equity instruments. These markets play important role in the development of a national economy. It significantly influences the growth and progress of the country. If capital market is efficient then it can provide attractive opportunities for both local and international investors. This helps in accelerating the growth of an economy by channelizing funds into different sectors. Market should be low in cost, perfectly competitive and efficient in information. Efficiency defines a market where all the information about the security is rooted in the current price of the security. Efficiency of stock market is one of the most disputed issues in the field of finance. Many studies have been conducted around the world to test the efficiency of the stock exchange in many different countries and have produced different results. The researchers have used different techniques to verify the efficiency of the stock market and have given different theories. One of the most applicable theories is the random walk hypothesis theory which has been analyzed by many researchers in many different settings of the world. Another associated concept is the Efficient Market Hypothesis (EMH) proposed by Eugene Fama (1969). The concept of random walk was first introduced by an American economist Karl Pearson in 1905. Random walk hypothesis explains the observed behavior of different events in different settings and serves as a basic model for determining randomness in a procedure. The main idea of this theory is that the prices of shares follow a random walk which means that prices of securities changes randomly and no single pattern can be identified to make future decisions. So we can say that the prices of shares cannot be estimated on the basis of past information about prices and abnormal returns cannot be generated by investors. It says that the current stock prices fully show all available information about the company and its performance and there is no method for generating extra income by using such information. EMH deals with one of the most basic topic in finance that why prices change in the stock market and in what are the reasons behind it. This hypothesis has high implication for finance managers, investors and technical analysts. According to EMH the effect of information (positive or negative) will be reflected rapidly in stock prices so that no one is able to take benefits of the informational changes and earn abnormal profits. Such types of markets are called informational efficient markets.

Karachi stock exchange was declared the best performing emerging market in 1990 but still it is considered a thin market. It is a volatile market and help to raise finds but on limited basis. This market has seen ups and downs from year 2000 onwards. The main causes of this could be poor distribution of information among investors, lack of support from authorities and lack of observance of rules and regulations of trading. Insider trading is high in KSE and this causes volatility in stock prices. Stock market members are given importance for their role as market makers. Foreign investors cannot invest without the prior approval of the government and regulations are not strictly followed. There are restriction on movement of foreign exchange, low liquidity, less trading and limited use of technology have created hurdles in development of this market. KSE has taken different steps to lowers the volatility in stock prices like introduction of Karachi automated transaction system, Central depositary system and National clearing system. These institutions help to control the excessive trading, to handle more than one million shares per day and to settle the transactions of three stocks exchanges. These steps have reduced the

rate of frauds, delay in transactions and volatility in stock prices (Mustafa, 2008).

As we have witnessed that in Pakistani stock market, investors are affected by heuristics and other biases in their investment decisions. They are more focusing on disposition effect for gaining returns on their investment. Overconfidence has less contribution towards response variable in KSE listed sectors. This shows that investors are not risk takers in this market. We have tested all variables got the idea of investors' interests in Pakistani market. They want to gain quick returns and focus on short term profits. They are risk takers but their numbers are less in the whole market as results suggested. They rely on historical prices, P/E ratios, market capitalization ratio, returns to make their decisions related to purchasing and selling of shares. EMH and CAPM theories assume that investors are rational and they act rationally in the market. These models consider all available information in the decision making process for investment. Therefore markets are efficient and security prices are truly reflected in intrinsic values of the assets. Those investors take action quickly to new information and update prices correctly in the security market. Investment market returns are believed to follow a random walk pattern therefore these are not predictable. This concept is based on the theory of arbitrage which suggests that rational investors undo price variations away from the original values rapidly and maintain market equilibrium. As prices reflect all available information and there is no investment strategy that can earn excess risk-free rate of return in the market. But we can see that in case of Pakistani stock market, investors have chances to earn high returns than other investors by using these heuristics and biases in their decisions making, which mostly they use. According to CAPM, investors can generate more returns by taking more risks. Investors are not rational in stock market of Pakistan and they heavily rely on their intuitions, estimations and historical data for stock buying and selling. In this market, investors want to generate high and quick returns. They mostly focus on short term returns. All sectors in KSE market have shown the presence of these heuristics and biases in investors' decisions. We have also witnessed that investors cannot take risks in every sector to generate income. Risk has some contribution in generating gains from investment but this percentage is not that much high to consider in all sectors listed at KSE. Investors do not behave rationally always as we have seen in case of stock market crisis in Pakistan of 2008-09. In that uncertain situation, they invested more so the prices were increased in the market. So we can say that basic assumptions of EMH and CAPM models are not applied in this market.

The results of our study are in accordance with other research studies that were conducted to test the validity of EMH and CAPM in stock market of Pakistan. There is a general concept in Pakistani stock market that volatility is result of insider trading by brokers. According to Khawja and Mian (2005) stock prices in Pakistan are manipulated by collusive stock brokers. This manipulation increases the cost of participation because of high volatility. This leads to less participation by outside investors in the market and cause the market to remain financially under developed. Wealth of outsiders decreases because of insider trading and adversely affects the market and its participants. Their transaction cost increases and profits decreases. Due to this factor EMH does not apply with all are assumptions in Pakistan. It suggests that stock prices in Pakistan do not follow random walk theory and investors can rely on past prices, past performance of the company and returns to predict future prices. Investors can use past prices to get abnormal returns on their investment. In this market we can use past data to predict future outcomes so EMH and random walk does not apply in KSE market. Trends in data are predictable and technical analysis is successful here to predict the future prices and get abnormal profits.

A study by Irshad and Sarwar (2013) on validation of weak form of EMH in KSE explored that return in this market are not normally distributed on daily, weekly and monthly basis. Prices do not follow random walk concept. KSE market index gained historical rise in year 2012-13 and investors were overconfident in their decision making relating investment. KSE has face many ups and downs like stock market crash of 1997, rising value index in 2007-08, stock market crash of 2008-09, prices recovery in 2010 and record increase in KSE index value in 2012. These dynamics situation has shown abnormal returns and price trends for investors and this study has also proved that EMH weak form does not exist in KSE market.

A research study by Naz et al., (2014) proves that KSE market does not follow EMH and random walk theories. Returns were abnormally distributed and investors used past prices to predict future returns. Statistical result showed that KSE market is an inefficient market. They use tests like unit root tests of stationarity (ADF, PP and KPSS), L-Jung Box, Q-statistics to test serial auto correlation, Run test to determine randomness. The results showed that data was negatively skewed and not normally distributed. Run test examined the random walk hypothesis and find that it does not apply in KSE market as it is inefficient.

Sultan et al., (2013) conducted a study on Kuwait and Pakistan stock market to test the validity of EMH. They used daily based observations from 1st January 2005 to 30th December 2010. They used Augmented Dickey Fuller test (ADF) and Autocorrelation and their null hypothesis was accepted which was defining Kuwait and Pakistan as inefficient markets and does not follow EMH. Descriptive statistics showed that yearly returns were not normally distributed and data was negatively skewed. They concluded that the stock markets of both countries are inefficient are weak. By using previous prices and returns investors can earn excessive returns in market. They can rely on past trends and results for investment decision making. Final findings revealed that stock market of both countries are weak and inefficient and investor can depend on historical data and news of the market and can

get higher returns.

Nisar and Hanif (2012) explored the evidences of South Asian stock markets to test the weak form efficiency of EMH. They tested four major stock markets of South Asia which include Pakistan, Sri Lanka, India and Bangladesh. Data of 14 years (1997-2011) was taken for analysis purpose. Daily, monthly and weekly historical data values were used in this study. They used run test, serial correlation test, unit root test and variance ratio test for data analysis. Results suggested that all four stock markets do not follow random walk behavior and are inefficient. These are also not weak form efficiency markets. Investors can earn abnormal profits from using previous prices and returns.

We can conclude this discussion by saying that Karachi stock exchange does not support EMH and CAPM. This market is inefficient and role of information is weak on stock exchange activity. Investors use heuristics in their decision making and are irrational in their approaches. They are affected by week effect like weekly high returns, previous prices, take risks with their investment and use market capitalization ratio.

Recommendations

We will suggest few points to investors and policy makers in the stock market of Pakistan:

- Investors can use previous information on stocks for buying and selling decisions
- Investors can see company performance by looking at P/E ratio and market capitalization ratio.
- Investors should focus more on disposition effect because it will bring them more profits on their investments.
- If Pakistan wants its stock markets to be efficient then flow of information should be made transparent to all investors in the market.
- There should be strict rules to stop insider trading in Pakistan as it affects minority traders.
- Trainings, seminars and print material should be provided to investors about the current situation of the stock market.
- They should be guided to make their investment more profitable.
- Pakistan stock exchange should have a strong data portal with reliable and complete entries for data collection and research on capital market. This will help in improving the current condition of the investment in country.

Limitations of the study

Following were the limitations of our study:

- Data of all listed companies were not completely available.
- Companies that were registered on and after year 2005 have missing values for most of years.
- Data collection resources were limited.

Future Research

In future market anomalies can be included to see the impact on investment decisions of investors in Pakistani stock markets. Other cognitive biases can also be used to determine investment decisions.

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