HERDING BEHAVIOR IN PAKISTANI STOCK MARKETS

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Researcher:
Zuee Javaira
Reg No. 09-FMS/MSFIN/F07

Supervisor:
Dr.Arshad Hassan
Associate Professor
MAJU

Faculty of Management Sciences
INTERNATIONAL ISLAMIC UNIVERSITY, ISLAMABAD

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Dr.Arshad Hasan
Associate Professor

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FORWARDING SHEET

The thesis entitled "Herding behavior in Pakistani stock markets" submitted by <u>Ms. Zuee Javaira</u> in partial fulfillment of M.S degree in Management Sciences with specialization in Finance, has been completed under my guidance and supervision. I am satisfied with the quality of student's research work and allow him to submit this thesis for further process as per IIU rules & regulations.

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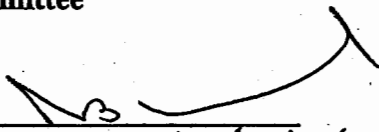
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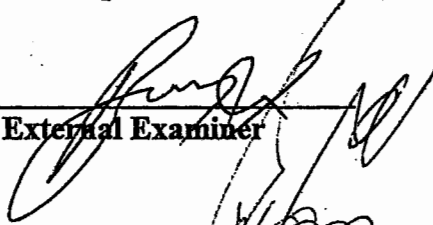
Name of Student: Zuee Javaira

Registration No: 09-FMS/MSFIN/F07

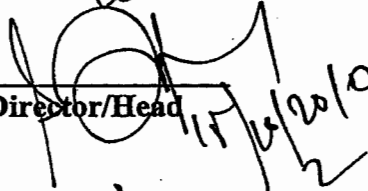Accepted by the Faculty of Management Sciences International Islamic University Islamabad, in partial fulfillment of the requirements for the Master of Science/Philosophy Degree in Management Sciences with specialization in Management.
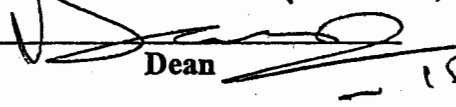
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Supervisor Dr. Arshad Hassan

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Member

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IN THE NAME OF
ALLAH, THE MOST MERCIFUL AND BENEFICIENT

Dedication

"To my great parents who are praise worthy for their sustenance of me on right lines
because I am today, only due to their untidy efforts for my sake"

ABSTRACT

This paper examines the investment behavior of market participants of Pakistani stock market, specifically with respect to their tendency to exhibit herd behavior. Two different methodologies as suggested by Christie and Huang (1994) and Chang, Cheng and Khorana (2000) are employed to test whether returns behave as predicted by the CAPM during periods of market stress. Results based on daily and monthly stock data from KSE indicate the non-existence of herd behavior for the years 2002-2007. This study finds no evidence of herding during asymmetric market conditions, high and low trading volume states and during period of asymmetric market volatility. The model is tested for the stock market crisis period of March 2005, it is found that individual return dispersion decreases with the market returns therefore herding behavior is evident in the Pakistani market during the crisis period of 2005. Macroeconomic fundamentals have insignificant role in decision making process of investor therefore has no impact on herding behavior. However market behavior is in general inefficient and irrational. Factor leading to his behavior needed to be explored. This study has implication for policy makers as this model can be used to detect the presence of herding behavior in Pakistani stock market.

Key Words: Herd behavior, Pakistan Stock Exchange, Cross-sectional dispersion of stock returns, market returns, and Asymmetric behavior.

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DECLARATION

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Zuee Javaira

MS (Finance)

Faculty of Management Sciences

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LIST OF ABBREVIATIONS

CAPM: Capital Asset Pricing Model

CSAD: Cross Sectional Absolute Deviation

CSSD: Cross Sectional Standard Deviation

EMH: Efficient Maket Hypothesis

NPV: Net Present Value

R_m: Market Returns

WACC: Weighted Average Cost of Capital

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

Understanding the pricing mechanism and decision making process of market participant has always been debatable to academics as well as practitioners. Since the birth of equity markets investor are trying to spot the turning points and trends in stock prices. Trading behavior of investor has always been a challenge to explain and model. Both theoretical and empirical research characterizes the influence of investor behavior and trading patterns on the determination of prices. Two streams of theories are evident from literature concerning the asset price dynamics. One set of research is built on the ideology of efficient markets (Fama, 1970; LeRoy, 1989; West, 1988), second is focused on the class of fads model based on the notion of "animal spirits" suggested by Keynes (1936). This research is focused on one of the basic human trait to imitate others, i.e. herding behavior. Recent researches have shown that herding behavior is one of the behavioral phenomena affecting the financial market stability and on the market ability to achieve allocative and informational efficiency.

Efficient market hypothesis is one of the most debated areas of finance. Market efficiency determine the extent to which the stock prices reflect the fundamental prices of the underlying assets, based on the assumption of EMH, market is affected by investment decision of rational market investors, their rational expectations of future perception are reflected in stock prices, whereas in practice many investors are motivated by real or imagined information and usually trade for speculative purposes. The investment behavior of market participants is influenced by number of factors such as the level of

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market volatility, behavior of other market participants, investor's investment horizons, the benchmarks used to measure performance, and the existence of fads and speculative trading activity in the financial markets (Chang, Cheng, & Khorana, 2000).

In the presence of inefficient information disclosure, market participants will tend to lack fundamental information on firms, which may consequently cause them to trade based on other signals. Investors that follow the crowd and imitate others may destabilize markets as prices are driven away from fundamentals creating excess volatility. Potential causes of such volatility in prices and existence of bubbles and crashes in stock markets are herding and positive feed back trading. Herding is the tendency of market participants to imitate the behavior of others and where trading activities of investors are highly correlated to each other. Banerjee (1992) define herding as "everybody doing what everyone else is doing even when their private information suggests doing something else", where as positive feed back trading is considered as a special case of herding, where traders buy the stock when prices are increasing and sell when the prices fall, confirming the presence of herding during asymmetric market movements. Thus presence of both destabilizes the prices and tends to exacerbate the volatility of returns and causes the prices to deviate from the fundamental value.

Herding appears and become a dominant factor when the market is uncertain as to whether the value of the asset have changed from its initial expected value and the when uncertainty about the average accuracy of trader's information increases. Herding is more prevalent in period of market stress due to the fact that obtaining reliable information is perceived more costly than following the aggregate trading behavior of the market investors. During periods of high volatility and abnormal information flows investors believe to earn average returns if they follow other investors. Therefore,

ignorance of private information and reliance on others causes the prices to deviate from fundamental values, aggravate volatility of returns, destabilize financial markets, may exacerbate the crisis situations and eventually increases the fragility of the financial system.

Herding has attracted the attention of academic researchers, because the associated behavioral effects on stock price movements may affect their risk and return characteristics and thus have implications for asset pricing models because herd can drive the prices away from equilibrium Tan, Chiang, Mason, & Nelling (2008). Caparrelli, D Arcangelis, & Cassuto (2004) illuminated both situations by arguing that, as the asset pricing model is based on the assumption of efficient market, therefore it is assumed that the investor make decision on the basis that information is complete and the provisions for risk and returns are unbiased, it is not possible to earn portfolio returns greater then aggregate market returns, and the objective of manager is solely concerned with maximizing returns in the mean-variance perspective. They further argue that in the presence of herding behavior, all investors are assumed to be imperfectly rational, and there exist both informed and noise traders. Prices are not closely related to mean-variance model rather they are reflection of psychological behavior.

Market portfolio is not an efficient portfolio in the presence of herding; speculation is the basis of most of the trading activities and this behavior cause the prices to rise. The market is irrational because of inefficiency, therefore the presence of herding can leads to the false determination of stock prices and their returns, and resultant increase in risk associated with investment horizon.

Rational and irrational herding is identified as two polar views of herding. According to rational herding investor is some what informed about the fundamentals and

willingly follow the behavior of others, where as irrational herding occurs when investor blindly imitates the action of preceding traders. This research is based on the assumption that investor is irrational and there actions are entirely reflective of speculative trading activity. According to previous researches based on same ideology it is evident that the trading activities of emerging economies like Pakistan are greatly influenced by the presence of herd behavior, because the investor is unsophisticated and uninformed and the market situations are uncertain of the upcoming trends in the economies.

Chang et al. (2000) identifies the presence of herding in the two emerging stock markets of South Korea and Taiwan. Caparrelli, et al. (2004) investigated herding in another emerging market of Italy. Where as the case of developed economies is a polar in a sense that traders are informed, markets are sophisticated and well developed and fundamentals truly reflect all available information. In this paper, we employ the methodologies used by Christie & Huang (1995), Chang et al. (2000), and Gleason, Mathur, & Peterson (2004) and test for the existence of herd behavior in an emerging stock market of developing country Pakistan.

1.2. Structure of Pakistani stock market

Pakistan has three stock exchanges, the largest and oldest Karachi stock exchange established in 1947 only after two months of formation of Pakistan, then Lahore stock exchange inaugurated in 1970, and Islamabad stock exchange commenced its operations in 1997. According to a recent estimate it is observed that 85 % of the turnover occurs at KSE, 14% at LSE and around 1 % at ISE. With a listed capital of US$12 billion and a combined market capitalization of US$70.18 billion 671 companies are listed with KSE, at the end of year 2007. Total market capitalization constitutes 49 % of the Pakistan total

GDP, i.e 143 billion according to the economic survey of fiscal year 2006-2007. KSE started with a 50 share index. With the growth of market requirement of represented index arises.

On November 1, 1991 the KSE- 100 index was introduced. The KSE 100 index is a capital weighted index and consists of 100 stocks consisting of top market capitalization companies from each of 34 sectors. KSE-100 index represents 86% of the market capitalization of the exchange. Most traded security on KSE is the ordinary share, beside this, securities like preference shares, redeemable certificates and corporate bonds are also traded. Since 2003, KSE also started operations in future trading of some active stocks. In 2002 an international magazine "Business Week" declared Karachi stock exchange as the best performing stock market of the world and this trend continued for the next three years due to the improvement in macroeconomic environment, low interest rates, Excess liquidity and improvement in regulations.

The regulatory authority for the securities market and corporate sector in Pakistan is the Securities and Exchange Commission of Pakistan. This commission was Setup in pursuance of the SECP Act 1997. The Act provides administrative authority, operational and financial autonomy in carrying out regulatory and statutory responsibilities and at the same time an accountability mechanism through its Policy Board, governed by parliament of Pakistan.

Pakistan economy like other economies has also gone through significant changes since 1990, these includes trade market and capital market liberalization, privatization, economic liberalization, relaxation of foreign exchange controls, and the easing of regulation on the repatriation of profits, investment and operation of financial institutions. In early 90's the equity markets were also opened for international investors. Pakistani

stock market is relatively smaller in size but trading activity is high. Iqbal & Javed (2008) reported two views on high trading activity, one view is the increase in liquidity due to recent development in political and macroeconomic conditions, second view is the presence of short term traders who exploit the trading arrangement and increase the level of trading. Hence, trading behavior of investor in Pakistan is considered to be near rational, due to recent changes in corporate governance structure that ensure fair level of trading but at the same times traders are influenced by number of external factors. Pakistani stock market is operating as an emerging market with high volatility, high market concentration, high returns and relative inability to mobilize new investment.

1.3. Problem Statement

The existence of herding behavior in Pakistani stock exchange and its consequent impact on equity returns.

1.4. Objective of the study

The purpose of this research is to

1. Investigate the existence of herding behavior in Pakistani stock market.

2. Explore herding behavior within KSE 100 index by employing Christie and Huang (1996) and Chang et al (2000) Model and their modified versions.

3. Investigate the herding impact on stock returns during period of extreme market movements.

4. Examine asymmetric effects associated with market returns, trading volume, and return volatility.

5. Check the robustness of the analysis by examining the possible effect of March 2005 stock market crash.

6. Confirm the existence of herding in the presence of other macroeconomic factor.

1.5. Significance of the study

Efficient market hypothesis is one of the most debated areas of finance. Number of anomalies have been identified these anomalies are sometimes company specific, time based, macroeconomic factor based or behavior specific. Herding behavior is one of the behavior based anomaly. It is interesting to stress that the herding phenomenon is in disagreement with the efficient market hypothesis. Herding is indicative of relative market inefficiencies, in the presence of inefficient information disclosure, market participants will tend to lack fundamental information on firms, which may consequently cause them to trade based on other signals. Investors that follow the crowd and imitate others may destabilize markets as prices are driven away from fundamentals creating excess volatility. This behavioral impact on stock prices tends to affect the risk and return characteristics of the stock, hence pricing on the basis of asset pricing model result in false determination.

Trading activities of market players can be improved by enhancing the quality of information disclosure, and the presence of efficiency results in the risk minimization and fair determination of fundamentals. For the determination of prices several model are used in finance like CAPM and Fama and French model. If herding factor is included in the determination of prices the expected returns on assets changes which in turn affect the cost of financing. This effect on cost of financing is incorporated in WACC. Businesses

often discount cash flows at WACC to determine the Net Present Value (NPV), which is widely used measure of business valuation required for investment analysis, capital budgeting, merger and acquisition transactions and financial reporting. Therefore for valuation purpose financial analyst should incorporate behavioral aspect while determining prices. Thus this analysis has policy implication for financial analyst for the emerging stock market like Pakistan where investor behavior is unsophisticated and market is characterized by unlimited growth potential and lack of earning history.

According to Demirer, Kutan, & Gubo, (2007) identification of herding is also important from the perspective of portfolio diversification, in markets where participants herd around the market consensus large number of securities is required for same degree of diversification than in otherwise efficient markets, therefore in order to diversify risk globally, it will be investors best interest to invest in equity market where there is no herding. In 90's Pakistan has liberalized its equity market for international investors, so in order to boost foreign investment and to gain foreign investors confidence it is vital to identify the existence of herding, because its presence would hurt the benefits of diversification for investors.

According to the knowledge of the researcher this research is the first one to identify the presence of herding behavior in Pakistan stock market, while also adding to the literature on herding behavior of investors and advancing the understanding of the phenomenon and the search for the possible implications of different levels of herding on the market, since empirical relationships are established between herding intensity, trading volume, stock market volatility and other macroeconomic fundamentals. The results could prove highly relevant in achieving a better understanding of market functioning and serve both academics and practitioners, given that an understanding of

level of herding and the nature of their influence could contribute to much more accurate valuation, forecasting and, furthermore, to the definition of new risk measures while taking investment decision.

1.7. Organization of following chapters

The rest of the study is organized as follows. In section 2, a brief review of literature is presented that include role of herding in determination of prices and the presence of other behavioral factors that may distort the pricing mechanism underlying EMH. This section also includes different models introduced to identify the presence of herding and the recent development in literature to find out herding formation in various economies. Section 3 describes the methodology for collecting the data, the data, and the models adopted to identify the presence of herding in Pakistani equity market. Where as section 4 presents the unique empirical results obtained and discussion on the findings and Section 5 conclude the research.

CHAPTER TWO

REVIEW OF LITERATURE

2.1 Literature review

According to psychological research on herding behavior it is concluded that interpersonal vitality between humans and particularly financial market dynamics will remain unchallengeable till the origination of change in the triune brain that comprises the human mind (Prechter & Robert, 2001). They further argue that Imitation is more obvious and becomes imperative for substitution for rationality in a situation where logic is inappropriate and knowledge is deficient. In such a situation where knowledge is bounded, reliance on logical reasoning is lacking and focus is to influence others, people usually trust others judgment for persistent decision making. In such a realm decisions are not made rationally rather they are dependant upon the herd behavior towards investment. As per experimental research human psychology possesses unconscious emotional imperatives that cause financial market participants to interact integratively. This cooperative effect results in price change from fundamentals and the whole process is expected to be unchallengeable.

When applied to financial markets herding is the most important concept in cognitive economics, which affect the pricing mechanism and trading decision of investors. Imitative behavior in capital markets is called "herding". Nofsinger & Sias, (1998) define herding as trading of group of investors over a period of time in the same direction. Similarly Banerjee (1992) define herding as duplicating others action by forgoing investors private information regarding the assets while making purchase decision in capital market. Herding is a most debated phenomena and discussed in

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opposition to the rational capital asset pricing model, where investors' decision is solely based on the action of others rather than fundamental based information.

According to Devenow & Welch (1996) there are two polar views on herding, one is rational herding and another is non-rational herding. Rational herding is based on externalities and access to information or incentive issues may distort the optimal decision making of an investor where as non-rational herding is based on investor psychology, in such type of herding investors follow others action blindly by simply ignoring rational analysis. Usually irrational investors are able to make large profit from such activities. According to intermediate view the investor are some-what or near rational, by avoiding information acquisition cost they use heuristic approach for decision making process and the effect of rational activities by others cannot be eliminated.

Two types of herding have been identified in literature: herd towards particular stock and herd towards the market. Hirshleifer, Subrahmanyam, & Titman (1994) discusses herd toward particular stock, where a group of investors focus only on a subset of securities by neglecting other securities with identical characteristics. Where as herd towards market happens when investor follow market trends and tend to move with markets (Chang, et al., 2000; Christie & Huang, 1995)

For a long time, Academic researchers believe that functioning of equity market was dominated by the efficient market hypothesis. Recent empirical development in the course have denied the existence of any systematic variation of stock prices from their fundamental values and eroded the trust in a theory. It was found that in actual, stock prices exhibit more volatility and fragility than fundamentals or the returns do (Lux, 1995). West (1988) finds evidence in favor of excess volatility and explains that the stock price dynamics cannot be explained adequately with the help of standard model of

expected returns. The presence of excess volatility in expected returns points to the intrinsic dynamic forces of speculative markets not related to fundamental factors. Therefore academic researcher have turned their focus back to reexamining the empirical puzzles not addressed in efficient market hypothesis, West (1988) suggest that academic researchers should focus their attention towards non-standard models such as fads, sociological and psychological mechanisms that may affect the pricing dynamics of stock markets. Kindleberger (1996) highlights the importance of psychological and irrational factors in explaining historical financial crisis. Keynes (1936) pointed out the trading dynamics of stock markets by comparing stock market with a beauty contest where judges make their decision on the basis of others choice, rather than who they considered to be the most beautiful one.

Kindleberger (1996) & Galbraith (1993) believe that evidence of bubbles and crashes are due to the mass errors caused by the fickle natures of herd formation. Devonow & Welch (1996) argued that the financial market phenomena exhibit waves or certain instability, i.e. any unforeseen event comes in waves and more augmented then possible waves in underlying fundamentals. Such pricing patterns are indication of herd formation. According to Shiller et al. (1995) consensus among market participants is not based on private information and seems to be low, indicating lack of independent decision making across the market participants. Devonow & Welch (1996) argued that the decision of market participants is highly influences by the decision of others. According to the asset pricing model the prices are outcome of rational decision making process, this phenomenon is challengeable in the presence of herd behavior because it implies that herd formation reflect an irrational response where prices may be driven away from their equilibrium values, investors are forced to make decision on the basis of

speculative activities and transact on inefficient prices and indulge in unpredictable whim of herds (Christie & Huang, 1995).

To explain this phenomena herding literature is emerging in both behavioral finance and financial economics curriculum. Academic literature contains several theoretical models of herding behavior. Banerjee (1992), Bikhchandani et al. (1992), & Welch (1992), used a model of informational cascades to explain short lived phenomena such as fads and fashions. Lakonishok, Shleifer, & Vishny (1992), Grinblatt et al. (1995), Nofsinger & Sias (1999), and Wermers (1999), Shiller & (Lakonishok, Shleifer, & Vishny, 1992)Pound (1989) investigate the herding behavior among institutional investors. Scharfstein & Stein (1990); Trueman (1994); Zweibel (1995); and Graham (1999); provide another theory of herding based on the reputational concerns of fund managers or analysts and few researchers indicate herding behavior among investors due to analyst forecast, (Froot, Scharfstein, & Stein, 1992); Welch, 1992). Brennan (1993), & Roll (1992) developed a model for compensation-based herding.

This research also highlighted several theoretical models related to herding behavior. One stream of research is focused on reputational concern or principal agent problem. This type of herding is due to reputational concern of managers or analyst cause Principal agent problem. According to Morck et al. (1989) managerial performance evaluation with in industry is relative to the firm performance with overall industry and poor performance can result in firing of top managers. So the reputational concern agents mimic the action of others and solely based on others evaluation and forecast, they completely ignore private information in order to show their ability as an efficient agent. This benefits the agent and if others follow same trait then herding occurs. Reputation herding is considered to be rational, conscious, exogenous, and utility maximizing

(Parker & Precter, 2005). Scharfstein & Stein (1990); Trueman (1994); Zweibel (1995); and Graham (1999); provide theory of herding based on the reputational concerns of fund managers or analysts and they describe different type of agents, according to Scharfstein & Stein (1990) agents that follow private signals are smart managers. Others following noisy signals are dumb managers however both agents have access to private signals regarding investment payoffs. The underlying assumption is that the investment activities of smart agents are correlated because they are considered to be following the same truth where as the activities of worse (dumb) agents are non-correlated. If number of investors following a decision that might be wrong, even smart managers will herd on same decision rather than taking risk to show their ability of being efficient because compensation is based on the assessment of his ability by the principal. So the correlated activities are beneficial for agents if the decision turn out to be wrong the blame can be shifted to others.

An agent can end up with inefficient portfolio, if the compensation of an agent (investment manager) is dependant on comparison of his performance with that of other professionals then this may distorts agent's incentive (Brennan, 1993; Roll, 1992). This situation can also lead to herd formation. Maug & Naik (1995) develop optimal compensation contracts for portfolio managers, and find traces of herding due to such contracts. Maug & Naik (1995) find that a risk averse investors compensation increases with her own performance and decreases in the performance of a benchmark, because the compensation of agent is an increasing function of the profit he earns and a decreasing function of benchmark profits, both the agent and benchmark investor make decisions on imperfect private information about stock returns. The agent portfolio choice decision is followed by the action of benchmark investor. Further analysis suggests that in extreme

cases agent will hold long position even when his information suggests him to own short position and vice versa. Palley (1995) argued that the portfolio allocation of both agent and his bench mark are interdependent, because they face a relative performance clause.

Another group of researchers focused on behavioral aspect of herding, Behavioral herding is often referred as model of non-rational or near rational herding. There are several proven studies that rational decision making is costly and in the presence of limited resources investors can economize by using non rational methods. Conlisk (1980) theoretically demonstrate that in an economic system imitation and rationality are complement to each other investors usually make choices in accordance with their level of satisfaction they derive from making that decision. This type of herding specifically deals with investor psychology, interpersonal communication or contagion of interest that is due to non rational decision making.

Pingle (1995) experimentally conducted a study to figure out when individual investors actually follow each others. He concluded that investors usually herd in a competitive environment, or immediately after the change in decision making environment or some times when investor is taking decision for the first time. Same results were found by Shiller (1990) who studied the behavior of economic actor, in speculative environment. Shiller & pound (1989) investigated this fact by using questionnaire and found non systematic behavior of investors in decision making, they found that investor usually react to each other and primarily rely on existing investors in their buying decision.

Some researchers focused on psychological factors influencing the behavior of traders. In this regard Lux (1995) discusses the behavior of non-sophisticated trader, who is receptive to other trader's behavior. These traders are regarded as uninformed about

fundamental values and therefore solely rely on the observations of the market. Traders make decisions either optimistically or pessimistically. The market is dominated by winners, i.e. if there are large no of optimistic traders then the remaining pessimistic trades most likely behave optimistically by changing there behavior because traders are considered non-sophisticated and vulnerable to other traders behavior.

Herding is also discussed by researchers on the basis of information acquisition. This type of herding occurs when all investors focus on a same set of information source or same assets and they use to mimic the action of others while purchasing information Calvo & Mendoza (1997). Golec (1997) provides an empirical evidence of herding on information acquisition. Information acquisition model presented by Brennan (1990) and Froot et al. (1992) are based on short term trading horizons; short term investors make their trading decision before the fundamental asset values are known. Investor profit is dependant on other trading decision on same information, the investor will earn more profit if more other investor trade on same piece of information. The rationale behind is that the trader will only gain if the information he traded on is incorporated completely into the market price at the time he unwind his position. So the profits can only be generated if investor acquire same piece of information that are widely studied by others. Brennan (1990) further argue that private information is reflected in stock prices after one period it is acquired and if it is acquired by minimum number of investors.

Hirshleifer et al. (1994) discusses a model of information acquisition by focusing on different types of investors. He argued that the information is discovered earlier by some investors and these investors gain when their information is confiscated in to market prices due to trade of late informed traders, by unwinding their position. Before making decision trader is not informed that whether they are early informed or late

informed, whereas the expected utility or profit maximizing is an increasing function of the sum of all informed investors. Therefore the investors herd and acquire same information.

The most debated phenomenon in herding literature is formation of information cascades. In information cascade models and herding behavior usually clustering of decision occurs. The basic idea of informational cascades suggests that the behavior of other individuals conveys information to an observing individual (Calvo & Mendoza, 1997). At a certain point, this individual will disregard his own information and follow the decisions of others. According to Bikhchandani, Hirshleifer & Welch (1992) an informational cascade appears when the investor make optimal choice of imitating the behavior of the preceding investors by observing the action of those ahead of him, without relying on his personal information.

In an informational cascade everyone is rational individual. The probability of taking wrong action is still present even if all participants as a collective have overwhelming information in favor of right action. Informational cascades explain why society, based on little information, will systematically tend to land close to the borderline, causing fragility. An unusual signal can turnover the persistent informational cascade, an little bit of public information can induce the subsequent investor to take opposite action, even if preceding investors have taken similar action (Bikhchandani et al., 1992). This type of herding is said to be rational because the reasoning process resultant in decision making process of individuals is solely based on the available information or perceived signals. The outcome may or may not be socially desirable.

Use of momentum investment strategies has also been documented in the herding literature Choe et al. (1999). Momentum trading strategies are used by academicians to

explain herding behavior mostly in irrational markets. Grinblatt et al. (1995) investigate the presence of herd behavior among fund managers and the relation of herd to momentum investment strategies and performance. Jegadeesh & Titman (1993) argued that superior returns over various monthly holdings periods can be generated by selling stocks that have performed poor in the past and buying equities that have performed well in the past. Momentum traders found to be least risk averse, follow the market consensus, rely on technical analysis and believe in miscalculations of others. Thus they appear to go with market aggressively and follow market consensus regarding their purchase decision (Brozynski, Menkhoff, & Schmidt, 2003)

Blasco, Corredor, & Ferreruel (2009) examine the way in which market volatility is affected by the presence of herding behavior in Spanish stock market. Chang et al. (2000), Oehler & Chao (2002) investigate the presence of herding behavior in foreign markets. Other recent examinations are the presence of herding behavior in futures trading (Gleason et al., 2002). Christie & Huang (1995) adopt a different approach by empirically investigating herding in equity returns. They measure the market impact of herding on stock returns by considering the cross-sectional standard deviation or dispersion of returns. The rationale behind was that, during period of extreme market movements if herding occurs, returns on individual stocks will tend to cluster around the market returns. In such periods individuals tend to suppress their private opinion in favor of the market consensus.

Christie & Huang (1995) argue that the decision making process of individual is dependant upon overall market conditions. They further contend that rational asset pricing model during normal periods predicts that dispersion in returns will increase with the absolute value of the market returns due to varying stock sensitivities to market

returns. When individual returns move in same direction as market returns dispersion is zero, where as if individual returns differ from market returns the dispersion will tend to increase. Christie & Huang (1995) findings were against herding as they find higher level of dispersion during periods of large price movements.

Demirer & Kutan (2006) used Christie & Huang (1995) model in Chinese stock market and find no evidence of herding in Chinese market. One of the drawbacks of the above said approach is that it requires the estimation of extreme returns whereas herding behavior may occur to some extent over the entire return distribution, but during periods of market stress become more prominent. Therefore Christie & Huang (1995) fail to find out herding over time and capture herding only during periods of extreme returns.

Chang et al. (2000) adopt and modify the model of Christie & Huang (1995) and develop a more sensitive means of identifying herding in stock returns by including an additional regression parameter. They use cross sectional absolute standard deviation to find out dispersion in international stock market. This model suggests that during period of large price movements, a nonlinear relationship exist between the absolute standard deviation of returns and the average market returns. They use monthly returns to investigate herding and find a significant nonlinear relationship between equity return dispersion and the underlying market price movement of the two emerging markets of South Korea and Taiwan, where as they failed to find out significant results in developed market of US, Japan, and Hong Kong. This model is further analyzed by researchers in various equity markets.

Henker et al. (2006) analyze the model using intraday data in Australian equity market and find no evidence of herding, Gleason et al. (2004) use intraday US Exchange Traded Funds (ETF) data to examine traders herd during periods of extreme market

movements and find no evidence of herding in this specialized market. Cajueiro & Tabak (2007) used Chang et al. (2000) model to investigate herding in Japanese stock market and find out herding in the period of extreme price movements. Tan et al. (2008) investigate herding behavior in two leading stock markets of china dealing in A and B shares by using the same methodology and find evidence of herding in both rising and falling market conditions. Therefore we have adopted the same methodology to find out the herding behavior in emerging market of Pakistan.

2.2. Evidence from Karachi stock exchange

Karachi stock market is considered to be a volatile market with minimal role in fund raising like many other emerging stock markets of world. Information plays limited role on stock market. Weak institutional support, lack of compliance with regulatory authority narrow trading base, poor dissemination of information, liquidity constraints and limited use of technology constrained to develop the market. Several reforms have been taken to improve the Pakistani stock market, like market liberalization, privatization, economic liberalization, relaxation of foreign exchange controls, and the easing of regulation on the repatriation of profits, investment and operation of financial institutions, Nishat (1999, 2001) have observed the change in behavior of stock prices and shift in pattern of observed anomalies after financial sectors reforms, but still there are irregularities identified in Karachi stock exchange.

Khilji (1993) studied about the behavior of stock returns and examined the returns distribution to be not normal, generally positively skewed, and positive mean. Hussain (1997) investigated the strong serial dependence in stock returns and suggested that the random walk model is inappropriate in describing the trading pattern of Pakistani

investors, similarly Ali and Mustafa (2001) investigated the effect of public information arrival on stock returns, and they also found anomalies regarding information.

Few researchers investigated the role of information related to market fundamental, Hussain and Mahmood (1999) suggest that stock market is inefficient with respect to money supply, Nishat and Khalid (2002) find out significant impact of money supply on stock returns in long run. They also examined the relationship between stock prices and exchange rates and found that Pakistani stock markets are inefficient with respect to exchange rates.

Increased volatility of many stock markets in recent years has sometimes been associated with rapid increases or decreases in asset values that may contain elements of speculative bubbles not justified by the underlying fundamentals. This lack of informational efficiency in Pakistan may lead to speculative bubble or crash situation in Pakistan. Presence of informational efficiency and speculative bubbles in Pakistani stock market may be explained by herding, as a nonlinear trend in Pakistani stock returns is identified by previous studies.

CHAPTER THREE

DATA DESCRIPTION AND METHODOLOGY

3.1. Data

The data for this study include daily and monthly closing prices and trading volumes of Pakistani individual stocks that comprise the KSE Index. The KSE 100 is the most widely followed and most frequently quoted Pakistani stock index, calculated to accurately reflect the Pakistani stock market. The KSE-100 is a capital weighted index and consists of 100 companies representing about 86 percent of market capitalization of the Exchange. Therefore, this research included individual stocks that belong to the KSE index (as of December 2008). We obtain daily data from June 1, 2004 to July 31, 2007. We have 774 daily return observations for Karachi stock exchange listed companies. The original sample comprised 100 largest KSE stocks by market capitalization for the year 2004-2007, out of which 72 companies fulfill our requirements of continuous data therefore included in the study to analyze herding in daily returns.

Monthly data set was obtained for the period ranging from July 2002 to June 2007, with total number of 59 monthly return observations. For monthly returns 71 out of KSE 100 companies meet our requirements, therefore included in the data set. The market return is defined as the equally weighted average of returns of all the firms in the sample. An equally weighted portfolio return is used rather than a value weighted return for our investigation because the market capitalization of Pakistani equities market is heavily concentrated. Top 100 companies at KSE represent 86 percent of the total market capitalization.

3.1.1. Data sources

Daily and monthly closing price of stocks has been obtained from business recorder and fnetrade. Daily trading volume for the period June 1, 2004 to July 31, 2007, consists of 775 daily trading volumes data points for 72 companies listed on KSE. Monthly trading volumes ranges for the period July 2002 to June 2007 consist of 60 trading volumes data points of 71 companies listed on KSE. Monthly money supply, Treasury bill rates, and exchange rates data were obtained from the data base of state bank of Pakistan.

3.1.2. Dependent variables

For the identification of herding behavior two dependant variables are used that is cross-sectional standard deviation (CSSD) as identified by Christie & Huang (1995) and CSAD (cross sectional absolute deviation) used by Chang et al. (2000). These are the most widely used measure to identify the presence of herd formation in individual trading activities.

3.1.3. Independent variables

For identification of herding in equity markets, average stock market returns were identified most appropriate measure to identify herding and utilized in several ways by relevant methodologies. Stock trading volumes, stock return volatility were used to detect the asymmetric effects on herding behavior. To find out the affect of macroeconomic fundamentals money supply, exchange rates and treasury bills rates were also used as independent variables.

3.2. Methodology

This section includes the empirical methodology designed to detect the presence of herding behavior in an emerging stock market of Pakistan. According to the efficient market hypothesis, investor reaction to information is reflected in the changes in stock market index of a particular country's stock market. This empirical investigation is built on the methodology used in Christie & Huang (1995), Chang et al. (2000) and Gleason et al. (2003, 2004). According to the frame work developed by Christie & Huang (1995) during periods of market stress, investors ignore their private information and rely on market consensus as their own belief. Thus if herding occurs, the investors make similar decisions, individual returns will converge to aggregate market returns leading to lower dispersion from market return (Gleason et al., 2004). In order to detect herd behavior Christie & Huang (1995) measure average proximity of the realized market returns to individual asset returns by using cross sectional standard deviation (CSSD), which is expressed as follow

$$CSSD_t = \sqrt{\frac{\sum_{i=1}^{N}(R_{i,t} - R_{m,t})}{N-1}} \qquad (1)$$

Where, N is the number of firms in the portfolio, Ri t is the observed stock return of firm

i at time t, Rm,t is the cross-sectional average stock of N returns in the portfolio at time t.

During period of market stress herding behavior represent contradictory prediction from the traditional asset pricing model concerning the behavior of the cross sectional standard deviation of returns. According to rational asset pricing model contrary sensitivities of individual securities to the market returns results in increased dispersion,

where as presence of herding can result in relatively lower dispersion in periods of large market movements, so this study test herding keeping in view the rational asset pricing model, by estimating the following empirical design proposed by Christie & Huang (2005):

$$CSSD_t = \alpha + \beta_1^U D_t^U + \beta_2^L D_t^L + \varepsilon_t \tag{2}$$

Where, $D_t^U = 1$, if the return on the aggregate market portfolio for the time period t lies in the extreme upper tail of the returns distribution, and 0 otherwise. $D_t^L = 1$, if the return on the aggregate market portfolio for time period t lies in the extreme lower tail of the returns distribution, and 0 otherwise. The α coefficient describe the average level of dispersion of the sample, include the area excluded by the dummy variables, whereas the dummy variables describe the difference in investor behavior during extreme market movements from the period of relatively normal market returns. Thus, the presence of negative and statistically significant $\beta 1$ and $\beta 2$ coefficients would indicate herd formation by market participants. Conversely, significantly positive coefficients $\beta 1$ and $\beta 2$ establish the prediction of rational asset pricing model.

An alternative methodology was proposed by Chang et al. (2000) to identify herding. Chang et al. (2000) argue that the model proposed by Christie & Huang (2005) requires defining what is meant by market stress. They used cross sectional absolute deviation rather then CSSD. During period of extreme market returns herding would be evidenced by a lower or a less than proportional increase in the cross-sectional absolute deviation (CSAD). CSAD can be expressed as follows,

$$CSAD_t = \frac{1}{N} \sum_{i=1}^{N} | R_{i,t} - R_{m,t} | \tag{3}$$

According to the rational asset pricing model there exist a linear relation between the dispersion individual asset returns and the aggregate market returns, and the dispersion in individual asset returns should increase as the absolute value of market returns increases. Where as in practice investor behave in a more uniform manner during period of large market price movements, they ignore their private assessment and follow the aggregate market trend, this behavior result in increase in correlation among asset returns, and likely to decrease dispersion among asset returns, or increasing at a decreasing rate with the market returns, so the relationship between aggregate market returns and individual securities become non linearly increasing or even decreasing (Chang et al, 2000). In such a situation prediction of rational asset pricing model no longer hold, this non linear relationship is modeled as follows,

$$CSAD_t = \alpha + \gamma_1 \left| R_{m,t} \right| + \gamma_2 R_{m,t}^2 + \varepsilon_t \tag{4}$$

The relationship among CSAD and $R_{m,t}$ indicates the presence of herding, where $R_{m,t}$ is the equally weighted average stock returns in the KSE listed portfolio, where as $R_{m,t}^2$ is included in the test equation to investigate the non linearity in market returns, presence of significantly negative coefficient γ_2 confirm the existence of herding behavior in equity markets.

Gleason et al. (2004) argue that this nonlinear component would also be observed for CSSD if herding is present during periods of market stress. To obtain a more comprehensive analysis, Gleason et al. (2004) test two additional models where they swap the dependent variables in Eqs. (2) and (4)

$$CSAD_t = \alpha + \beta_1^U D_t^U + \beta_2^L D_t^L + \varepsilon_t \tag{5}$$

$$CSSD_t = \alpha + \gamma_1 |R_{m,t}| + \gamma_2 R_{m,t}^2 + \varepsilon_t \qquad\qquad (6)$$

Chang et al. (2000) report asymmetry in investor's reaction to market movements. Scope of this research also include the identification of potential asymmetries in market conditions, Tan et al. (2008) identify potential asymmetry in market returns, trading volume, and volatility of Chinese stock market. With the help of trading volume, market returns and volatility this study characterize the existence of herding asymmetry in Pakistani stock markets during different market conditions.

It is observed that rate of increase in dispersion with respect to aggregate market returns is higher when market is progressing as compare to when market is declining. The herding regression is estimated separately for positive and negative market returns to investigate the asymmetry in bullish and bearish trends. Specifically, the system can be written as

$$CSAD_t^{Up} = \alpha + \gamma_1^{Up} |R_{m,t}^{Up}| + \gamma_2^{Up} (R_{m,t}^{Up})^2 + \varepsilon_t, \qquad \text{if } R_{m,t} > 0 \quad (7)$$

$$CSAD_t^{Down} = \alpha + \gamma_1^{Down} |R_{m,t}^{Down}| + \gamma_2^{Down} (R_{m,t}^{Down})^2 + \varepsilon_t, \qquad \text{if } R_{m,t} < 0 \quad (8)$$

Where $R_{m,t}^{Up}$ ($R_{m,t}^{Down}$) represent the equal-weighted portfolio returns during the bullish (bearish) market trends at time t, and $(R_{m,t}^{Up})^2 [(R_{m,t}^{Down})^2]$ is the squared value of equal-weighted portfolio to investigate the non linearity in market returns when market is rising (declining). $CSAD_t^{Up} (CSAD_t^{Down})$ is the cross sectional absolute deviation at time t consequent to rising (declining) market returns.

It is obvious from the previous studies that the level of herding behavior may be associated with trading volume, and suggested a positive relationship between market returns and trading volumes, (Wermers 1999; Nofsinger & Sias, 1999; Edelen & Warner,

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2001). Li et al. (2009) had proven this fact by finding significantly positive correlation among average trading volumes and market returns of the individual investors. Furthermore they find positive correlation in dispersion of individual trading volumes and also that individual trading volumes are highly correlated. Li et al. (2009) findings supported the argument that investors follow the behavior of others and closely observe and rely on each others trade patterns. Tan et al. (2008) empirically tested the significance of herding in the rising and declining trends in trading volume, so this study also examine possible asymmetric effects during periods of high or low volume. For daily market returns trading volume V_t is considered to be high (low) if on day t it is greater (lesser) then last 30 days moving averages. Similarly for monthly data 5 months moving averages is considered to characterize the presence of herding with respect to high or low trading volumes. The herding regression is estimated separately for high and low trading volumes. Specifically, the arrangement can be represented as,

$$CSAD_t^{V-high} = \alpha + \gamma_1^{V-high}\left|R_{m,t}^{V-high}\right| + \gamma_2^{V-high}(R_{m,t}^{V-high})^2 + \varepsilon_t \qquad (8)$$

$$CSAD_t^{V-low} = \alpha + \gamma_1^{V-low}\left|R_{m,t}^{V-low}\right| + \gamma_2^{V-low}(R_{m,t}^{V-low})^2 + \varepsilon_t \qquad (9)$$

Where $R_{m,t}^{V-high}$ refers to market returns when trading volume is high and $R_{m,t}^{V-low}$ represent the low trading volumes state. Significantly negative coefficients γ_2 establish the presence of herding in market with respect to trading volumes.

Friedman (1953) first reported the relationship between investor behavior and market volatility by finding that the irrational investors destabilize prices by purchasing stocks when prices are high and selling when they are low, where as rational investor by buying low and selling high move the prices towards their fundamentals. French,

Schwert, & Stambaugh (1987) find a negative correlation between volatility and returns, where volatility increases after stock price decline and decrease after stock price increases, a fact identified to be asymmetric volatility effect. Hellwig (1980) and Wang (1993) argued that information asymmetry may drive volatility, irrational investor follow the market trends by buying when prices rise and sell when prices fall so uninformed trading result in volatility, this behavior is identical to herding. Therefore irrational trading resulting in increased volatility may lead to herd formation. This study focused to investigate potential asymmetric effects of herding behavior with respect to market volatility.

Tan et al. (2008) claimed that the herding is more obvious during period of high volatility. Similar to our analysis of trading volume, we examine possible asymmetric effects during periods of high or low volatility. For daily market returns volatility δ_t is considered to be high (low) if on day t it is greater (lesser) then last 30 days moving averages. Similarly for monthly data 5 months moving averages is considered to characterize the presence of herding with respect to high or low returns volatility. The possible asymmetric effect is investigated using following empirical specification,

$$CSAD_t^{\delta^2,High} = \alpha + \gamma_1^{\delta^2,High}\left|R_{m,t}^{\delta^2,High}\right| + \gamma_2^{\delta^2,High}(R_{m,t}^{\delta^2,High})^2 + \varepsilon_t \qquad (10)$$

$$CSAD_t^{\delta^2,Low} = \alpha + \gamma_1^{\delta^2,Low}\left|R_{m,t}^{\delta^2,Low}\right| + \gamma_2^{\delta^2,Low}(R_{m,t}^{\delta^2,Low})^2 + \varepsilon_t \qquad (11)$$

Where, $R_{m,t}^{\delta^2,High}$ refer to high return volatility and $R_{m,t}^{\delta^2,Low}$ represents low return volatility, and $(R_{m,t}^{\delta^2})^2$ is computed as the square of the portfolio market return in period t.

Our analysis in this research is focused on the determination of prices from a behavioral perspective, herding behavior. The above stated analysis is intended to find

that the presence of herd behavior and its impact on stock prices, because presence of herding destabilizes the prices and tends to exacerbate the volatility of returns and causes the prices to deviate from the fundamental value, therefore we expect CSAD to change over time with the change in ($R_{m,t}$) in response to level of herding in market. In realm several other fundamental factors that may affect the stock prices or may increase the volatility of returns, so in order to find out the resultant CSAD due to presence of herding is robust in the presence of other variables or the market state such as the degree of market volatility or the market returns as well as potential variables reflecting macroeconomic fundamentals.

To check the potential impact of macroeconomic variables this research includes Treasury bill rates, money supply and exchange rates to the herding regression. These variables have potential impact on asset price as well, if interest rate rises, it will increase the cost of capital, higher interest rate reduces the profit margin. Lower profits, lower cash inflows and a higher required rate of return for investors all translate into depressed fair value for the company's stock. Changes in interest rates impact the theoretical value of companies and their share, a share's fair value is its projected future cash flows discounted to the present using the investor's required rate of return. If interest rates fall and everything else is held constant, share value should rise and vice versa.

Money supply is a measure of liquidity available to investors, more liquidity indicate more investment and excessive demand of equity, this increase in demand can result in higher prices at a given supply of stocks. An increase in stock prices leads to an increase in demand of domestic assets; this in turn cause a domestic currency to appreciate. Similarly the export of a country increases if a domestic currency depreciates which in turn makes local firms more competitive, which in turn raises their stock prices.

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If $R_{m,t}$ become statistically insignificant and $R_{m,t}^2$ becomes insignificant and non linear in the presence of the above mentioned macroeconomic variables then changes in the $CSAD_t$ is expected to be due to these fundamental rather then herding. Therefore fundamentals like exchange rate, Treasury bill rate and money supply allow us to take into account the effect of these variables while determining the level of herding through $CSAD_t$ is Treasury bill rates

$$CSAD_t = \alpha + \gamma_1 |R_{m,t}| + \gamma_2 R_{m,t}^2 + \theta_1(TB_t) + \theta_2(ER_t) + \theta_3(M_t) + \varepsilon_t$$

In order to check the robustness of the analysis, we examine the possible effect of March 2005 financial crises on our results. On March 15, 2005, Karachi stock market index shot of the record and closed at 10,300 points, a historic day in Pakistan stock market history. But this stock price bubble was followed by a crash that caused many small investors to lose their life savings, the KSE 100 index started to slump down on March 16, 2005 just after a week time on March 24, 2005, crash landed at 7,900 points. This unusual period is included in our study design in order to confirm the presence of speculative trading that leads to herd formation. In this regard data was separated for the period from 31st January to 29th April and estimated the following regression equation.

$$CSAD_t = \alpha + \gamma_1 |R_{m,t}| + \gamma_2 R_{m,t}^2 + \gamma_3 R_{m,t}^2 * DM_t + \varepsilon_t$$

Where DM_t is dummy variable takes the value of unity during the crisis period, and zero otherwise. In this study $R_{m,t}^2$ is utilized to find out non-linearity over the entire period of time, whereas we use cross dummy $\gamma_3 R_{m,t}^2 * DM_t$ to highlight the non linear behavior in that specific behavior when Pakistan equity market was experiencing a crash.

3.3. Test statistics

We used OLS regression analysis to estimate the relationship between dependent and independent variables to detect the presence of herding in Pakistani stock market.

3.4. Hypothesis

H1: Equity return dispersions are different from average during periods of extreme market movements.

H2: There exist a non linear relationship between market returns and cross section absolute deviation during market stress

H3: Herding exists during period of falling market returns.

H4: Herding exists during period of rising market returns.

H5: Herding exists in low trading volumes periods.

H6: Herding exists high trading volumes period.

H7: Herding exists during period of low volatility.

H8: Herding exists during period of high volatility.

H9: Macroeconomic fundamentals affect the herding behavior

CHAPTER FOUR

DATA ANALYSIS AND DISCUSSION

4. Results

4.1. Descriptive statistics

Table 1 reports summary statistics for weighted average portfolio market returns, cross sectional standard deviation and cross sectional absolute deviation for daily and monthly data. For daily data, the sample spans the year 2004-2007 and consist of observations from 72 frequently traded stocks from the KSE 100 index. It consists of 772 daily observations, where as for monthly returns the data period is extended over a period ranging 2002-2007, and consists of 60 observations from 72 stocks traded on KSE 100.

Table 1: Results of descriptive Statistics

Sample	variable	N	Mean (%)	Standard deviation (%)	Min (%)	Max (%)
Daily	$R_{m,t}$	775	0.0808	1.0897	-5.5478	5.6408
	$CSSD_t$	775	2.5294	2.6631	1.0931	47.5412
	$CSAD_t$	775	1.6395	0.6864	0.3690	11.0385
Monthly	$R_{m,t}$	60	2.7153	6.6532	-17.3535	13.7407
	$CSSD_t$	60	18.8997	15.7246	7.6236	69.5434
	$CSAD_t$	60	10.3578	3.9198	5.7265	22.8818

The average market returns based on monthly data are greater than that of daily data. As expected, the return dispersion measures increases with the increase in return interval. The magnitude of dispersion measure is higher for the monthly data than for daily data. Mean and variability is lower for daily CSAD measure as compare to daily CSSD measure, which confirms the previous findings research of Granger and Ding, 1993. They argued that absolute deviation metrics are inherently less sensitive to outlier as compare to Standard deviations.

4.2. Evidence on herding

4.2.1. Regression results for extreme market movements using CSSD.

Table 2 provides the regression estimates for the regression across the KSE 100 index companies, we construct two sets of dummy variables D_t^U and D_t^L which capture the change in investor behavior associated with extreme upward and downward market movements, Following the methodology in Christie & Huang (1995), Chang et al. (2000) and Gleason et al. (2003), we use 1 and 5% criteria to restrict the dummy variables to 1 and 5% of the lower and upper tail of the market return distribution. Our findings are consistent with the previous researches in the sense that during period of extreme market movements we didn't find any evidence of herd formation.

Table 2

Panel a: Regression coefficients for $CSSD_t = \alpha + \beta_1^U D_t^U + \beta_2^L D_t^L + \varepsilon_t$ using 5% criterion

Sample	α	β_1^U	β_1^L	adj.R^2	F	Sig
		5% criterion				
Daily	2.3226	1.9454	1.7961	0.0472	20.2063	0.0000
t-stats	23.4868	4.5521	4.5885			
p-value	0.0000	0.0000	0.0000			
Monthly	17.5010	14.2632	13.7116	0.0399	2.2261	0.1172
t-stats	8.3468	1.5606	1.5002			
p-value	0.0000	0.1241	0.1390			

For daily data regression results yield significantly positive coefficients for all coefficients, so our results supports the rational asset pricing models that predicts during period of market stress dispersion increases, as the individual returns differ in their sensitivity to the market returns. Further more the coefficient values for upside moves are almost equal to the downside moves. The regression results for monthly data are

significantly positive for 1% criteria, whereas insignificant for 5% criteria where data extreme values lies at 1% and 5% of the upper and lower tails of the distribution. It is evident from previous researches that the effect of herding behavior average out in long run.

Panel b: Regression coefficients for $CSSD_t = \alpha + \beta_1^U D_t^U + \beta_2^L D_t^L + \varepsilon_t$ using 1% criterion

Sample	α	β_1^U	β_1^L	adj.R^2	F	Sig
			1% criterion			
Daily	2.3584	7.1122	9.4544	0.1977	96.4134	0.0000
t-stats	27.2397	8.3895	11.1522			
p-value	0.0000	0.0000	0.0000			
Monthly	17.2326	50.3415	49.6870	0.3080	14.1336	0.0000
t-stats	10.0334	3.8159	3.7663			
p-value	0.0000	0.0003	0.0003			

4.2.2. Regression results for extreme market movements using CSAD.

Table 3 reports the results of extreme market movements following the model of Gleason et al (2004) where the herding can also be observed by using CSAD as a measure of dispersion, instead of CSSD. The findings are very similar to the findings evident from the table 2, where CSSD was used as a dependant variable, here too β_1 and β_2 are significantly positive indicating a divergence of individual market returns from the aggregate market portfolio returns, in other words absence of herding behavior. These findings support the findings of Gleason et al. (2004) that irrespective of measure utilized for dispersion, the results from both regression reported in table 2 & 3 do not support the presence of herding behavior for the KSE 100 index companies. According to Christie & Huang (1995) the presence of positively significant coefficient supports the assumption of asset pricing model in extreme market returns.

Table 3

Panel a: Regression coefficients for $CSAD_t = \alpha + \beta_1^U D_t^U + \beta_2^L D_t^L + \varepsilon_t$ using 5% criterion

| | 5% criterion | | | | | |
Sample	α	β_1^U	β_1^L	adj.R^2	F	Sig
Daily	1.5380	1.0288	0.8199	0.1804	86.2016	0.0000
t-stats	65.0523	10.06925	8.7620			
p-value	0.0000	0.0000	0.0000			
Monthly	9.9419	4.6388	3.6782	0.0731	3.3272	0.0429
t-stats	19.3591	2.0722	1.6431			
p-value	0.0000	0.0427	0.1058			

Results in table 3 replicate the analysis in table 2, except the adjusted R^2, that become progressively higher, and gives more explanatory power to the model when CSAD is used as a dependant variable instead of CSSD. In all 2 cases CSAD provides a better fit of data comparative to CSSD.

Panel b: Regression coefficients for $CSAD_t = \alpha + \beta_1^U D_t^U + \beta_2^L D_t^L + \varepsilon_t$ using 1% criterion

| | 1% criterion | | | | | |
Sample	α	β_1^U	β_1^L	adj.R^2	F	Sig
Daily	1.5898	2.2908	2.5144	0.2465	127.6678	0.0000
t-stats	73.5105	10.8174	11.8731			
p-value	0.0000	0.0000	0.0000			
Monthly	9.9645	12.9172	10.6764	0.2749	12.1886	0.0000
t-stats	22.7367	3.8371	3.1715			
p-value	0.0000	0.0003	0.0024			

4.2.3. Regression results estimation of non-linearity using CSSD and CSAD.

Table 4 presents the regression results of the empirical investigation based on the Chang et al. (2000) model on the entire data; daily and monthly sample, the regression results of the equation where quadratic term is included to evaluate the possibility of non-

linearity to change in dispersion. For daily data, the coefficient γ_1, is significant and negative confirming that CSAD and CSSD both decreases with the absolute market returns.

Table 4

Panel a: Regression results estimation of non-linearity using CSSD.

Sample	α	γ_1	γ_2	adj.R^2	F	Sig
Daily	1.4632	-0.0786	0.1985	0.542	459.336	0.0000
t-stats	48.0486	-1.5100	13.8812			
p-value	0.0000	0.1314	0.00000			
Monthly	10.7101	-0.7317	0.07841	0.246	10.667	0.0001
t-stats	9.7923	-2.0946	3.2938			
p-value	0.00000	0.0406	0.00170			

These findings depict inefficiency in market and consistent with the findings of Demirer et al. (2007). They observe similar findings in Asia, Africa and some developed countries.

Panel b: Regression results for estimation of non-linearity using CSAD.

Sample	α	γ_1	γ_2	adj.R^2	F	Sig
Daily	3.0833	-2.6297	1.2303	0.4679	341.4416	0.0000
t-stats	24.2114	-12.0787	20.5731			
p-value	0.0000	0.0000	0.0000			
Monthly	25.2567	-4.1614	0.3604	0.2017	8.4537	0.0006
t-stats	5.5914	-2.8843	3.6658			
p-value	0.0000	0.0055	0.0005			

Where as the nonlinear term γ_2 is statistically significant but there is no evidence of herding because market dispersion is increasing at increasing rate showing in efficiency in market rather then herding, result findings suggests that investors trade

away from the market consensus during periods of market stress. These results were confirmed by adding continuous values of market returns to the following equation.

$$CSAD_t = 3.08 - 2.63|R_{m,t}| + 1.23R_{m,t}^2 + \varepsilon_t \qquad \text{(i)}$$

$$(-12.07)** \qquad (20.57)**$$

The findings were graphed to observe the buying trend of market investor. It was observed that as market returns increases dispersion decreases, this decrease in dispersion do not prevail for a long time as increase in market returns reaches at a specific point dispersion of individual returns from market returns starts to increase at an increasing rate.

Table 1:
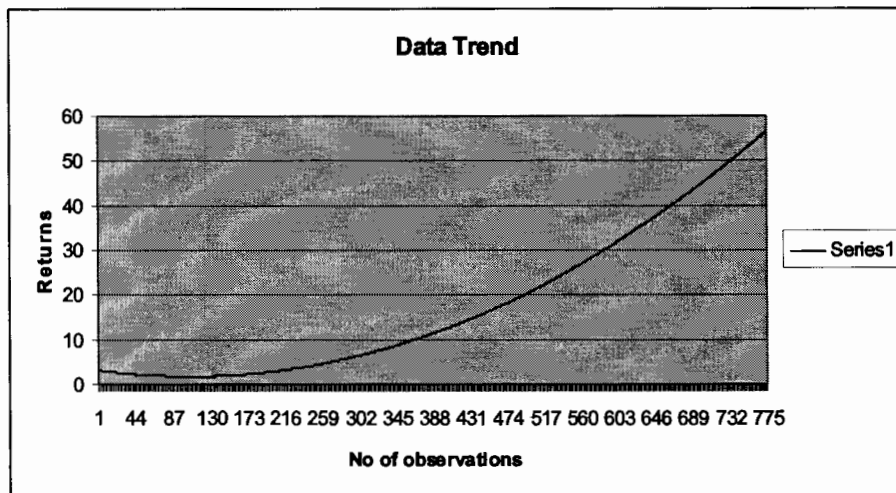
Therefore above graph indicates that when returns increases CSAD increases it means their exist divergence between market returns and individual stock returns therefore it can be said that individual market do not follow the market thus no evidence of herding exist in Pakistani market. But the findings are also contradictory with rational asset pricing model because presence of significant negative coefficient γ_1 indicates convergence of individual and market returns rather then convergence.

The results are almost similar for monthly data. Results suggest that assets are mispriced in Pakistani stock market due to lack of appropriate information to traders, uncertainty in market trends and unregulated market structure. The presence of short term speculators also affects the pricing mechanism. On contrary Panel b suggest that our findings are in line with the findings of Gleason et al (2004), by swapping CSAD with CSSD there was no difference in results.

4.3. Asymmetric effect on herding behavior

4.3.1. Market returns

Further more Table 5 reports the evidence of herding behavior during bull and bear conditions, absolute returns are used because we are interested in the size of returns not the signs, panel a reports that γ_1 coefficients for up market conditions are insignificant for both daily and monthly returns, whereas γ_2 coefficients report results similar to the results of equation (i). At the beginning dispersion between individual returns and market returns converges, immediately after reaching a specific point the crowding of returns disappear and prices continuously rises due to inefficiency and mispricing.

Table 5

Panel a: Estimating regression in bull market conditions ($R_{m,t} > 0$)

Sample	α	γ_1^{Up}	γ_2^{Up}	adj.R^2	F	Sig
Daily	1.4868	-0.1058	0.2153	0.5426	280.4535	0.0000
t-stats	40.6967	-1.6447	12.1050			
p-value	0.0000	0.1007	0.0000			
Monthly	9.3521	-0.2393	0.0425	0.1303	3.9235	0.0284
t-stats	6.8301	-0.5112	1.2412			
p-value	0.0000	0.6121	0.2223			

It is verified that during period of falling market returns the γ_1 coefficient are insignificant for both daily and monthly market returns violating the assumption of asset pricing model, where as results for γ_2 coefficient are in line with the results during rising market conditions.Both models were found to be good fit as the F-test give significant results. The explanatory power is almost same in both bull and bear market conditions.

Panel b: Estimating regression in bear market conditions ($R_{m,t} < 0$)

Sample	α	γ_1^{Down}	γ_2^{Down}	adj.R^2	F	Sig
Daily	1.4223	-0.0377	0.1816	0.5428	180.3417	0.0000
t-stats	26.7860	-0.4364	7.6835			
p-value	0.0000	0.6628	0.0000			
Monthly	11.9925	-1.1119	0.1026	0.3304	5.6881	0.0128
t-stats	5.8161	-1.6598	2.5687			
p-value	0.0000	0.1152	0.0199			

4.3.2. Trading volume

Panel A and B of Table 6 reports the results of the asymmetric trading volume herding regressions. The evidence from Panel a indicates that in the high trading volume state γ_1 coefficient are significant and positive, confirming the assumption of asset pricing model, whereas γ_2 measure is insignificant indicating no herding during period of high trading volumes.

Table 6

Panel a: Estimating regression in high trading volume state

Sample	α	γ_1^{V-high}	γ_2^{V-high}	adj.R^2	F	Sig
Daily	1.3699	0.3897	-0.0128	0.2644	65.7162	0.0000
t-stats	37.1578	4.7467	-0.3626			
p-value	0.0000	0.0000	0.7170			
Monthly	11.9954	-1.0412	0.0921	0.3641	9.0191	0.0010
t-stats	7.2205	-2.1800	3.1321			
p-value	0.0000	0.0384	0.0042			

Findings from monthly returns reports consistent results with equation (1) suggesting inefficiency in Pakistani stock markets. These results indicate that Pakistani markets are weak form efficient in period of high trading volume, where as these affects vanishes as the time horizon is expanded. In the long run markets are inefficient and pattern of investors trading behavior is dependant upon unknown factors. It is evident from results that in the low volume state, the coefficient $\gamma 2$ is positive and significant for all daily returns, confirming increase in dispersion from market returns and no evidenced of herding but the presence of statistically negative γ_1^{V-low} is indicative of relative inefficiency and negate the assumption of rational asset pricing model. The coefficient γ_2^{V-low} is insignificant for monthly returns, showing no herding as the time interval increases.

Panel b: Estimating regression in low trading volume state

Sample	α	γ_1^{V-low}	γ_2^{V-low}	adj.R^2	F	Sig
Daily	1.4556	-0.1997	0.2290	0.6080	298.8566	0.0000
t-stats	30.6284	-2.5612	11.6407			
p-value	0.0000	0.0108	0.0000			
Monthly	10.4362	-0.8300	0.1005	0.0300	1.4027	0.2653
t-stats	5.8041	-1.0536	1.3928			
p-value	0.0000	0.3025	0.1764			

4.3.3. Market volatility

This study found similar results when market volatility was high, $\gamma_1^{\delta-high}$ coefficient was negative and significant showing decrease in dispersion from market returns and relative inefficiency, where as $\gamma_2^{\delta-high}$ for non-linear term was significant and positive depicting increase in dispersion of individual returns from

average market returns, therefore no evidence of herding was identified during period of high market returns volatility.

Table 7

Panel a: Estimating regression in high volatility state

Sample	α	$\gamma_1^{\delta-high}$	$\gamma_2^{\delta-high}$	adj.R^2	F	Sig
Daily	12.5091	-24.1715	13.0754	0.07222	23.4184	0.0000
t-stats	4.2194	-3.9297	4.1569			
p-value	0.0000	0.0000	0.0000			
Monthly	20.0055	-3.6029	0.2948	0.2821	6.6994	0.0043
t-stats	4.4295	2.6419	3.1193			
p-value	0.0001	0.0135	0.0042			

These findings are inconsistent with rational asset pricing model suggesting that the Pakistani market is in inefficient and assets are mispriced because of certain influential factors leading market toward irrationality.

Panel b: Estimating regression in low volatility state

Sample	α	$\gamma_1^{\delta-low}$	$\gamma_2^{\delta-low}$	adj.R^2	F	Sig
Daily	1.5070	-0.7263	0.8128	0.0433	4.7876	0.0095
t-stats	0.5085	-0.1176	0.2561			
p-value	0.6117	0.9064	0.7981			
Monthly	14.1342	-1.7981	0.1553	0.1685	3.4334	0.0503
t-stats	4.5423	-1.7479	2.1413			
p-value	0.0001	0.0944	0.0435			

In the low volatility state none of γ_1 and γ_2 coefficient significant for both daily and monthly returns; suggesting no herding when market volatility is low. These results are consistent with Tan et al., (2007).

4.4. Herding behavior and Macroeconomic fundamental

This study also verified the effect of change in macroeconomic information on the presence of herd formation, the results provide evidence that Pakistani stock markets are

irrational, inefficient and assets are mispriced, the investors did not follow market consensus at one extreme or even market relevant information at the other, unidentified behavior is observed regarding purchasing decision of traders. Results in table 8 reports that effect of macroeconomic fundamentals on herding behavior is insignificant, therefore confirming the state of inefficiency in markets. According to Chang et al (2000), higher R^2 value in emerging markets implies that investor is more focused on the macroeconomic information due to relative scarcity of rapid and correct firm specific information in developing markets. However, to the extent that investor react to any useful information, whether the information is market related or firm specific, such type of behavior is viewed as rational.

Table 8

Regression results to detect the affect of macroeconomic fundamentals

Sample	α	γ_1	γ_2	θ_3	θ_4	θ_5	adj. R^2	F	Sig
Monthly	-360.28	4.3276	0.3481	17.0354	21611.4	0.0079	0.228	4.493	0.0017
t-stats	-1.3859	-3.0185	3.5765	0.0088	1.4616	1.6073			
p-value	0.1714	0.0038	0.0007	0.9929	0.1496	0.1137			

Table 8 reports conflicting results with Chang et al (2000), as the value of R^2 has decreased rather then increasing. Therefore it is argued that when the markets are irrational and prices are not determined on the basis of asset pricing models, fundamentals like macroeconomic variables are back bitters and non influential. Investor pricing decisions does not seem to be largely affected by change in interest rates, money supply and exchange rates. According to EMH market information completely reflects any change in these fundamentals but in case of inefficient markets and due to presence of herding investors imitate the behavior of others. Prices deviate from their

fundamentals; therefore the effect of either firm specific or macro economic information is not reflected in the purchasing decision of investors.

4.5. Robustness of the herding measure

In order to check the robustness of our results we use cross dummies and separate the data set for March 2005, the time period when a crash hits the Pakistani equity market. The presence of herding is confirmed by significantly negative γ_3 during period of extreme market movements, specifically when market follows bullish trends.

Table 9
Regression results to check the robustness of herding measure.

Sample	α	γ_1	γ_2	γ_3	adj.R^2	F	Sig
Daily	1.4613	-0.0916	0.2238	-0.0745	0.5640	334.7883	0.0000
t-stats	49.1727	-1.8033	15.4137	-6.2985			
p-value	0.0000	0.0717	0.0000	0.0000			

Therefore it is observed that in the long run herding is not identified where as herding is present to the extent where stock markets are highly volatile i.e. markets are following either bullish or bearish trends, because the crash period of 2005 was indicative of record bullish trend followed by a sharp decline in market activity. Therefore presence of herding is confirmed to the extent of abnormal market activities but overall market trading is indicative of inefficiency driven by unidentified trading pattern.

CHAPTER FIVE

CONCLUSION

5.1. Major findings

This study examines the existence of herding behavior in Pakistani stock markets. Herding is a psychological state in which investors rationally or irrationally follow each others decisions in financial world, such state of market returns is associated with market inefficiency and abnormal market volatility. In order to identify herding two different methodologies as suggested by Christie and Huang (1994) and Chang, Cheng and Khorana (2000) were employed to test whether returns behave as predicted by the CAPM during periods of market stress. Results based on daily and monthly data indicate that Pakistani stock exchange is characterized by no investor herding in overall market conditions.

The empirical tests indicate that during periods of extreme price movements, equity return dispersions tend to increase rather than decrease, hence providing evidence against the presence of any herd behavior. The results for the Pakistani equity markets are consistent with those documented by Christie and Huang (1995) and findings are inline with the rational asset pricing model, indicating higher dispersion of equity returns (no herding) during both extreme up and down price movement days, which indicates the efficiency of markets during extreme market movements. Therefore Christie and Huang (1995) model can be employed in Pakistani markets when there is an extreme movement in market returns.

Results based on Chang et al (2000) indicate no herding and inconsistent with the rational asset pricing model. As market dispersion is increasing at increasing rate showing in efficiency in market rather then herding, result findings suggests that investor's trade away from the market consensus during periods of market stress. Results suggest that

assets are mispriced in Pakistani stock market due to lack of appropriate information to traders, uncertainty in market trends and unregulated market structure. The presence of short term speculators also affects the pricing mechanism.

This study also tested potential asymmetric effect of market returns, trading volume and market volatility to confirm hard formation during extreme market conditions for both daily and monthly returns. Market returns provide similar results and provide no evidence of herding in both bullish and bearish trends and market behavior is inefficient and irrational in both rising and falling returns. At the beginning dispersion between individual returns and market returns converges, immediately after reaching a specific point the crowding of returns disappear and prices continuously rises due to inefficiency and mispricing. For Pakistan, we document the presence of higher equity return dispersions (and hence no herding) during both extreme up and down price movement days. The increase in return dispersions across the emerging markets may partly be the result of incomplete information disclosure in the emerging markets.

When potential asymmetric affect of trading volumes was tested, Similar results were obtained in case of low trading volumes, confirming increase in dispersion from market returns and no evidenced of herding but the presence of statistically negative linear coefficient is indicative of relative inefficiency and negates the assumption of rational asset pricing model. Where as market returns in high trading volumes indicates results consistent with the rational asset pricing model in case of daily returns. According to the rational asset pricing model there exist a linear relation between the dispersion individual asset returns and the aggregate market returns, and the dispersion in individual asset returns should increase as the absolute value of market returns increases but this effect tends to disappear as time horizon expended i.e. in case of monthly returns. Therefore it is

concluded that Pakistani markets are weak form efficient particularly in high trading volume states, so Pakistani investor behave rationally in times when trading volumes are high.

Asymmetric affect related to market volatility provides results against any herding behavior. During the phase of high market returns volatility results indicate increase in dispersion of individual returns from average market returns; therefore no herding was identified during period of high market returns volatility, but results does not support the assumption of asset pricing model, whereas low market volatility has insignificant impact on herding behavior.

When macroeconomic factors were included in the regression model it was observed that macroeconomic information have insignificant role in the decision making process of market participants. Pakistani investor is observed to be irrational, as both market related and firm specific information has no effect on the buying behavior of investor. Therefore it is stated that overall Pakistani markets are dominated by inefficiency but weak form efficiency is evident during a short time horizon, specifically when trading volume is high, in long run assets are mispriced because of certain influential factors leading market toward irrationality.

Lastly, we conduct tests to examine crises period of March 2005, to find out the effect of abnormal nature of stocks market on trading activities. However, these tests alter our evidence in favor of herding specifically in crises situations. In an emerging market, like Pakistan, studying price patterns and observing the extent of their relationship with market fundamentals provides valuable insight for policy making and investment decisions specifically when there is abnormal market movements. . Therefore in Pakistan this model can be used to detect herding behavior during crises situation.

5.2. Policy implications

These findings have important implications for stock market inefficiency and offer an interesting insight to detect the presence of herding behavior during stock market crisis situations. For an accurate determination of asset pricing investors should also include this behavioral factor specifically in crises situation. As the results for overall market are inconsistent with the asset pricing model therefore relying on CAPM only can result in false determination of prices and in accurate valuation of assets. Pakistani investors take caution while making decisions' like merger and acquisition, sales of securities, capital budgeting and investment analysis. As the assets are mispriced, markets are inefficient and uncertain, foreign investors should invest with cautions and large numbers of securities are needed to achieve the same level of diversification than in an otherwise normal market. By understanding the market mechanism trading behavior of market players can be improved by enhancing the quality of information disclosure.

5.3. Limitations and future research

In this study we investigated only herding towards the market portfolio, and consider it in the asset specific component of returns, whereas other form of herding is not included due to lack of data base and systematic market structure. This research can be extended by employing stock return portfolios based on market capitalization and by employing sector wise data from KSE to examine the level of herding for each sector in order to identify those sectors that are more affected by herding. Further research can be conducted to investigate those factors that cause market to be overall inefficient and define the pattern of the investor trading activities. Future research should separate the herding behavior between individual and institutional investors of Pakistan.

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