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The impact of investor sentiments on stock returns and volatility: do economic forces and herding behaviour matter?

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Abstract: This study examines the relationship between investor sentiments, stock returns and stock volatility. Herding behaviour and macroeconomic forces are also used as explanatory variables in this study. Stock returns and stock volatility are used as dependent variables. The main objective of this research is to examine the impact of investor sentiments, macroeconomic forces, and herding behaviour on stock returns and stock volatility. The data of the non-financial sector of Pakistan has been collected from 2010 to 2019. Panel quantile regression has been used for determining the relationship among dependent and independent variables of the study. Different quantiles, i.e., 0.25, 0.50 and 0.75 are used for desired results. Results of this study suggest that investor sentiments affect stock returns and stock volatility at different quantiles. Macroeconomic forces also affect stock returns and volatility at different quantiles. This research will aid managers, and policymakers in future investments.

Keywords: investor sentiments; macroeconomic forces; stock volatility; stock returns and herding.

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1 Introduction

Behavioural finance theory suggests that the behaviour of investors in the market can influence the decisions making of investors and hence the trading of stock can be affected in the stock market. Fluctuations in the daily trading volume of securities influence the stock prices of securities. Investor sentiments play an important role in the under-pricing or overpricing of stocks. If investors are optimistic about the market conditions, then there is an increase in the expected share prices and hence the return will increase. However, if investors are pessimists about market conditions, then the stocks prices will tend to decrease, resulting in negative returns (Deng et al., 2018). Conventional finance differs from behavioural finance, but conventional finance cannot be replaced by behavioural finance. Behavioural finance is related to the human psychological patterns and their role in making the financial decisions.

Market efficiency does not fully hold in the markets. The variations that are unexplained in the stock markets are responsible for this inefficiency. Cognitive errors are related to market anomalies. Market anomalies are responsible for influencing the assets trading decision and portfolio management. Incorporation of inefficiency in the market can be done through analysing overreaction, underreaction, overconfidence, and mental accounting. Stock markets are inefficient according to past empirical research. Stock prices keep on deviating from their original values over the period. There are several past studies that show the relationship between economic indicators and stock returns (SRs). Economic indicators are GDP, interest rate and inflation rate, etc. (Ali et al., 2018). A study analysed the relationship between SRs and investor sentiments. For examining the relationship between investor sentiments and SRs, the investor confidence index has been used as a proxy for investor sentiments by Oliveira et al. (2013).

Economic forces have a strong impact on SRs. Elangkumaran and Jenitta (2014) showed that in Colombo Stock Exchange, there existed a relationship between SRs and the macroeconomic forces. They found that the SRs were influenced by GDP with a positive significant correlation among both. They also found that the SRs were negatively correlated with interest rates. They indicated a positive correlation between GDP and SRs through multiple regression analysis. It is assumed to be disruption in the stock market due to the presence of herding behaviour. This behaviour is responsible for market instability. There may be higher fluctuations in volatility due to the presence of herding behaviour. The valuation of assets cannot be done properly with the presence of herding behaviour. Diversification is affected by the presence of this type of behaviour in the market. Investors do not invest in multiple securities and hence maximise the diversification due to the presence of higher correlation among the traded securities in the market (Economou et al., 2011).

The concept of complete rationality in an investor's decision no longer prevails in finance today. Behavioural finance supports the view that investors are not fully rational. Behavioural finance also states that markets are not efficient enough due to investor moods and behaviour. This research confirms the impact of investor sentiments on SRs and volatility. Detailed study of investor sentiments and their impact on SRs indicates that there exists a relationship between SRs and investor sentiments. Herding behaviour has also been used as an explanatory variable in this study, while economic forces as explanatory variables also affect SRs. Moreover, this study is significant due to its scope in behavioural finance. This study will be quite beneficial for financial analysts to analyse the herding behaviour of investors and the impact of herding behaviour on SRs and volatility. It is also an addition to the literature regarding the impact of macroeconomic forces on SRs and volatility. The study of investor sentiments on SRs and volatility of a stock is one of the most important topics in the understanding of behavioural finance. Herding behaviour is the behaviour in which investors mimic the behaviour of other investors in the market. This study is also addressing the impact of investor sentiments on future outcomes. Forecasting is widely used by investors as a major source of information for making investment decisions. It creates trouble when the optimal forecasts deviate.

Herding behaviour is widely being studied because investors mimic the actions or behaviours of other investors to minimise risk factors and hence this behaviour leads to suboptimal forecast. Traditional economics and finance reflect that investment decisions are rational. This study will help the managers with policies and strategies formulation through analysing investor sentiments, macroeconomic forces, and herding behaviour. It is subjected to enlighten the policymakers for Pakistan Stock Exchange management and the government. This research will provide an opportunity to the investors of developing countries to analyse the behavioural aspects of investing in the markets. These aspects play an important role in determining market returns. This research is also beneficial for the managers for decision making activities.

Considering the other sections, Section 2 presents the literature review, Section 3 is for data and methodology, and Section 4 is assigned by presenting the main regression analysis and discussion on empirical results. In Section 5, we conclude the whole discussion and disclose some policies and limitations.

2 Literature review

The most debatable topic in behavioural finance of this contemporary time is to understand the trading behaviour of investors and the effect of the sentiments of investors on risky assets. Some researchers have also analysed that the returns in the future markets may get affected through the investor's sentiments. Javaira and Hassan (2015) found that the hedger's sentiments affect the return of the futures markets. The volatility of stocks is the price fluctuations and the range of change among the prices of securities over a given period. The highly volatile securities are those securities that have a rapid downfall in their prices as well as the dramatic increase in their prices; in short, the price fluctuations are quite visible. The stocks that are highly volatile in their nature are usually riskier as compared to the stocks that are less volatile (Gharbi et al., 2014). Another research conducted by Białkowski et al. (2012) showed that the stock markets of Muslim countries usually show higher returns and low volatility during the month of Ramadan. The reason behind this fact was the religious and optimistic beliefs of people that were depicted in their investing decisions. Another most important reason is the calendar anomalies that play a very important role in stocks volatility and SRs in the different parts of the world.

According to basic theory of herding behaviour, people imitate the actions and behaviours of other people without analysing the consequences of that behaviour. This is based on Baye's theorem. According to this theorem, there is two types of information that is available to people. One is the 'private signal' that people experience in their life at their own while the other type of information is 'public information' which is history of actions that were taken by predecessors. Public information also carries the consequences of decisions. These two foundations are psychology and limited arbitrage. Securities that are mispriced cannot be addressed through limited arbitrage because it talks about the cost and risks. Whereas the behavioural finance addresses the mispricing of stocks through psychology. The reasons behind the financial market collapse can also be addressed through behavioural finance.

Some other researchers suggested that the investors are irrational in their decision making. The presence of such irrational investors makes a bubble collectively, depicting the herding behaviour. Irrational behaviour develops through social constraints and social conventions. According to Keynes (1939), the investors are influenced by the social patterns in a society, and they mimic the actions of other investors in the time of uncertainty. The forces of supply and demand play an important role stabilising the prices of securities to an equilibrium level (Jarrow and Protter, 2019). Another research conducted in Taiwan showed the relationship between the investor sentiments and the stock prices. Yang and Wu (2011) concluded that there exists a sequential relationship between stock prices and investor sentiments. Those market that has higher SRs in the weekdays are get affected by the days affect such as Saturday effect or Monday effect, but the emerging market usually do not get affected by these day's affect. Some past research has shown that media is one of the most important factors in affecting the SRs and stock volatilities. Media is also responsible for fluctuating the share prices in the stock market hence affecting the stock market returns.

Hu et al. (2015) examined that investor trading strategies and investors trading frequency can be determined through analysing the investor sentiments in the market. They also determined the relationships between the individual investor's trading behaviour how they affect the future returns if they remain unexplored. They used the

intraday data from Taiwan stock exchange for determining the relationship between the positive feedbacks trading the investor's sentiments. Sen (2016) examined that the valuation of the stocks can be done through examining the behaviour of the investors and the sentiments in the stock market. This research was conducted on the data of the third quarter of the financial year, i.e., 2016–2017. He used the common variables such as dividend payout ratio, exchange rate (ER) and leverage ratio for the results.

Chari et al. (2017) analysed more aggressive media coverage of the events happening in a country will affect the stock prices and the investor's decision making. The chances of occurrence of the overreaction of the investors in taking decisions are higher in such condition. Kaplanski et al. (2015) analysed that happy and unhappy investors tend to invest equally in the stocks or not. Do they trust on economic facts and figures? They used survey-questionnaire method for finding the return expectation and risk expectations through the subjective surveys. They also examined the investments plans. They supported the Winter's blue hypothesis from which they concluded that sufferers may have lower returns in autumn due to seasonal affective disorder.

Havermans et al. (2015) analysed that how do people think and act in the light of the actual human behaviour. In some cases, the trading behaviour of investors shows that how people act while the sentiments of investors show that what people think. Over the past few decades, the effect of the behaviour factors of the investors and the sentiment factors have become obvious. Some studies have conducted the analysis of the effects of sentiments of investors in the developed markets. Recent studies have shown the results that sentiments of investors affect the stock markets of China and Korea through playing the systematic role in investment.

Dreger et al. (2016) analysed the mean deviation of profits in securities exchange with the assistance of CSSD (model). Be that as it may, with the utilisation of this philosophy, they did not break down any huge effect of herding or mimicking behaviour in American Stock Exchange. Later, this philosophy was altered to get the precise outcomes. This procedure was pertinent on the developing business sector, for example, Asian markets. Christoffersen and Pan (2018) utilised supreme deviation for estimating herding behaviour. Standard deviation was recently utilised by analysts; subsequently they received total deviation for investigating the grouping behaviour. The connection between outright market returns and total return deviation was inspected, and it was finished up from the outcomes that there exists herding behaviour in Taiwan Stock markets. Numerous past studies have utilised market return scattering strategies for breaking down herding behaviour and they found the critical changes in stock costs with the nearness of grouping behaviour among financial specialists.

Cerutti et al. (2015) gave the reason that there exists grouping in SRs during pressure periods in securities exchange. Because of this grouping among SRs, the connection among the developments of stock costs was appeared in research. They presumed that pressure periods are the after effect of quality of grouping behaviour of investors in financial exchanges where they do not take choices at their very own yet impersonate the conviction and activities of different financial specialists in market. Later investigates likewise demonstrated that the instability of stock within the sight of grouping behaviour of financial specialists is low. The unpredictability of profits for this situation, is known as cross-sectional scattering. Exchanging is another approach to demonstrate the presence of grouping behaviour in market.

Blake et al. (2017) considered the diverse example of herding under various states of financial exchange. The conditions that they considered for their investigation were

exchanging volume and unpredictability. They reasoned that when the market is in ‘blast’ condition, mimicking is increasingly noticeable because of higher instability in stocks and higher exchanging volume. It is seen that during the administration intercession in securities exchange, numerous individual financial specialists will in general settle on choices for speculation. Therefore, the degree of grouping behaviour is higher in such condition. Another examination led by Indārs et al. (2019). It was done for distinguishing the nearness of herding behaviour in financial exchanges. They reasoned that there was no nearness of herding behaviour in these business sectors. Exchanging examples and style of financial specialists additionally influence the herding behaviour. Through changes in grouping behaviour, SRs additionally vary. Galariotis et al. (2016) inquired about after exchanging styles of investors. They took reactions of various financial specialists for investigating different exchanging styles. They took information from individual financial specialists of Korean Stock Exchange. They inferred that the positive criticism was very noticeable from individual investors while their exchanging movement demonstrated a negative connection with the SRs. Based on theoretical background, the following hypothesis can be asserted.

H1 Investor’s sentiments have significant positive impact on both SR and stock volatility (SV).

H2 Herding behaviour has significant positive effect on both SR and SV.

3 Data and methodology

Data collection was a time taking process for conduction of this research. SRs of 457 firms were collected from official website of Pakistan Stock Exchange from 2000 to 2018 on daily basis. SV has been calculated through SRs and then whole data was annualised to match with other data. Following formula has been applied for volatility:

$$\sigma = \sqrt{\frac{\sum_{i=0}^n (r_i - m)^2}{n - 1}}$$

σ standard deviation of SRs

r_i SRs

m mean of all data points

n total number of days in a year.

Economic forces that are used in this research as explanatory variables are ER, gross domestic product (GDP), and consumer price index (CPI). Firm-level data of Pakistani firms have been used for analysing the impact of investor sentiments on SRs and SV. For measuring the investor sentiment, we have used the firm-level financial indicators named, market turnover (TO), price to earnings (PEs) ratio, and equity share. The data has been collected from the entire non-financial firm listed in Pakistan Stock Exchange Commission. The time span for our data ranges from 2010 to 2019. The data on market TO was collected from the official website of the Pakistan Stock Exchange. While the other data such as shareholder’s equity (SHE), outstanding shares, and long-term debt

were collected from the financial statement analysis of non-financial firms. STATA has been used for estimating results. Panel quantile regression at 0.25, 0.50, and 0.75 have been applied to get more precise results of the regression. The value of the R-square is an indication of the degree of change independent variable due to independent variables. F-test has been used for determining the significance of models at different quantiles. The data used for conducting our analysis is unbalanced panel data.

3.1 Models

Rashid et al. (2017) analysed the impact of investor sentiments on different industries in Pakistan. They also used economic forces as explanatory variables in their study. They used firm-level data for constructing industry level sentiments. They obtained national sentiments by combining the sentiments of each industry. They also found the impact of sentiments on future SRs. We have extended their model and constructed two models in our study by adding up some additional explanatory variables, i.e., herding behaviour and macroeconomic forces. In our first model, SRs of ‘*i*’ firms at time ‘*t*’, is taken as dependent variable while in second model, SV of ‘*i*’ firms at time ‘*t*’ is acting as dependent variable. We have constructed two empirical models of our study that are stated as follows:

$$SR_{it} = \beta_0 + \beta_1 SHE_{it} + \beta_2 PE_{it} + \beta_3 TO_{it} + \beta_4 GDP_t + \beta_5 ER_t + \beta_6 CPI_t + \beta_7 CSAD_{it} + \epsilon_{it} \quad (1)$$

where

- SR_{it} is returns of stocks ‘*i*’ at time *t*. SR_{it} is dependent variable in model (1).
- $\beta_0, \beta_1, \dots, \beta_7$ are coefficients.
- SHE_{it} is shareholder equity of stock *i* at time *t* and is also used for determining the size of firms.
- PE_{it} is price-earning ratio of stock *i* at time *t* and is used for growth.
- TO_{it} is TO of stock *i* at time *t* and is used for liquidity.
- GDP_t is GDP of Pakistan at time *t*.
- ER_t is ER of Pakistan at time *t*.
- CPI_t is CPI (measure of inflation) at time *t*.
- $CSAD_{it}$ is cross sectional absolute deviation of stocks *i* at time *t*.

All of the above-mentioned variables are explanatory variables of model (1) that come on right hand side of equation. SHE, PE and TO are investor’s sentiment proxies while, GDP, ER, CPI are macroeconomic forces used as explanatory variables and cross-sectional absolute deviation (CSAD) is a measure of herding behaviour.

$$SV_{it} = \beta_0 + \beta_1 SHE_{it} + \beta_2 PE_{it} + \beta_3 TO_{it} + \beta_4 GDP_t + \beta_5 ER_t + \beta_6 CPI_t + \beta_7 CSAD_{it} + \epsilon_{it} \quad (2)$$

where

- SV_{it} is SV of stocks i at time t . SV_{it} is dependent variable in model (2).
- $\beta_0, \beta_1, \dots, \beta_7$ are coefficients.
- SHE_{it} is shareholder equity of stock i at time t .
- PE_{it} is price-earning ratio of stock i at time t .
- TO_{it} is TO of stocks i at time t .
- GDP_t is GDP of Pakistan at time t .
- ER_t is ER of Pakistan at time t .
- CPI_t is CPI (measure of inflation) at time t .
- $CSAD_{it}$ is cross sectional absolute deviation of stocks i at time t .

SHE, PE and TO are investor's sentiment proxies while, GDP, ER, CPI are macroeconomic forces, used as explanatory variables and CSAD is a measure of herding behaviour.

3.2 Estimation method

Panel quantile regression analysis is used as an alternative approach to other regression methods such as ordinary least square method. Panel quantile regression analysis is not an estimation of regression of a quantile, as the name represents. In this approach, the weighted distances are minimised and weights differently the distances between predicted values of regression line and observed values. We have applied this technique on three different quantiles, i.e., 0.25, 0.50 and 0.75 quantiles to get more precise and accurate results at different levels. We constructed two models for our study and applied panel quantile regression at three different levels. We have used unbalanced panel data. Most suitable software for this technique is STATA. Herding behaviour has been measured through cross sectional absolute deviation of returns. Panel quantile regression supplements the unbiased analysis as it has capacity to overcome the prevailing issues, e.g., multi-collinearity, and un-observed heteroskedasticity in panel data. Additionally, this model can provide the suitable results when the data face the problem of normality. Miyazaki (2019) has employed the similar model to ascertain the regression analysis.

Table 1 Summary of CSAD

<i>Variable</i>	<i>CSAD</i>
Observations	6,553
Mean	0.116
Std. dev.	0.058
Min.	0.000
Max.	0.593

Note: Authors own calculations

3.3 Data and sample

Data collection was a time taking process for conduction of this research. SRs of 457 firms were collected from official website of Pakistan Stock Exchange from 2000 to 2017 on daily basis.

The summary of statistics of CSAD has total number of observations, i.e., 6,553. The positive value of std. dev. depicts that there exists herding behaviour in Pakistan Stock Exchange.

Table 2 Summary of variables

<i>Variables</i>		<i>Variable notion</i>	<i>Measurement</i>
<i>Dependent variables</i>			
Stock returns		SR	$SR_{i,t} = \ln \left[\frac{P_{i,t}}{P_{i,t-1}} \right]$
Stock volatility		SV	Standard deviation of $SR_{i,t}$
<i>Independent variables</i>			
Investor's sentiments proxies	Price-to-earnings ratio	PE	$PE_{it} = \frac{\text{Share price}_{it}}{\text{Earning per share}_{it}}$
	Shareholder's equity	SHE	$SHE_{it} = \frac{\text{Gross equity issuance}_{it}}{\text{Gross equity issuance}_{it} + \text{Long-term debt}_{it}}$
	Turnover	TO	$TURN_{it} = \ln \left[\frac{\text{Volume}_{it}}{\text{Capitalisation}_{it}} \right]$
Economic forces	Gross domestic product	GDP	Gross domestic product (GDP) is the monetary value of all finished goods and services made within a country during a specific period
	Inflation	CPI	The CPI measures the average change in prices over time that consumers pay for a basket of goods and services, commonly known as inflation
	Exchange rate	ER	In finance, an exchange rate is the rate at which one currency will be exchanged for another
Herding behaviour	Cross-sectional absolute deviation	CSAD	$CSAD_t = \frac{1}{N} \sum_{i=1}^N R_{i,t} - R_{m,t} $

Source: Authors own calculations

4 Results and discussion

4.1 Correlation matrix

Correlation matrix shows correlation among the variables of study. This table tells the degree of association among variables, magnitude of association and the negative or

positive relation among variables. Following correlation matrix is showing the correlation among dependent variables, i.e., SRs and SV with independent variables, i.e., SHE, TO, PEs ratio, GDP, ER, CPI and CSAD. TO and SHE are positively correlated with each other with 0.345. It means if SHE increases, TO will also increase. TO is basically the selling of shares those results in increasing the equity.

SHE is positively correlated with PE with 0.99. TO and PE are also positively correlated with each other. Increase in PE will increase TO for the firm. SHE and SV are negatively correlated with each other. Increase in equity will decrease the volatility of stocks. TO and SV are positively correlated but with a lower magnitude. SHE and SR are positively correlated. Increase in equity will result an increase in the returns. It means that the firm is profitable if its equity is increasing through greater TO. There exists a negative correlation among SR and TO in the above model. SR and PE are positively related with each other. SHE and GDP are negatively correlated with each other. If GDP increase, SHE will decrease. There exists a positive correlation between GDP and TO. There exists a positive correlation between GDP and PE, but the magnitude of this relationship is very low. SV and GDP are positively correlated.

Table 3 Correlation matrix

	<i>SHE</i>	<i>TO</i>	<i>PE</i>	<i>SV</i>	<i>SR</i>	<i>GDP</i>	<i>ER</i>	<i>CPI</i>	<i>CSAD</i>
SHE	1								
TO	0.345	1							
PE	0.9991	0.1688	1						
SV	-0.0992	0.0191	-0.001	1					
SR	0.1076	-0.1419	0.0155	0.0053	1				
GDP	-0.0611	0.0304	0.0088	0.0142	-0.242	1			
ER	0.1466	-0.2112	-0.0002	-0.0095	0.7754	-0.3509	1		
CPI	0.1482	-0.2248	-0.0008	-0.0113	0.7623	-0.3822	0.988	1	
CSAD	-0.0112	-0.0941	-0.0117	-0.0203	-0.0326	0.0102	-0.0219	-0.0234	1

Source: Authors own calculations

Increase in volatility will increase GDP and vice versa. SR and GDP are negatively correlated with each other. Increase in GDP will decrease the SR for Pakistani firms and vice versa. SHE is positively correlated with ER. TO and ER are negatively correlated with each other. PE and ER are negatively correlated with each other. Volatility of stocks is negatively correlated with ER and vice versa. SR and ER are directly proportional to each other. GDP is indirectly proportional to ER. Increase in ER will decrease the GDP of the country and vice versa.

SHE is positive related with CSAD. This means the herding behaviour of investors decreases if equity of the firms increases. Increase in the firm's equity is an indication that the herding behaviour in market is decreasing. TO is negatively correlated with CSAD. There exists a negative correlation between PE and CSAD. There correlation between SV and CSAD is also negative. SR is negatively correlated with CSAD. GDP and CSAD are positively correlated with each other. Increase in GDP will increase the herding behaviour in the market. ER and CSAD are negatively correlated with each other. This means if ER increases, herding behaviour of investors will decrease. CPI and CSAD are negatively correlated with each other.

Following table is reporting the correlation among the variables chosen for this research of Pakistani non-manufacturing sector from the year 2000 to 2018.

4.2 Descriptive stats

Table 4 Descriptive statistics

<i>Variables</i>	<i>Mean</i>	<i>Std. dev.</i>	<i>Min</i>	<i>Max</i>	<i>Obs.</i>
SV	0.1082	0.3066	0.0234	3.634	6,441
SR	2.0619	1.5281	0.0956	4.781	5,876
PE	5.0456	3.4589	3.4531	9.304	5,511
TO	0.4184	0.7670	-0.997	3.764	5,751
SHE	0.6523	0.4562	0.2043	0.981	5,521
ER	78.723	19.211	53.651	106.2	6,553
GDP	4.0750	0.9013	2.3723	5.787	6,553
CPI	96.267	38.554	51.512	156.91	6,553
CSAD	0.0181	0.0163	0.0012	0.0513	6,547

Notes: In Table 4, SV is stock volatility, SR is stock return, PE is price to earnings ratio, TO is turnover, SHE is shareholder's equity, ER is exchange rate, GDP is gross domestic product, CPI is consumer price index and CSAD is cross-sectional absolute deviation.

4.3 Panel quantile regression

There are some advantages of using panel quantile regression analysis. One of the biggest advantages of using this method is that it allows for understanding relationships between variables outside of the mean of the data, making it useful in understanding outcomes that are non-normally distributed and that have nonlinear relationships with predictor variables. There are other methodological advantages to quantile regression when compared to other methods of segmenting data.

Miyazaki (2019) used panel quantile regression analysis for clarifying the response of gold return to financial indicators. For this purpose, he used different quantiles to get precise results. The quantiles that he used in his paper were 0.05, 0.10, 0.25, 0.50, 0.75, 0.90 and 0.95. He obtained different results at each quantile. We have used panel quantile regression analysis to determine a precise relationship among variables at different quantiles. We used three different quantiles. Due to time constraint, we used these three quantiles to explain our results in a precise manner.

Hu et al. (2015), disclose that quantile regression allows us to identify the impact of investor sentiments on SRs and stock market volatility in the tails of the distribution. Such relationships were not captured by OLS and robust regressions. One might argue that separate regressions could be run stratifying on different segments of the population according to its unconditional distribution of the dependent variable. Panel quantile regression at 0.25 shows above results for two DV's, i.e., SV and SRs. PEs ratio is significant with a probability value of t-stats 0.099 and is significant at 0.10 levels in model (1). TO is insignificant in model (1), it means it has no impact on SRs at 25%. ER is highly significant because the value of probability of t-stats is 0.000. It is quite evident from past research that ER influence the stock prices (Blake et al., 2017). As the value of

β is 0.551. This means when the ER increase, SRs will also increase, and it is significant at 0.01 significance level. GDP is significant at 0.10 significance level. There is positive significant change in SRs due to change in GDP. The value of coefficient or β of GDP in model (1) is 0.0392. It is evident from past literature that in the long run, corporate earnings or SRs will increase if there is economic growth or increase in GDP of the country.

Yang and Wu (2011) elaborate that the CPI is the measure of inflation in a country. It is also significant with p-value 0.036 in model (1). It is positively significant in model (1). CSAD is a measure of herding behaviour. It is insignificant in model (1) at 0.25 quantile. SHE is significant at 0.25 quantile with p-value 0.000. It is negatively significant with SRs in model (1). The value of R-square is 42% that means the significant variables in model (1) are responsible for 42% change in SRs at 0.25 quantile. The value of F-stats for model (1) at 0.25 quantile is 604.19, which is quite high. It means the null hypothesis is rejected and we accept our alternate hypothesis at 0.25 quantile. The probability value of F-stats is 0.0000 that means model (1) is significant at 0.25 quantile.

In model (2), dependent variable is SV. PEs ratio is insignificant and it has not impact on SV at 0.25 quantile. TO is also insignificant at 0.25 quantile in model (2) with p-value 0.914. ER is significant with p-value 0.000 at 0.25 quantile. B of ER in model (2) is 0.551, it means when the ER increases, SV also increases and vice versa. Literature review showed that the stock show more volatility when the ERs are increasing (Christoffersen and Pan, 2018). GDP is also significant but with negative β -value, i.e., -0.152. GDP has negative impact on SV. When GDP increases, stocks become less volatile at 0.25 quantile in model (2) and vice versa. CPI has been used as a measure of inflation in this study. CPI is significant with p-value 0.000 at 0.25 quantile. B-value for CPI is negative; it means CPI is negatively significant at 0.25 quantile in model (2). If inflation increases, the stocks become less volatile because there exists an indirect relationship among inflation and SV at 0.25 quantile. The value of R-square is 22.9% that means the significant independent variables in model (2) are responsible for causing 22.9 changes in SV at 0.25 quantile. In model (2), the value of F-stats is 575.59, which is quite high. The probability of F-stats is 0.0000 which means, model (2) is significant at 0.25 quantile.

Above results are for panel quantile regression at 0.50. In model (1), PEs ratio is significant with p-value 0.01. β of PE in model (1) is 1.32E-05 that indicates a positive value. Hence PE is positively significant in model (1) at 0.50 quantile. TO is also significant in model (1) at 0.50 quantile with p-value of t-stats 0.002. Coefficient of TO is 0.01927. It means that increase in TO of firms will increase SRs. P-value of ER is 0.000 which means, it is significant at 0.50 quantile. As β is positive for ER in model (1), so it indicates a positive correlation between ER and SRs at 0.50 quantile in model (1). Increase in ER will also increase SRs. GDP is also significant as its p-value is 0.000. The sign of coefficient of β is positive in model (1), it indicates a positive correlation among GDP and SRs at 0.50 quantile. When GDP of a country increases, then the SRs also get increase and vice versa (Elangkumaran and Jenitta, 2014). Inflation is also significant in above model measured through CPI. The p-value of CPI is 0.000 which is statistically significant. Negative sign with β indicates a negative correlation with SRs. When inflation rate of a country increases, then SRs decrease at 0.50 quantile. It is evident from past researches that there is negative relationship between inflation and SRs.

Hyperinflation causes negative SRs. The value of probability of t-stats for cross sectional absolute deviation is 0.465 that indicates that herding behaviour is insignificant at 0.05 quantile.

SHE is significant because its p-value at 0.50 quantile is 0.001. The value of coefficient is negative that indicates a negative correlation among SRs and SHE at 0.50 quantile in model (1). The value of R-square is 49% which is good. It indicates that the significant variables in model (1) at 0.05 quantile are responsible for 49 changes in SRs. The value of F-stats for model (1) at 0.50 quantile is 20,921.3, which is quite high. It means the null hypothesis is rejected and we accept our alternate hypothesis at 0.50 quantile. The probability value of F-stats is 0.0000 that means model (1) is significant at 0.50 quantile.

In model (2), dependent variable is SV. PE ratio is insignificant because p-value of t-stats is 0.998 which is statistically insignificant at 0.50 quantile. TO is also insignificant at 0.50 quantile because p-value is 0.998. exchange rate is significant at this quantile with p-value of t-stats is 0.000. The coefficient of ER is positive that indicates a positive relation with SV. When ER increases, volatility of stock is also increases because they are directly proportional to each other. GDP is also statistically significant at 0.50 quantile with negative coefficient, indicating a negative impact on SV. The situation, when GDP is increasing, then the stock becomes less volatility at 0.50 quantile as indicated in above table. CPI is also significant at 0.50 quantile but with a negative coefficient sign. This means that when inflation increases, the stocks become less volatile. Herding behaviour is insignificant in model (2) at 0.50 quantile. SHE is also insignificant at 0.50 quantile in model (2) with p-value of t-stats 1.000. The value of R-square in model (2) is 45% which means the significant IV's in model (2) at 0.50 quantile are responsible for 45% change in dependent variable, i.e., SV. The value of F-stats for model (2) at 0.50 quantile is 3,270.19, which is quite high. It means the null hypothesis is rejected and we accept our alternate hypothesis at 0.50 quantile. The probability value of F-stats is 0.0000 that means model (2) is significant at 0.50 quantile.

The results of panel quantile regression at 0.75 quantile show that in model (1), PE ratio is insignificant because the value of probability of t-stats is 1.000. It has no impact on SRs at 0.75 quantile. TO is also insignificant because its p-value is 1.000 which is statistically insignificant and has no impact on SRs at 0.75 quantile. ER is significant because p-value of t-stats is 0.098. The sign of β is negative for ER at 0.75 quantile indicating a negative relationship between ER and SRs in model (1). GDP is significant because its p-value is 0.000 and the sign of β is positive, indicating a positive correlation among SRs and GDP. CPI is also significant with p-value 0.000 and negative β sign, indicating a negative correlation among SRs and inflation. When inflation increases, the SRs decreases and vice versa (Rashid et al., 2017). CSAD is insignificant because p-value is 0.456 which is statistically insignificant at 0.75 quantile in model (1). It has no impact on SRs. SHE is significant because its p-value is 0.001 which is statistically significant with negative β . It indicates when shareholders equity increases, SRs decrease and vice versa at 0.75 quantile in model (1). The value of R-square is 34% which means the significant independent variables at 0.75 quantile are responsible for 34% change in SRs in model (1). The value of F-stats for model (1) at 0.75 quantile is 234.99, which is quite high. It means the null hypothesis is rejected and we accept our alternate hypothesis at 0.25 quantile. The probability value of F-stats is 0.0000 that means model (1) is significant at 0.75 quantile.

Table 5 Panel quantile regression at 0.25, 0.50 and 0.75 quantiles

<i>Models</i>		<i>Model (1)</i>			<i>Model (2)</i>		
<i>Variables</i>		<i>SR</i>			<i>SV</i>		
<i>Quantiles</i>		<i>0.25</i>	<i>0.50</i>	<i>0.75</i>	<i>0.25</i>	<i>0.50</i>	<i>0.75</i>
Constant		−3.925	−6.1956	−2.0694	−2.3451	−6.2447	−0.5949
		[−16.82]	[−118.97]	[−5.56]	[−46.60]	[−80.56]	[−1.30]
		(0.000***)	(0.000***)	(0.000***)	(0.000***)	(0.000***)	(0.195)
PE		3.7081	1.3298	1.7392	6.5121	1.1121	−6.7202
		[1.65]	[2.58]	[0.00]	[0.00]	[0.03]	[−0.00]
		(0.099)	(0.010**)	(1.000)	(0.998)	(0.998)	(1.000)
TO		0.0277	0.01972	−3.32167	0.01192	1.48015	1.61014
		[0.97]	[3.08]	[−0.20]	[0.11]	[0.01]	[0.23]
		(0.335)	(0.002**)	(1.000)	(0.914)	(1.000)	(1.000)
ER		0.5512	0.1096	−0.0184	0.2114	0.2799	0.1247
		[7.88]	[64.70]	[−1.65]	[54.43]	[121.00]	[9.10]
		(0.000***)	(0.000***)	(0.098)	(0.000***)	(0.000***)	(0.000***)
GDP		0.03924	0.16139	0.3753	−0.1524	−0.5573	−0.5261
		[1.72]	[31.63]	[10.29]	[−11.16]	[−68.48]	[−10.92]
		(0.086)	(0.000***)	(0.000***)	(0.000***)	(0.000***)	(0.000***)
CPI		0.00749	−0.00692	0.0459	−0.9473	−0.1262	−0.04813
		[2.10]	[−8.70]	[8.07]	[−46.87]	[−104.86]	[−6.75]
		(0.036**)	(0.000***)	(0.000***)	(0.000***)	(0.000***)	(0.000***)
CSAD		−0.8519	−1.9825	−1.5412	−0.238	3.4313	8.0513
		[−0.07]	[−0.73]	[−0.00]	[−0.03]	[−0.03]	[0.00]
		(0.944)	(0.465)	(1.000)	(0.973)	(0.981)	(1.000)
SHE		−1.3309	−8.0610	−6.4822	−4.8011	−5.1922	0.0112
		[−1.18]	[−3.20]	[−0.02]	[−0.05]	[−0.03]	[2.78]
		(0.000***)	(0.001**)	(1.000)	(0.958)	(1.000)	(0.010**)
R ²		0.4184	0.4901	0.3366	0.2297	0.4592	0.0400
F-statistics		604.19	2,0921.3	234.99	575.59	3,270.19	45.45
Prob. (F-stats)		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Notes: ***significant at 0.01 level; **significant at 0.05 level; *significant at 0.10 level,
() indicates p-value of t-stats while [] indicates t-stats.

In model (2), PE's ratio is insignificant because the value p is 0.998. It has no impact on SV at 0.75 quantile. TO is also insignificant at 0.75 quantile with p -value 1.000. ER is significant at 0.75 quantile with p -value 0.000 and with positive sign of coefficient. This means there exists a positive correlation between volatility and ER at 0.75 quantile. When ER increases, the stock become more volatile at 0.75 quantile. GDP is also significant with p -value 0.000 and the sign of β is negative. It indicates that there exists a negative significant relationship between GDP and SV at 0.75 quantile. CPI is also

significant at 0.75 quantile with p-value 0.000 and with negative coefficient sign. This indicates an indirect relationship between inflation and SV. CSAD is insignificant with p-value 1.000 and has no impact on SV at 0.75. Shareholder equity is significant at 0.75 quantile with p-value 0.010 and positive sign of coefficient. As SHE increases, the stock becomes more volatile at 0.75 quantile in model (2). The value of R-square is quite less as compared to 0.25 quantile and 0.50 quantile, it is 4%, so the significant IV's in model (2) at 0.75 quantile are responsible for 4% change in SV. The value of F-stats for model (2) at 0.75 quantile is 45.45, it means the null hypothesis is rejected and we accept our alternate hypothesis at 0.75 quantile. The probability value of F-stats is 0.0000 that means model (2) is significant at 0.75 quantile.

5 Conclusions and policy recommendations

Investor sentiments and economic forces acted as explanatory variable in model and have significant impact on SV while herding behaviour as explanatory variable has insignificant impact on SV. Christie and Huang (1994) identified herding behaviour through calculation of CSAD. Herding behaviour has been calculated through this methodology in STATA. Panel quantile regression was run at 0.25, 0.50 and 0.75 quantile. Through this, the data was divided into three quantiles in order to remove discrepancies from big dataset. The data was collected on daily basis of share prices and then volatility was calculated and annualised to merge with other annual data of financial statements. Value of R-square has been reported while reporting regression results in order to show the degree of variability in dependent variables due to independent variables. This paper has also addressed the existence of herding behaviour in Pakistan Stock Exchange. Herding is the behaviour, in which investors copy or mimic the actions of other investors in market without considering their own thoughts and information. This approach is also known as *pied piper* approach. Estimation of results in panel quantile regression at different quantiles have shown that there is no significant impact of herding behaviour on SRs and volatility while literature review has shown its significant impact on SRs and volatility in some countries such as US, China and Finland.

It is the common view that investors in market mimic other investors in order to avoid risk and uncertainty in markets. During the entire investigation, it is quite clear from results that investor sentiments have a significant impact on SRs at different quantiles. Pakistan is an emerging country, so the relationship among SRs and investor's sentiments is strong and also the relationship among economic forces and the SR and volatility is significant. Theory of classical finance addresses two main postulates. First postulate is that the financial market are efficient and the information that they provide is efficient for rational decision making while second postulate is that the investors are rational. In classical finance, there is no space for investor sentiments.

Macroeconomic forces play an important role in country's economy. When inflation in a country increases, the price of goods also increases. It affects the stock prices because people tend to buy things more expensive and the SRs decrease because the demand of stocks decreases. This trend has been seen in many countries in crisis. This is also supported by our results. SHE, PE ratio and TO have greater impact on SRs and volatility. All the models at different quantile are significant. This research will be quite helpful for future investors and researchers. The most important benefit that they will get from this research is to make effective decisions while investing in stocks. When TO of a

stock is increasing or decreasing then they can predict the change in future SRs and volatility. If inflation in a country is increasing, then they can infer that the stock prices will decrease in such situation. Economists can also get help from this thesis to develop the sound knowledge about impact of macroeconomic forces on SRs and volatility. There is a significant impact of macroeconomic forces on SRs and volatility, so government officials and policy makers should improve macroeconomic conditions in order to get positive impact on SRs. Baker et al. (2012) used other indirect sentiments of six countries, i.e., Germany, US, France, Canada, UK and Japan. Through this research, a sentiment index on global basis can be made in order to find its impact on other stock markets in the world.

There are several other investor sentiment proxies that are used for measuring the investor sentiments in the past literature such as volatility premium, mutual funds flow, etc. but in this study we have chosen three most important sentiment proxies that have greater impact on SRs and volatility as per literature review. There are several other explicit investor sentiment proxies such as surveys, questionnaires and interviews but we have used implicit proxies for our research. There are several macroeconomic variables that impact the SRs and volatility such as interest rate, industrial production rate, etc. but we have chosen three of the most important proxies for macroeconomic conditions, i.e., GDP, CPI and ER. Despite the hard work and great effort that has been put in this work in analysing the impact of investor sentiments on SRs and volatility, the role of economic forces and herding behaviour, some other interesting issues were not being addressed in this thesis due to time constraint and availability of data. It is viable for future researchers to explore the impact of investor sentiments and SRs for long run. Future research can address the issue that why SRs are more prone to investor sentiments and microeconomic as well as macroeconomic forces.

This research takes into consideration three proxies of investor sentiments due to limited availability of data. Other investor sentiment proxies can be taken for future research in order to draw most purposeful results. Non-manufacturing firms has been considered for this research. In future this research can be done on financial sector for analysing investor sentiments and their impact on returns of banks. From past literature, it has been analysed that in emerging countries, the impact of investor sentiments on SRs and volatility can even be stronger as compare to developed countries because there is lack of institutional investors in emerging markets. In addition to this research, the relationship between other market anomalies and investor sentiments can be investigated in future. Macroeconomic forces and herding behaviour can also be used as controlled or dummy variables while investigating the relationship among SRs and investor sentiments for future research. It is evident from past literature that in some markets, herding prevails and impacts SRs but, in this research, results have shown that herding prevails in Pakistan Stock Exchange, but it does not impact SRs and volatility of stocks.

As for policy concerns, the current analysis extends the proper policy implications for corporate managers and other stakeholders including fund management agencies, brokers, and other fund management institutions. As the findings show that the investor sentiments affect the SRs and SV, therefore corporate managers should consider the investor sentiments in their investment decisions. Meanwhile, other macroeconomic forces also affect SRs and volatility. This influencing behaviour of economic forces asserts the policy agenda regarding the sensitivity of economic forces in investment decisions. This research will aid managers, and policymakers for future investments. Few

economic forces are taken for carrying out this research and they acted as explanatory variables. But for future research, more macroeconomic forces can be taken for carrying out research. Panel quantile regression can be applied at more precise quantiles in order to get more detailed results at each quantile. Due to time constraint we have applied panel quantile at 0.25, 0.50 and 0.75 quantile in order to get detailed results of regression and R-square. Surveys, questionnaires, and interviews can also be conducted in order to get direct response from investors.

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Appendix (see online version for colours)

