Investor Overconfidence and Stock Returns: Evidence from Pakistan

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Abstract: *The study investigates investor overconfidence in Pakistan stock market. By taking daily stock prices of 27 leading companies representing all sectors of Karachi stock exchange we found that return of the securities have impact on securities' trading volumes. While trading volumes failed to impact returns in short term horizon. Further returns volatility had impact on the returns but failed to impact trading volume. This indicates that despite return volatility, overconfident Pakistani investor continue to trade in the security. Impulse response analysis exhibits that trading are impacted by one standard deviation of security return but they still remain positive and mostly stay above zero. The study was conducted in vector auto regressive environment.*

Key words: *Investor overconfidence, Returns, Volatility, Vector Auto regression*

I.   Introduction

The history of stock markets is full of events that made mark on the history. The crash of 1929 of U.S stock markets; Black Monday crash of 1927; Dot Com bubble burst and Crash of Asian stock exchanges in 90s; market liquidity crunch of 2007 are the events that refer to dramatic changes in stock prices and trading volumes. The standard finance models of sharpe (1964), Linter (1965) and Black (1972) were helpless in explaining these anomalies. Thus the best way to explain such phenomena is to study the behavior of the people who were at the heart of these crises. The standard flaw in these models was assumption of "rational investor" which in the world lead by perception is difficult to be found. Thus researchers of behavioral finance tried to augment them with alternative model that takes into account irrational behavior of the investor.

Delong, Shleifer, Summers, and Waldmann (1990) were the first to give the idea of investor sentiments. They posit that investors are governed by beliefs of future cash flows and not by the facts regarding risks of such future benefits. Further they argued that rational investor should not compete with sentimental investor because it's costly and risky. Thus they are unable to bring the prices to their fundamental values. Thus it's the major assumption in behavioral finance literature that there are no limits to arbitrage. The Dot Com bubble supported this theory with flying colors. The periods of enthusiastic investor sentiments pushed the price to an unprecedented level. The arbitragers were unable to correct the market because of high prices and went out of business.

Thus studying investor sentiment is they key to understand the behavior of today's stock markets. Getting in-depth knowledge of investor sentiments by digging into the factors that contribute to it, quantifying them and how they affect sentiment is of paramount importance in the research of today. The most powerful factor in this relation is investor overconfidence. Overconfidence relates to investors belief that he is precise in his prediction of stock returns and because of this misconception he continue trading (Odean ,1998a). Odean (1999) posits that those investors who trade more tends to loose more. The bullish behaviour of stock markets mistakenly leads investor to believe that his investment skills are superior. Thus he keeps on investing and raising trading volumes. Further, overconfident investor do not reduce their trading activities in the same ratio as market is declining. This tendency is responsible for higher trading volumes even in the wake of declining trend in the market.

However, investor overconfidence should not be confused with investor disposition-a tendency to sell securities in time of rising prices to gain profit and retain them in time of price drop in anticipation that loss can be avoided when prices rise again. This concept is discussed in detail in literature. Most of today's researchers are relying on investor confidence to explain market behavior. Trading volumes are taken as proxy for investor overconfidence in recent studies (see for example Shefrin and Statman, 1985; Statman et al., 2006; Goetzmann and Massimo, 2003; Odean, 1998b; Ranguelova, 2001). All these studies take into account the investor overconfidence to explain returns and vice versa. There is a debate whether returns impact on investor overconfidence or vice versa

This study will take investor overconfidence to see whether Pakistani stock market's returns are dependent on overconfidence of investors or whether returns themselves determine the trading volumes. The

study will provide an insight into rationality of Pakistani investor and also to the best of my knowledge this is the first study that examines investor overconfidence and stock returns in Pakistan.

II. Methodology

2.1 Sample Selection and Data

The primary objective of the study is to study the relationship of investor overconfidence and stock returns. In order to achieve this objective daily data was taken from a convenient sample of 26 stocks representing all sectors of Karachi Stock Exchange (KSE) from 2003-2010. Since outstanding share information regarding particular security was calculated from company's price earnings ratio therefore the sample was constrained to 2010 as Balance Sheet Analysis published by State bank of Pakistan is available till 2010. Further 2003-2010 offer an ideal period for analysis because this period consists of KSE boom (2003-2006) and also its depression period (2007-2008) and its recovery period (2009-2010). Daily data has advantage in a way that volatility can be measured with accuracy. Also different researchers have preferred daily data when working (under Vector Autoregressive environment) with stock returns and time series data (Constantinos et al., 2010; Kumar, 2010). The stocks were selected after careful scrutiny. Care was taken to take those stocks that have maximum observations and relevant accounting data.

The data for different variables were taken from Balance Sheet Analysis (BSA) published by State Bank of Pakistan and from the website of KSE stocks.com. BSA was preferred as its an official document of the Government. The website (www.ksestocks.com) was preferred because most of websites in Pakistan offer historical data from 2007 and onwards. However the records of this website are from 2003. This enabled us to study different market conditions through different phases of market volatility.

III. Variables and Measurements

Following simultaneous equations were estimated in this study;

(1)

$$mturn_t = \propto + \sum_{k=1}^{K} \beta_k \, mturn_{t-k} + \sum_{m=1}^{m} \beta_m \, mret_{t-k} + \sum_{j=1}^{j} \beta_j mvolt_t + \varepsilon_t$$ (2)

Where;

mturn & *mret* are market turnover and weighted return of cross section of securities at time *t*. *mvolt* is volatility of weighted security returns. The computational details of these variables are as follows,

$$mret_t = \propto + \sum_{m=1}^{m} \beta_m mret_{t-k} + \sum_{k=1}^{k} \beta_k \, mturn_{t-k} + \sum_{j=1}^{j} \beta_j \, mvolt_t + \varepsilon_t$$

3.1 Security Turnover (*mturn*)

This variable is calculated by following equation;

(3)

$$mturn_i = ln \left\{ \sum w_i t_i \right\}$$

Where w_i is the weight based on capitalization it is calculate by individual security capitalization(No. of outstanding shares multiply by beginning price of the share at year t) divided by sum of capitalization of all securities in the investor's portfolio.

t_i is turnover of individual security calculated by security's trading volume (*vol*) divided by outstanding shares (*os*), mathematically;

(4)

$$t_i = \frac{vol_i}{os_i}$$

Since historic record of outstanding stocks of selected companies were not available on KSE stock.com, we referred to earnings per share (EPS) to find outstanding shares. The formula is as follows;

(5)

Net income is (earnings before taxes-tax provision). The figures for above formula were obtained from BSA

$$os = \frac{Net\ Income}{eps}$$ published by SBP.

Statman et al. (2006) (following Lo and Wang, 2000) used this measure to proxy

for investor overconfidence.

3.2 Security Return (*mret*)
This variable is measured by following formula;

(6)

$$mret_t = \sum_{i=1}^{i} w_i R_i$$

Where;
w_i is the weight of security measured by capitalization of individual security divided by capitalization of all securities in investor portfolio. R_i is security return measured by following formula;

(7)

This variable was used by Statman et al. (2006) to calculate returns of cross sections of securities. We also adopted this weighted return methodology to calculate security returns.

$$R_i = ln\{\frac{R_t}{R_{t-1}}\}$$

3.3 Security Return Volatility (*mvolt*)
This variable measures the security's return risk. Ideally it is measured by standard deviation but it requires large volume of observations. However in a scenario where this availability is restricted, we can use GARCH variance series to proxy for volatility. The GARCH variance is calculates by estimating following GARCH (1,1) mean equation;

$$R_t = \propto + R_{t-1} + \varepsilon_t \quad (8)$$

This method is superior to standard deviation in a sense that it measures volatility observation by observation. On the other hand standard deviation provides an accumulated single value for a set of observations.

IV.   Analytic Model
Vector Auto Regression (VAR) model is the most dynamic and flexible model for time series analysis. An extension of auto regressive models, its extremely useful and robust in predicting model which involve two dependent variables. Our general VAR model is of the following form;

$$l_t = \propto + \sum_{j=1}^{j} \beta_j K_{t-j} + \sum_{m=t}^{m} \beta_m f_t + \varepsilon_t \quad (9)$$

Where l_t is n x 1 vector of endogenous variables, which in our study is returns and turnover. While ft is a vector of exogenous variable at time *t*, which in our study is Return volatility. β_j and β_m are coefficients of endogenous and exogenous variables respectively. Whereas, j is the number of lagged endogenous variables while m is the exogenous variable observation at time t. e_t captures contemporaneous correlation between endogenous and exogenous variables.

4.1 Unit Root Test for Stationarity
VAR can only be applied if data is stationary. Thus in order to check the stationarity of our exogenous and endogenous variables we will use Phillip Peron test for unit root analysis. All variables will be tested for stationarity at level, 1st difference and 2nd difference under assumption of intercept, without intercept but trend and with no intercept or trend.

4.2 Optimal Lag Selection
Optimal lag of exogenous variable is very important in VAR analysis. We will us Akike information criteria to find optimal lag of exogenous variables. This will be done by conducting VAR at different level of lags and the level which provides lowest score for above criterion will be used as lag value for endogenous variables.

4.3 Unrestricted VAR
Unrestricted VAR model will be carried out if no co integrating equations are found. However, if co integrating equation is found, then we will conduct our analysis using unrestricted VAR.

4.4 Impulse Response Function
Impulse response analysis is possible with VAR. they provide the impact of 1 Standard Deviation change in one variable (impulse) on the behavior of other variable (response).

4.5 Granger Causality

In order to find whether turnover impacts return or return has impact on turnover, we will conduct Granger causality under following hypothesis;

H_o: mret (returns) granger cause mturn (turnover)

H_0: mturn granger causes mret

The p-values of .05 or less will imply that we will reject the null hypothesis.

V.   Results and Discussion

5.1 Descriptive Statistics

Table 1: Descriptive Statistics

	MRET	MTURN	MVOLT
Mean	0.000781	8.276102	0.000785
Median	0.002824	8.194212	0.000266
Maximum	0.114718	11.27925	0.046101
Minimum	-0.432656	5.440353	9.53E-05
Std. Dev.	0.024437	0.915504	0.003067
Skewness	-9.177473	0.321462	10.50214
Kurtosis	159.6984	3.085703	128.2590
Jarque-Bera	659619.4	11.14842	427471.6
Probability	0.000000	0.003794	0.000000
Observations	636	636	636

Table 1 represents descriptive statistics of the data. The mean value of returns is .000781 with minimum -.432% and maximum of 0.1147. Total observation of cross sectional weighted returns, volatility and turnover is 636 each. The turnover has a mean of 8.26 this is due to the fact that turnover of large companies is large. Further it has no negative value as turnover technically cannot be negative. Higher turnover mean and lower mean of returns indicates that even in lower returns, the investors are investing and hence security turnover is increasing.

5.2 Unit Root Test

The Phillip Peron unit root test indicated that returns (mret) and volatility (mvolt) were stationary at level under all assumptions. However, the mturn was found non stationary at level when the test was conducted under "no intercept and no trend" assumption. However, it was stationary under all assumptions when test was conducted by taking its first difference. Thus we present following results of Philip Peron unit root test;

Table 2: Unit Root Results

Variables	Stationary (Under all assumptions)
Mret (Returns)	Level
Mvolt (Return's Volatility	Level
Mturn (Turnover)	1st Difference

The test clearly indicates that variables are stationary at different levels, thus co-integration analysis is not possible and hence no co-integrating equation is possible. This indicates that we will use VAR in unrestricted form and Vector error correction is not possible.

5.3 Vector Auto regression

Prior research did not specify any hard and fast criteria for lag criteria. Thus we let our data to determine its lags. The Akike information criteria is used to determine lag of endogenious variables. The results of VAR were repeated up to 12 lags and it was found that at lag 5 the Akike information criteria was at its lowest value, Thus we took lag=5. The VAR conducted at 5 lags of endogenous variables outlined following results;

Table 3 VAR Results:

		Turnover				
		n-1	n-2	n-3	n-4	n-5
Mturn	coeff	0.454228	0.168317	0.103325	0.110656	0.098654
	se	0.04142	0.04483	0.04502	0.04429	0.04036
	t-values	10.9655	3.7547	2.29523	2.49833	2.44418
Mret	coeff	1244	0.000526	0.000404	0.000293	110
	se	0.00235	0.04483	0.00255	0.00251	0.00229
	t-values	0.52976	-0.20673	0.1583	-0.11656	0.04808
Constant	coeff	0.519368	0.519368	0.519368	0.519368	0.519368
	se	0.17401	0.17401	0.17401	0.17401	0.17401
	t-values	2.98478	2.98478	2.98478	2.98478	2.98478
Mvolt	coeff	11.57806	11.57806	11.57806	11.57806	11.57806
	se	7.32636	7.32636	7.32636	7.32636	7.32636
	t-values	1.58033	1.58033	1.58033	1.58033	1.58033
		Mret				
		n-1	n-2	n-3	n-4	n-5
Mturn	coeff	0.341744	-0.74671	0.479011	-0.34153	-0.79801
	se	0.81756	0.8098	0.77919	0.75653	0.73429
	t-values	4.08747	-0.92209	-1.89815	-0.45144	-1.08678
Mret	coeff	61813	-0.02342	0.02521	0.046099	0.084472
	se	0.04636	0.04592	0.04419	0.0429	0.04164
	t-values	1.33328	-0.50997	-0.57054	1.07455	2.02866
Constant	coeff	0.007771	0.007771	0.007771	0.007771	0.007771
	se	0.00987	0.00987	0.00987	0.00987	0.00987
	t-values	-0.78753	-0.78753	-0.78753	-0.78753	-0.78753
Mvolt	coeff	0.770784	0.770784	0.770784	0.770784	0.770784
	Se	0.41546	0.41546	0.41546	0.41546	0.41546
	t-values	1.85526	1.85526	1.85526	1.85526	1.85526

The results of the VAR conclude that turnover is in high correlation with its previous value. Thus yesterdays turn over has impact on today's turnover. This indicates that investor overconfidence keeps the turnover at higher level despite the fact that this rise in turn over has no impact on returns. Further it is observed that return volatility has significant impact on returns but it hasn't got any significant impact on turnover. This may indicate that over confidence of the investors do not account for the risk associated with the return of the security and volumes are not impacted by return's volatility.

The second parts of these results indicate that previous days returns have significant positive impact on today's turnover. However no evidence is found of the correlation between returns and turnover in later period. The significance of returns on turnover indicates that lag of returns determine the turnover in market. This indicates that previous day's return determines to today turn over. The results also confirm that Pakistani stock market investors have imperfect knowledge of the market and perfect market hypothesis does not hold.

5.4 Impulse Response Function (IRF)

Impulse response function is only possible in VAR. this analysis graphically presents the behavior of the endogenous variable regarding a shock from the behavior of other endogenous variable. Following IRF graphs have been taken to predict future 30 days behavior of turnover and return

Figure 3: Response to One S.D. Innovations ± 2 S.E.

The graph shows the impact of 1 SD deviation movement (upward) of return on return. The graph indicates that return are positive in the beginning but then start landing in negative territory by eventually getting equal to zero.
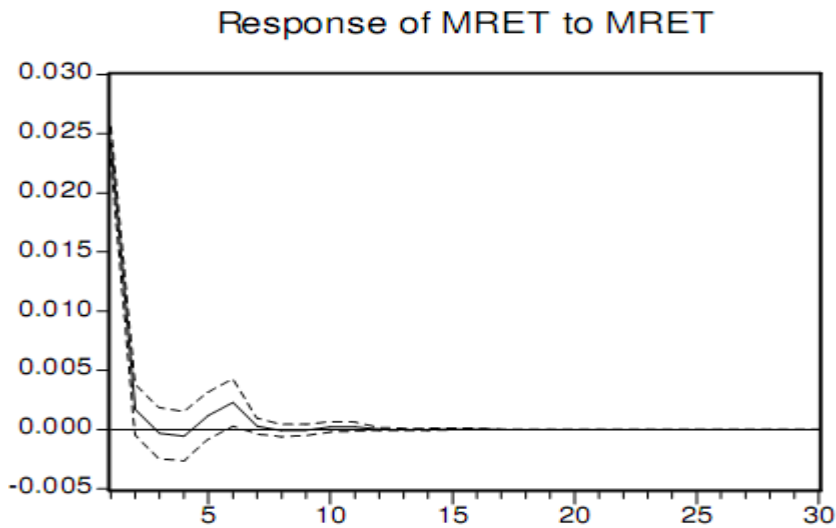

Figure 4: Response to One S.D. Innovations ± 2 S.E.

This graph indicates the shock of returns (impulse) on turnover (Response). The graph indicates that turnovers are impacted by returns and the shock of return impacts them but they stay in positive territory. This indicates that investors do react to shocks in returns but their overconfidence, translated in terms of turn over, will keep volumes in positive territory.
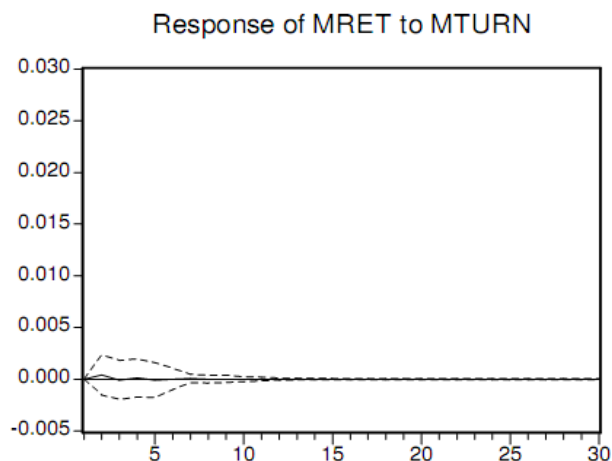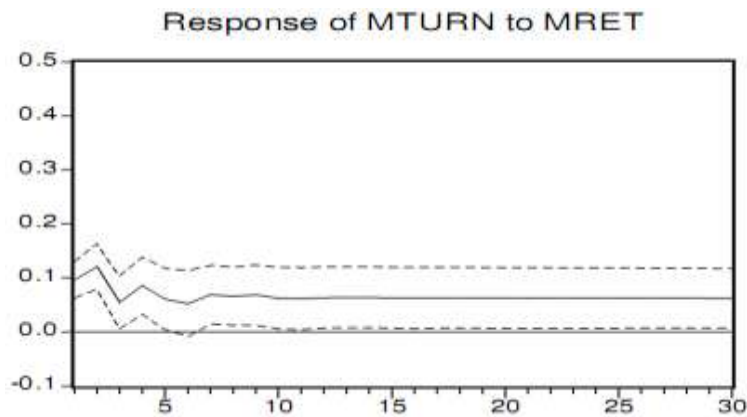

Figure 5: Response to One S.D. Innovations ± 2 S.E.

This figure indicates that future returns are almost unaffected by change in turn over in Pakistan. The line is mostly flat and indicates that returns do not show much movement in response to change in 1 SD of turnover.
5.5 Granger Causality
Granger causality test is conducted along side VAR. This test roughly validates the results of VAR. However this is not conducted for such purpose. Its purpose is to detect bi causality. By using 5 lags of endogenous variables, we granger cause endogenous variables. The results are displayed as follows;

Pair wise Granger Causality Tests

Sample: 1,636

Lags: 5

Null Hypothesis:	Obs	F-Statistic	Probability
MTURN does not Granger Cause MRET	631	0.30949	0.90732
MRET does not Granger Cause MTURN		4.40141	0.00060

The first null hypothesis is accepted as it has values more than probability more than .05 and F-score is 4.41. Thus granger test reveal that turnover has no impact on returns. The second null hypothesis is accepted because it has F-values of 4.41 and p values are less than .05. thus we reject null hypothesis and confirm that returns has impact on turnover. This result is in conformity with our findings

VI.   Discussion

The study was conducted in order to determine whether investor overconfidence impacts return and vice versa. The study is a deviation from standard finance models as it indicates that there are non-systematic components that impacts returns. However VAR analysis confirmed that returns impact turnover. The results indicated that previous days returns have impact on today's turnover.

This study indicates that Pakistani investor keep an eye on returns of the security. If they expect that over all the returns are increasing, they flock towards market and in ignorance increases the turn over of market. The impulse response function indicates that even when there is a risk in returns of the portfolio, the turnover experience a shock but yet stay in positive territory. This overconfidence may lead to irrational decision making by the investor and will suffer a loss. The impulse response function predicts that returns are reverting to zero and yet the turnover is high. This will lead to correction in market and investor will suffer loss.

This paper has implications for policy makers. Investors laboring under overconfidence should discuss with professional and seek advice. Further they need to adjust their positions in different stocks where turnover and returns are balanced and turnover does not deviate more than returns.

6.1 Future Research

Due to time, data and cost constraints we took 26 securities for our analysis. However future study may be conducted by taking all the stocks of market and conducting VAR analysis. Also we have taken only volatility as control variable, other factors such as GDP and Exchange rate, proven to have impact on stock prices can also be taken for analysis.

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