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The Effect of Investor Sentiment on Portfolio Returns: Evidence from the Pakistan Stock Exchange

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Abstract: *Economic literature presents numerous factors for pricing stocks following the normative assumptions. However, a perfect model for elaborating the returns has not been developed. Therefore, the theory proposes behavioural aspects for determining portfolio returns. This study tests a behavioural attribute investor sentiment on portfolio returns of 682 listed stocks on the Pakistan Stock Exchange from 2001-2021 over 245 months. The results show that the sentiment index mimics the stock index during the sampling period. The OLS and Newey-West standard error regressions, verify that investor sentiment can explain size and book-to-market sorted portfolio returns. Furthermore, the sentiment also explains the decile portfolio returns of selected anomalies. The results reveal that sentiment is an independent risk factor. The findings of this enquiry are helpful for investors and analysts who may consider investor sentiment when making investment and portfolio formation decisions.*

Key Words: Investor Sentiment, Portfolio returns, Asset Pricing, and Pakistan Stock Exchange

Introduction

Traditional financial theories suggest investors are rational, well-informed, and make optimal decisions. They use all available information to make investment decisions. Thus, prices shall reflect all available information. Therefore, financial models incorporate fundamental factors for pricing stocks. However, late twentieth-century literature demonstrated that psychological and emotional factors can influence economic and financial decisions. Therefore, the tendency to incorporate behavioural factors for explaining portfolio returns has increased. Studies show that investors invest in more hyped stocks by incorporating only partial information. They make highly speculative investment decisions.

Asset pricing theories demonstrate returns as a function of risk and return where return = f(risk). Broadly, the risk is divided into two types: diversifiable and non-diversifiable risk. Traditionally, an optimal portfolio can be designed by combining stock with different risks and returns. In Markovitz's (1952) optimal portfolio, the variance of stock returns is used as the risk indicator. The beta (β) of Sharpe (1964) and Lintner (1965) simplified portfolio design, where the beta reflects the market risk. The introduction of size and book to market as independent risk factors opened the gates for a flurry of scholarly production for other fundamental risk factors. Meanwhile, the researchers also highlighted behavioural sources of risk, too.

Among the other behavioural factors, investor sentiment is a leading attribute in portfolio formation. The evidence of sentimental trading is confirmed in financial markets with different sentiment proxies. Joseph et al. (2011) verify the role of sentiment in determining traded volume by using online searches as the sentiment proxy. Meanwhile, Tetlock (2007) shows that pessimism in the media reduces trading activities in the equity market. Baker et al. (2012) revealed a positive correlation between an indirect sentiment index and stock returns. Schmeling (2009) explores that sentiment inversely affects long-term cross-sectional returns. The role of investor sentiment in driving market returns has also been discovered in several other studies (Schmeling, 2009; Baker et al., 2012; Niu et al., 2023).

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Additional support for investor sentiment has been provided by Stambaugh et al. (2012) and Stambaugh and Yuan (2017), where the authors show that investor sentiment is a risk proxy to predict stock returns. The authors show that investor sentiment can predict stock returns even after controlling all fundamental factors. The sentiment-led returns indicate imperfections in the market. They suggest that several agents are pricing the stocks differently, and the market cannot reveal the unified value determined by fundamentals. They also hint that arbitrageurs are unable to re-align the market promptly.

Like the international market, investor sentiment has been investigated in Pakistan through multiple inquiries. Khan and Ahmad (2018) present that investor sentiment positively affects current stock returns while it inversely explains future stock returns. Rashid et al. (2019) argue that the sentiment index enhances the power of Fama French three-factor and Carhart's four-factor model. In an earlier study, Rashid et al. (2017) show that investor sentiment inversely explains current and future returns. Similarly, Muhammad (2022) finds a negative relationship between the sentiment index and the market's future performance. Rahman et al. (2022) affirm a positive relationship between investor sentiment and stock returns. More recently, Andleeb and Hassan (2023) observed that the sentiment index explains the current and future market returns for at least forty days. Tauseef and Suman (2023) concluded that investor sentiment is crucial in determining market returns.

Pakistan has a volatile stock exchange and has been experiencing severe economic stress for decades. Only 0.25 million out of 250 million of the country's population invests in the stock market, which can make it prone to more emotional and sentimental trading. Although investor sentiment has been investigated in Pakistan to elaborate the market returns, its application in asset pricing is uncommon. Rashid et al. (2019) incorporate the sentiment index in Fama French's three-factor and Carhart's four-factor model only. Moreover, the studies use a limited number of proxies to measure investor sentiment in small sampling periods. Therefore, after incorporating the investor sentiment index in the Pakistan Stock Exchange asset pricing regressions, this study adds to previous research in the following way. Firstly, the investor sentiment is analyzed for an extended sampling period of 2001-2021. Secondly, Fama French's three factors, five-factor, and six-factor models are used in regressions, and thirdly, decile excess returns of eight prominent anomalies are incorporated in the analysis.

Consequently, this study computes a sentiment index and obtains estimates from OLS and Newey-West standard errors on quartile portfolio returns. Furthermore, the sentiment index with SMB, HML, RMW, CMA, and Momentum is regressed on excess returns of decile returns of anomalies. The findings show that the stock market mimics the sentiment index, which reflects the ups and downs of the Pakistan Stock Exchange. Moreover, the OLS and Newey-West standard error estimates show that sentiment can predict the size and book-to-market sorted quartile portfolio returns. The regression on excess returns of decile portfolios of anomalies also confirms that the sentiment index captures variation in portfolio excess returns.

Review of Literature

Investor sentiment is the beliefs and opinions of investors when investing without the information in hand. Sentimental trading forces prices away from intrinsic value. This section highlights the literature that reflects the effect of sentiment on financial decision-making, specifically in the equity market.

The effect of investor sentiment on risk has been established widely. Changsheng and Yongfeng (2012) test the effect of investor sentiment on stock valuation. They reveal that the sentiment can explain the returns sorted by book-to-market and price-earnings ratio. The authors assert that investor sentiment is crucial for stock valuation and a good measure of systematic risk. Similar results are produced by Kim and Ha (2010) in a study of investor sentiment in South Korea. The sentiment effect remained intact even after controlling size and book-to-market factors, and the results did not change when other anomalies were controlled. Hence, they conclude that investor sentiment is part of systematic risk. Similarly, Stolbov and Shchepeleva (2023) show that sentiment measures systematic risk.

More evidence associating risk and sentiment has been revealed in empirical research. Shen et al. (2017) show that pricing fundamentals depend upon risk exposure. The higher-risk projects yield higher returns.

Notably, the returns are influenced by investor sentiment. The results suggest that higher returns on risky investments follow low investor sentiment. Overall, a risky portfolio does not generate higher returns.

Furthermore, Antoniou et al. (2016) present that noise traders trade in high beta or more risky stocks because of their raised optimism in high sentiment phases. Therefore, noise trading declines in low sentiment, and more rational trading occurs. The authors assert that though humans cannot rule out rational trading's high order imbalance, earning expectation and the profitability of informed trading indicate that in bullish phases, high beta trading is fueled by investor sentiment and optimism.

The most established fact about investor sentiment revealed by studies in the equity market is its power to predict stock returns. The sentiment and stock returns have a coinciding relationship. The returns surge in high sentiment periods and later reduce. Thus, sentiment induces contrarian returns. The contrarian returns induced by sentiment are evident from several studies. Baker and Wurgler (2006) investigate the effect of sentiment on cross-section returns and design the famous indirect, six-factor sentiment index, exploring contrarian results with investor sentiment and stock returns. When investor sentiment is low, the returns in subsequent periods grow. The results are robust for small, non-dividend paying, volatile, young, distressed and non-profitable stocks. On the other hand, the high sentiment shows a reduction in future returns for these stocks. More evidence is provided by Baker et al. (2012), who explore investor sentiment in a global framework and find a positive correlation between sentiment index and stock returns, both at the USA and global markets. The authors affirm that the sentiment has a contrarian effect on returns, suggesting that current high sentiment results in low future returns and arbitrage opportunities.

Brown and Cliff (2005) provide insight into understanding the relationship between sentiment and returns from the investor sentiment index of newsletters. They control some rational factors and use a few firm-level factors to confirm the robustness of results and affirm that the sentiment index from the survey can explain future returns and price deviation from intrinsic value for one to three years.

In investigating investor sentiment from foreign and local segments of investors, Aissia (2016) finds that both foreign and domestic investor sentiment determine the stock returns. The sentiment for local investors is measured with Baker and Wurglur's (2006) sentiment Index, while sentiment for foreign investors is gauged as a discount on closed-end funds. Their findings confirm investor sentiment-induced contrarian returns.

Furthermore, Fisher and Statman (2000) study the sentiments of strategists, newsletter writers, and individual investors. Data are obtained for sentiment from magazine user surveys. The results indicate that investor sentiment predicts negative future stock returns for all three groups. However, they are only significant for strategists and individual investors.

Ryu et al. (2018) present evidence of sentiment-induced low future returns. They test the effect of investor sentiment and trading behaviour on stock returns in South Korea by using different proxies of investor sentiment, i.e., relative strength index (RSI), psychological line index (PLI), the logarithm of trading volume (LTV), and adjusted turnover rate (ATR). The results show that investor sentiment has a positive relationship with stock returns.

Investor sentiment has been investigated in Pakistan in multiple inquiries. In a detailed study, Tauseef (2020) enquired about sentiment in conventional and Islamic equities in Pakistan and presented that sentiment explains current stock returns in Islamic and conventional stocks. However, sentiment only affects contrarian returns in conventional stocks. It uses the Baker and Wurgler (2006) approach to obtain the sentiment index. However, due to certain limitations associated with data availability, it uses few proxies different from Baker and Wurgler (2006). The author uses advances to decline ratio, the premium on dividends, the price-earnings ratio, money flow, relative strength, and turnover as proxies for investor sentiment.

Earlier, Rashid et al. (2017) used the Baker and Wurgler Approach, with only three proxies for sentiment: volatility premium, turnover, and equity share. They show that investor sentiment inversely explains current and future returns. Khan and Ahmad (2018) constructed a sentiment index from the nine indirect proxies of sentiment and with a direct proxy—the Google search volume index—using the Baker and Wurgler approach from a sampling period of ten years, 2006-2016. The authors show that investor

sentiment positively affects current stock returns while it inversely explains future stock returns. Later, Muhammad (2022) constructed a sentiment index based on news-based sentiment, social media sentiment, and indirect sentiment from 2009 to 2018. The author finds a negative relationship between the sentiment index and the market's future performance.

Furthermore, Rahman et al. (2022) provide more evidence of investor sentiment regarding stock returns. From a short sampling period of two years,2017-2010, using the consumer confidence index and trading volume as proxies of investor sentiment, the authors affirm a positive relationship between investor sentiment and stock returns. Khan and Saleem (2022) test the effect of investor sentiment on equity returns of 61 stocks listed on the Pakistan stock exchange from 2000 to 2019. The share turnover, price-earnings ratio, and money flow are used as the proxies of investor sentiment. The authors show that the share turnover and money flow positively relate to the expected returns through vector auto-regression. In contrast, the earnings ratio is inversely related to the expected returns.

More Recently, Andleeb and Hassan (2023) investigated the influence of investor sentiment on the current and future stock returns from China, Brazil, Russia, India, Indonesia, and Pakistan. They construct a sentiment index from traded volume and turnover ratio. Their study underscores the importance of market-specific research, as they observe that the role of the sentiment index in determining market returns varies across these diverse markets. For Pakistan, the sentiment index explains the current and future market returns for at least forty days. Also, Rasheed et al. (2023) delved into a pertinent issue in the financial world: the role of technology, sentiment, and investor behaviour in determining market outcomes. Their use of a dummy variable of investor emotions as a proxy for investor sentiment and data from 2009-2021 led to the compelling conclusion that investor sentiment plays a crucial role in determining market returns.

Additionally, Tauseef and Suman (2023) rigorously examine an investor sentiment index, considering factors such as money flow, share turnover, advances to declining ratio, price-earnings ratio, interest rate, relative strength index, and dividend premium. Their findings, while indicating that the one-period lag sentiment index explains market returns, also underscore the complexity of the relationship. The lack of significant results in cross-sectional analysis highlights the need for further research.

The incorporation of investor sentiment in factor models in Pakistan is scarce. In a study, Rashid et al. (2019) used the investor sentiment index in factor models with the Fama-French three-factor model and Carhart four-factor model for the sampling period 2000-2013 only. The sentiment index is drawn by following the Baker and Wurgler Approach, where only three proxies, volatility premium, turnover, and equity share, are used. The findings suggest that adding a sentiment factor to the three-factor model improves performance. Moreover, the sentiment index enhances the power of Carhart's four-factor model.

The theory reveals that investor sentiment is measured, either directly or indirectly. Direct measures obtain primary data through experiments and surveys, which are challenging to carry out in the long term. Therefore, data from direct measures is not available for most economies worldwide. The unavailability of data for direct measures has paved the way for constructing indirect measures from various market factors (Baker & Wurgler, 2006).

The most common indirect proxies for investor sentiment are daily stock market turnover, Number of IPOs, average returns on the first day of IPO, market capitalization to leverage, advances to declining ratio, adjusted advances to declining ratio, high/low index, margin trading, short interest, specialist short sell ratio, odd-lot sale to purchase, put call ratio, commodities futures trading commission, monthly forecast for returns of mutual funds, close-end fund discount, and proportion of fund assets held by the fund. These factors have been incorporated separately, grouped, or combined to construct a unified index for investor sentiment. (Lee et al., 1991; Brown & Cliff, 2004; Baker et al., 2012; Mclean & Zhao, 2014).

In isolation, the proxies for investor sentiment do not show the whole picture, as various attributes represent sentiment (Baker & Wurgler, 2006). Therefore, Baker and Wurgler (2006) construct a sentiment index from six factors, i.e., trading volume as measured by NYSE turnover, the dividend premium, the closed-end fund discount, the number of IPOs and first-day returns on IPOs. This unified sentiment index captures cumulative sentiment from individual proxies of sentiment. Since its introduction, this sentiment index has been widespread. It has been employed to measure investor sentiment (Baker et al., 2012; Mclean

& Zhao, 2014). According to Baker and Wurgler (2006), the individual factors of their sentiment index are representative of investor sentiment, and we can easily obtain data for these factors.

These factors are highly correlated and cyclical. Moreover, each factor is correlated with economic factors. The macroeconomic factors reflect sentiment from the microeconomy. To obtain a smooth index, regression on each sentiment proxy is applied with economic factors, i.e., industrial production index, growth in consumer durables, nondurables, and services, and a dummy variable for NBER recessions. Afterwards, regression residuals on each sentiment proxy are obtained. Finally, Principal Component Analysis (PCA) is employed to smooth the proxies to construct the unified index. That is used in further analysis. For designing the index, Baker and Wurgler (2006) use data from various frequencies, i.e., daily, weekly, monthly, and annual frequencies have been employed. However, the sentiment index from monthly data is the most common.

Methodology

Monthly data for 682 listed stocks on the Pakistan stock exchange for prices, turnover, dividends, price-earnings ratio, size, book-to-market, gross profit, and total assets are obtained from Thomson Reuters. Furthermore, macroeconomic data for the Karachi interbank offer rate (Kibor), the percentage change in consumer price index (CPI) and industrial growth rate are obtained from the State Bank of Pakistan website. The portfolio returns during 2001-2021 are obtained over 245 months. The monthly frequency of the data helps obtain the indirect proxy of the sentiment easily. Furthermore, data with monthly frequency creates less noise.

This study uses a sentiment index following the Baker and Wurgler (2006) approach. Baker and Wurgler used – share turnover, the dividend premium, the closed-end fund discount, the number of IPOs, first-day returns on IPOs, and equity issue to total debt – as the sentiment proxy. However, for the stock market in Pakistan, the frequency of data for closed-end funds and IPOs is low; thus, the sentiment index is developed from premium on dividends, mean price-earnings ratio, turnover, relative strength index, advances to declining ratio, and money flow, previously used by (Tauseef, 2020; & Tauseef, 2023).

Baker and Wurgler (2006) argue that individual sentiment proxies have attributes in common with macroeconomy. Therefore, an independent factor can be obtained by partially outlining the macroeconomic effect. Controlling macroeconomic factors' effect shall yield a clean index for investor sentiment free from the cyclical effect of the macroeconomy. For macroeconomic factors, Baker and Wurgler use growth in industrial production, consumer durables, nondurables, and services as proxies of the sentiment of the macroeconomy. However, in Pakistan, the data for all the proxies is unavailable. Thus, the consumer price index, industrial production, and KIBOR are used as factors of the sentiment from the macroeconomic environment.

Regression on each investor sentiment component is employed to control the macroeconomic sentiment.

$$DP_t = \alpha + CPI_t + IP_t + KIBOR + \varepsilon_t \quad (1)$$
$$PE_t = \alpha + CPI_t + IP_t + KIBOR + \varepsilon_t \quad (2)$$
$$STO_t = \alpha + CPI_t + IP_t + KIBOR + \varepsilon_t \quad (3)$$
$$RSI_t = \alpha + CPI_t + IP_t + KIBOR + \varepsilon_t \quad (4)$$
$$AD_t = \alpha + CPI_t + IP_t + KIBOR + \varepsilon_t \quad (5)$$
$$MF_t = \alpha + CPI_t + IP_t + KIBOR + \varepsilon_t \quad (6)$$

DP represents the dividend premium, PE represents the mean price-earnings ratio, TO represents the share turnover ratio, RSI shows the relative strength index, AD represents the advances to declining ratio, and MF represents the money flow. Moreover, CPI, IP, and KIBOR are the macroeconomic factors that stand for consumer price index, industrial production, and Karachi interbank offer rate, respectively. The computations for the proxies are shown in the following paragraphs. The dividend premium is calculated as below,

$$DP_t = log(MB)_P - log(MB)_{NP} \quad (7)$$

The dividend premium is the average difference between dividend-paying and non-dividend-paying stocks' book-to-market ratio. The share turnover is calculated as below;

$$STO_t = \frac{Turnover_t}{No\_of\_shares_t} \quad (8)$$

Share turnover is the ratio of the total number of shares traded divided by the total number of shares outstanding. Furthermore, the price-earnings are calculated as follows;

$$PE_t = \frac{1}{No\_of\_Stocks_t} \sum PE_t \quad (9)$$

The PE is the average price-earnings ratio at time t. It increases in periods of high sentiment and decreases in periods of low market sentiment. Equation (10) presents the relative strength index.

$$RSI_t = \frac{\sum(p_{t-i} - p_{t-i-1})}{\sum |p_{t-i} - p_{t-i-1}|} \quad (10)$$

The relative strength index (RSI) shows how the market performs over 14 days. A value of RSI greater than 80 indicates that the market is overbought, and a value of 20 indicates that it is underbought (Chen et al., 2010). The advances to the declining ratio are expressed below,

$$AD_t = \frac{Gained_t}{Lost_t} \quad (11)$$

The advance to decline is the winner-to-loser ratio in each period. In periods of high sentiment, more stocks gain value than lose. Finally,

$$MF_t = log(Traded\ Volume_t * priced_t) \quad (12)$$

The money flow indicates liquidity in the market. Like other sentiment proxies, it surges in high sentiment periods (Chen et al., 2010).

The residuals of each regression are obtained to smooth proxies (to partial out correlations) of investor sentiment. The following equation is used to obtain the residuals.

$$STOr_t = STO_t - \alpha - \overline{CPI_t} - \overline{IP_t} - \overline{KIBOR_t} \quad (13)$$

Where $STOr$ shows residuals of share turnover regressed on economic factors and $\overline{CPI_t} - \overline{IP_t} - \overline{KIBOR_t}$Are the regression estimates of the consumer price index, industrial production, and KIBOR.The exact process is applied to obtain the residuals of other sentiment proxies.

Finally, to construct a single sentiment index, PCA is employed on the residuals obtained from the regressions of each sentiment proxy. PCA is used because sentiment proxies have different units. PCA is an appropriate data reduction tool for creating an index variable with indicators measured in different units.

The empirical results are generated through the ordinary least square regression and Newey-West standard errors, where sentiment is controlled by size, book-to-market, profitability, and investment on portfolio returns (equation (22) by following (Fama & French, 1993: 2015: & 2018). The SMBbtm and HML factors resulted from 2x3 sorts on size and Book to Market ratio. Returns from each portfolio are calculated for August to July of the year $t + 1$. The SMB form size and book to market sorts and HML are calculated as,

$$SMBbtm = \frac{(SL+SM+SH)}{3} - \frac{(BL+BM+BH)}{3} \quad (14)$$

$$HML = \frac{SH+BH}{2} - \frac{SL+BL}{2} \quad (15)$$

The CMA and RMW are the investment and profitability factors of the FF's five-factor model. For CMA, six portfolios are formed based on a 2x3 interaction of size and investment. Equation (16) shows the computation of SMB from investment, and equation (17) presents the calculation of CMA.

$$SMBiv = \frac{(SC+SM+SA)}{3} - \frac{(BC+BM+BA)}{3} \quad (16)$$

$$CMA = \frac{SC+BC}{2} - \frac{SA+BA}{2} \quad (17)$$

A similar approach is used for computing the robust minus weak (RMW) with 2x3 interactions with size; six profitability portfolios are obtained. The SMB from profitability and RMW are obtained as below,

$$SMBp = \frac{(SW+SM+SR)}{3} - \frac{(BW+BM+BR)}{3} \quad (18)$$

$$RMW = \frac{SR+BR}{2} - \frac{SW+BW}{2} \quad (19)$$

Fama and French (2015) compute the SMB of the five-factor model as the average of the SMB form size and book to market sort, size and investment sorts, and size and operating profitability sorts.

$$SMB = \frac{(SMBv+SMBiv+SMBp)}{3} \quad (20)$$

The momentum factor is from the 2x3 sorts of size and returns momentum. Thus, six interacting portfolios are formed, where the momentum premium is calculated.

$$WML = \frac{SW+BW}{2} - \frac{SL+BL}{2} \quad (21)$$

For LHS side portfolio returns, quartile portfolio returns of size and book-to-market and decile portfolio returns of eight anomalies are used. Hence, four portfolios of returns on size and four portfolio returns for book-to-market ratio are constructed. The decile portfolio returns of eight anomalies are computed as per (Hou et al., 2015). The anomalies include failure probability (PF), returns on equity (ROE), returns on asset (ROA), price-earnings ratio (PER), Net share issuance (NSI), accruals (ACRL), net operating assets (NOA), and asset growth (AG). Furthermore, the empirical outcomes are generated through equation (22).

$$R_t = \alpha + \beta_1 sent_t + \beta_2 X_t + \varepsilon_t \quad (22)$$

In equation 22, the R_t reflects the portfolio returns, $sent_t$Is the sentiment index while X_tReflects the other independent factors, i.e., size, book-to-market ratio, profitability, investment, and momentum. The empirical results are obtained by using OLS with Newey-West standard errors.

Results

This section demonstrates the results in detail. SENT is the proxy of market sentiment. The SMB, HML, RMW, CMA, and WML show excess returns of 2x3 sorted portfolios on size, book-to-market, profitability, investment, and momentum. The WML is the momentum factor of Carhart (1997) that presents overconfidence and momentum. The mean of sentiment is 0.014, showing positive sentiment in the sampling period. The mean for SMB, HML, and RMW are 0.005, 0.015, and 0.004, respectively, showing that small minus big, high minus low, and robust minus week portfolios generate 0.5%, 1.5% and 0.4% excess returns in a month. However, the CMA and WML have mean -0.003 and -0.002, indicating that conservative minus aggressive and winner minus loser portfolios yield negative excess returns in the sampling period.

Table 1

Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
$r_m - r_f$	245	.008	.064	-.372	.185
SENT	243	.014	.527	-2.497	1.394
SMB	245	.005	.064	-.211	.698
HML	245	.015	.079	-1.002	.255
RMW	233	.004	.074	-.244	.56
CMA	245	-.003	.042	-.131	.18
WML	245	-.002	.044	-.212	.148

Note: The data for 245 months is obtained from 2001-2021. The $r_m - r_f$ Represents the market premium; SENT is the sentiment index constructed from the six proxies using the principal component matrix. The SMB, HML, RMW, and CMA are the factors of Fama and French (1993:2015). The WML is the momentum factor of (Carhart, 1997).

Figure 1 displays sentiment proxies: premium on dividends, mean price-earnings ratio, turnover ratio, relative strength index, advances to declining ratio, and money flow. Three sentiment proxies, i.e., the premium on dividends, mean price-earnings ratio, and money flow show time trends, while the other three suggest a stochastic process. Almost all the proxies correctly predict the stock market collapse of

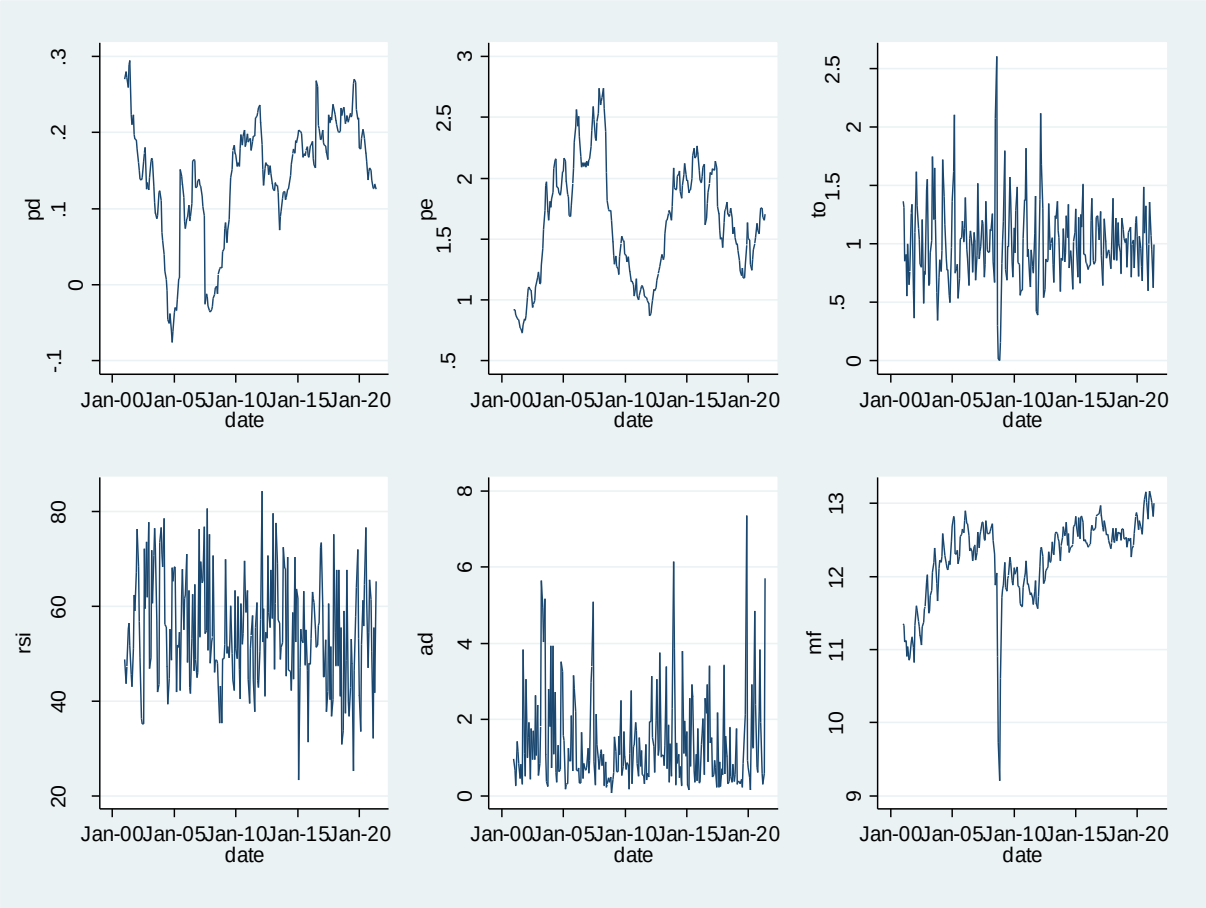
2008. It indicates that premiums on dividends peaked in 2001, declining to the bottom to reach the floor before 2008. It increases afterwards and remains moderately stable with gradual fluctuations.

The price-earnings ratio peaked just before the market collapsed during the 2008 crisis. It recovered when the Pakistan Stock Exchange swung upward after the crisis. It also reflects the decline in the market in 2017-2018. The turnover shows a random pattern. However, it remains more volatile in the early half of the sampling period. A very sharp spike can be observed in turnover in 2008. The relative strength index remains around the mean value most of the time, but lower values can be spotted near the market crisis 2008 and during the decline of the post-2017 market peak. The advance-to-decline ratio highlights a similar picture where the ratio remained very passive during the market crash of 2008. One of the best elaborators of market performance is the money flow. It shows how liquid the market is. The graphs show that markets remained liquid in the sampling period except in 2008, when the market observed severe illiquidity.

Figure 2 illustrates the sentiment index and the KSE 100 index. The sentiment index is the first component of the six individual sentiment proxies. The sentiment index resembles the market index but looks more volatile than the market index. The sentiment remains high when the market rises. The sentiment index is positive for the years before the fall of 2008. It remains negative for a couple of years after 2008. After the recovery, the sentiment index is positive most of the time. The sentiment declines when the market slides down after reaching its peak.

Figure 1

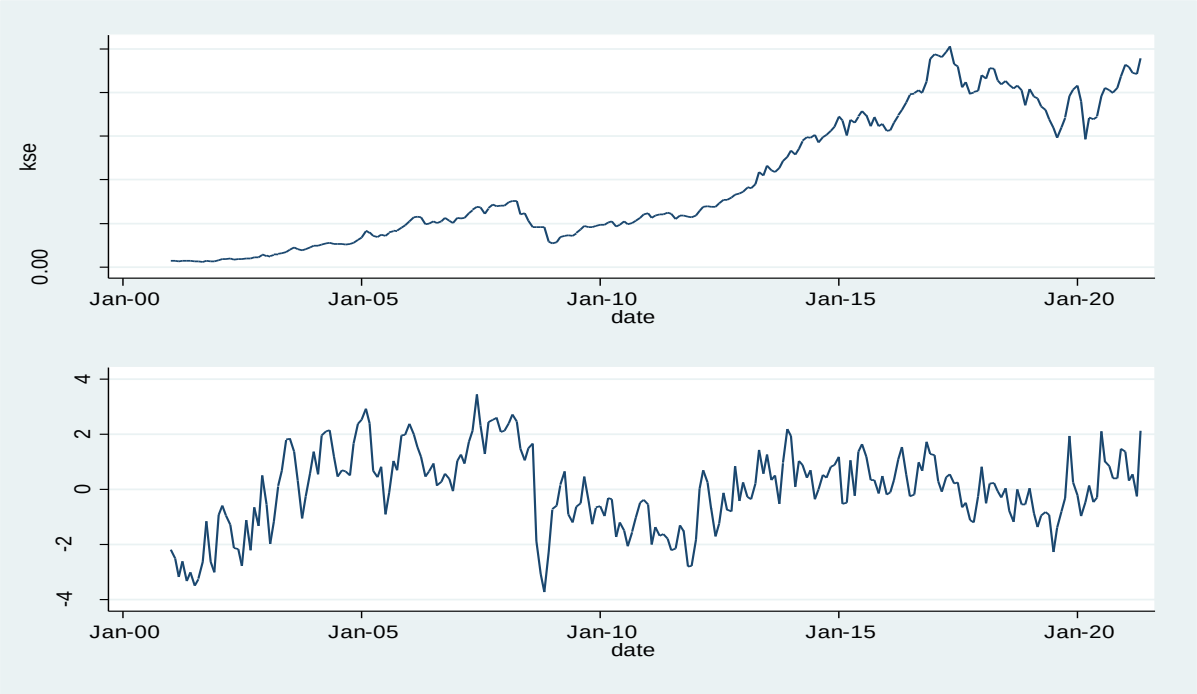
Proxies of sentiment



Note: The figure displays the individual proxies of investor sentiment. Where ***pd*** shows the dividend premium, ***pe*** represents the price-earnings ratio, ***to*** shows the turnover ratio, ***rsi*** is the relative strength index, an ***ad*** is the advances to the declining ratio, and ***mf*** represents the money flow.

Figure 2

Sentiment and KSE 100 index



Note: The *KSE* shows the KSE 100 index, and the *score of the component−1* is the market sentiment from Jan 2001 – May 2021. The *component-1* is obtained through PCA.

Results from OLS on Quartile Portfolios of Size Sorts

The results for ordinary least square regressions are presented in Table 2. Sequential regressions are performed on each quartile of portfolio returns. In the first instance, the portfolio returns are regressed on$(R_m - R_f)$, that is the market risk premium. In the second equation, sentiment is regressed on portfolio returns. In another equation, the market factor is controlled with sentiment to see the response of sentiment when the market factor is controlled for. Additionally, market factors' size and value premium are controlled to observe their relative performance. Furthermore, momentum is controlled by size and value premium. Finally, sentiment is controlled by market factors, size premium, value premium, and momentum. The regressions on size-sorted quartile returns are significant for sentiment, confirming that investor sentiment affects stock returns. The size, value, and momentum returns are significant in all quartiles. However, momentum fails to capture returns in the third and fourth quartiles. Most significant results are observed for premium on market returns. It is highly significant in all quartiles.

The coefficients of sentiment remain significant in all quartile regressions and show a strong prediction power in sequential regressions. This is aligned with the theory, which shows that sentiment raises contemporary returns. Furthermore, the signs on market factor, size, and book-to-market value align with the theory. Meanwhile, the inverse coefficient of momentum indicates contrary momentum returns in the sample period.

Table 2

Ordinary least square regressions for size-sorted portfolios

	Alpha	Sent	MKT	Size	BMV	WML	Adjusted R2
	.0044**	.0206***					
	[2.28]	[6.16]					0.1795
SQ1	.0252***		3.096***				
	[8.06]		[8.11]				0.2097
	.0204***	.0157***	2.418***				
	[6.67]	[4.92]	[6.31]				0.2932

	Alpha	Sent	MKT	Size	BMV	WML	Adjusted R2
SQ1	.0202*** [6.57]	.0151*** [4.77]	2.488*** [6.52]				0.3042
	.0342*** [16.2]		4.742*** [17.78]	.947*** [16.79]	.0677 [1.63]		0.6606
	.032*** [15.76]		4.587*** [17.44]	.941 [17.13]	.082** [2.04]	-.106*** [-3.76]	0.6782
	.029*** [14.74]	.009*** [4.63]	4.141*** [15.93]	.938*** [17.89]	.044 [1.16]		0.7166
	.029*** [14.54]	.009*** [4.77]	-.163*** [-9.41]	.938*** [15.65]	.055 [1.46]	-.072** [-2.62]	0.7228
SQ2	.0205*** [8.89]		2.853*** [10.14]				0.2945
	.001 [0.63]	.017*** [6.79]					0.2373
	.016*** [7.26]	.012*** [5.45]	2.264*** [8.24]				0.4029
	.016*** [7.23]	.012*** [5.23]	2.277*** [8.24]				0.4012
	.025*** [13.19]		3.809*** [15.67]	.492*** [5.97]	.121*** [3.23]		0.5368
	.025*** [12.8]		3.773*** [15.33]	.490*** [9.54]	.125*** [3.30]	-.024 [-0.94]	0.5366
	.021*** [11.70]	.008*** [4.82]	3.256*** [13.87]	.485*** [10.26]	.096*** [2.81]		0.6207
	.021*** [11.82]	.009*** [4.89]	3.26*** [13.89]	.505*** [10.44]	.092*** [2.66]	.014 [0.57]	0.6228
SQ3	.0260 [12.41]		3.643 [12.24]				0.4525
	.001 [0.96]	.017*** [6.90]					0.3017
	.021*** [10.01]	.021*** [2.63]	3.012*** [11.20]				0.5341
	.028*** [13.19]		4.060*** [15.55]	.180*** [3.26]	.105** [2.59]		0.4977
	.026*** [13.06]		3.937*** [15.14]	.175*** [3.23]	.117*** [2.92]	-.086*** [-3.09]	0.5148
	.021*** [10.90]	.021*** [5.56]	2.990*** [12.43]				0.5740
	.023*** [12.14]	.009*** [4.96]	3.411*** [13.89]	.176*** [3.57]	.076** [2.11]		0.6100
	.023 [11.99]	.009 [5.06]	3.371 [13.70]	.185 [3.66]	.081 [2.25]	-.040 [-1.54]	0.6127

	Alpha	Sent	MKT	Size	BMV	WML	Adjusted R2
SQ4	.034***		4.791***				0.6262
	[17.55]		[20.24]				
	.002	.0168***					0.2431
	[1.14]	[5.81]					
	.030***	.008***	4.270***				0.6894
	[16.23]	[4.30]	[18.64]				
	.033***		4.632***	-.135**	.055		0.6339
	[16.68]		[18.55]	[-2.56]	[1.42]		
	.031		4.509	-.139	.066	-.083	0.6469
	[16.20]		[18.16]	[-2.69]	[1.75]	[-3.14]	
	.030***	.008***	4.246***				0.6896
	[16.26]	[4.37]	[18.49]				
	.028***	.008***	4.06***	-.142***	.031		0.6977
	[15.27]	[4.70]	[16.77]	[-2.92]	[0.89]		
	.028***	.009***	4.014***	-.142***	.039	-.048	0.6999
	[15.03]	[4.78]	[16.56]	[-2.85]	[1.11]	[-1.88]	

Note: The ordinary least square regression results are obtained from different equations. Where the **Sent** is the sentiment index from the six proxies of sentiment, MKT represents the market premium (RM-Rf), the size represents the size-sorted premiums, BMV shows the value-sorted premiums, and MOM represents the momentum-sorted premiums. The SQ1, SQ2, SQ3, and SQ4 are average returns from size sorted quartile portfolios. Q1 represents the bottom 25% of stocks, and Q4 shows the top 25% of stocks sorted based on size. The t-statistics are presented in brackets []. The Adjusted R-square of each equation is presented in the rightmost column.

Results from Newey-West Regressions on Quartile Portfolios of Size Sorts

The results for Newey-West standard errors are obtained on all equations presented in Table 3 to control the autocorrelation resulting from lagged residuals. It holds the results of OLS. The coefficients and t statistics adjust slightly, but the overall significance remains consistent. The investor sentiment is significant at a 5% significance level on all portfolio returns. Furthermore, the size, book-to-market, and momentum-sorted premium on returns perform well in predicting size-sorted quartile returns. The size itself fails to explain the returns of the third quartile. The F-statistics show that the model is well specified when the investor sentiment is controlled. However, the most outstanding factors remain market factors for predicting portfolio returns of the first to fourth quartiles, where its prediction power improves for the top deciles.

Table 3

Newey-west standard errors for Size sorted portfolios.

	Alpha	Sent	MKT	Size	BMV	WML	F – Statistics
SQ1	.005***		-.118***				27.66
	[2.62]		[-5.26]				[0.00]
	.004**	.023***					16.96
	[2.20]	[4.99]					[0.00]
	.004**	.021***	-.081***				18.40
	[2.49]	[4.62]	[-3.50]				[0.00]
	.003***		-.204***	.755***	.231***		52.57
	[2.62]		[-11.29]	[7.51]	[3.51]		[0.00]
	.003**		-.200***	.758***	.252***	-.162***	52.95
	[2.27]		[-10.42]	[7.72]	[3.75]	[-3.05]	[0.00]
	.003**	.016***	-.163***	.772***	.175**		71.94
	[2.39]	[4.28]	[-9.07]	[8.45]	[2.51]		[0.00]

	Alpha	Sent	MKT	Size	BMV	WML	F – Statistics
SQ1	.002**	.017***	-.163***	.774***	.197***	-.118***	51.20
	[2.28]	[4.28]	[-8.66]	[8.47]	[2.85]	[-2.97]	[0.00]
	.002**	.017***	-.163***	.774***	.197***	-.118***	51.20
	[2.28]	[4.28]	[-8.66]	[8.47]	[2.85]	[-2.97]	[0.00]
	.002		-.107***				39.14
	[1.47]		[6.26]				[0.00]
	.001	.020***					26.00
	[0.72]	[5.89]					[0.00]
	.001	.018***	-.074***				24.08
	[1.03]	[5.36]	[-4.52]				[0.00]
SQ2	.001		-.168***	.339***	.257***		41.68
	[0.75]		[-10.79]	[4.44]	[4.81]		[0.00]
	.000		-.166***	.341***	.266***	-.0711	34.13
	[0.57]		[-10.33]	[4.45]	[4.88]	[-1.49]	[0.00]
	.000	.015***	-.131***	.357***	.203***		50.35
	[0.22]	[5.13]	[-8.87]	[5.08]	[3.32]		[0.00]
	.000	.015***	-.131***	.375***	.204***	-.022	42.43
	[0.41]	[5.16]	[-8.68]	[5.13]	[3.50]	[-0.58]	[0.00]
	.002		-.147***				82.34
	[1.91]		[-9.07]				[0.00]
	.001	.021***					31.04
	[0.87]	[5.58]					[0.00]
SQ3	.002	.004***	-.107***				42.57
	[1.45]	[3.94]	[-6.67]				[0.00]
	.001		-.187***	.021	.258***		45.45
	[1.40]		[-11.26]	[0.27]	[5.14]		(0.00)
	.001		-.183***	.024	.275***	-.133***	35.61
	[1.10]		[-10.84]	[0.32]	[5.32]	[-2.63]	(0.00)
	.001	.016***	-.145***	.045	.199***		46.02
	[0.96]	[4.70]	[-9.99]	[0.67]	[3.61]		(0.00)
	.001	.016***	-.145***	.053	.213***	-.079**	36.43
	[0.98]	[4.71]	[-9.60]	[0.73]	[4.00]	[-2.00]	(0.00)
	.003**		-.191***				140.92
	[2.46]		[-11.87]				(0.00)
	.001	.021***					22.12
	[1.09]	[5.12]					(0.00)
	.002***	.016***	-.157***				69.51
	[2.01]	[4.29]	[-12.38]				(0.00)
SQ4	.003**		-.200***	-.322***	.215***		57.45
	[2.39]		[-11.82]	[-3.38]	[3.34]		[0.00]
	.002**		-.196***	-.319***	.233***	-.139***	44.15
	[2.07]		[-10.97]	[-3.41]	[3.49]	[-2.75]	(0.00)
	.002**	.016***	-.156***				52.83
	[2.24]	[4.33]	[-12.28]				(0.00)
	.002**	.016***	-.160***	-.305***	.160**		49.86
	[2.11]	[4.38]	[-9.40]	[-3.49]	[2.29]		(0.00)
	.002**	.016***	-.159***	-.305***	.177**	-.094**	35.23
	[1.98]	[4.37]	[-8.99]	[-3.48]	[2.56]	[-2.31]	(0.00)

Note: The results for Newey-West standard errors are obtained from different equations. Where the **Sent** is the sentiment index from the six sentiment proxies, **MKT** represents the market premium (RM-Rf), the size represents the size-sorted premiums, MBV shows the value-sorted premiums, and MOM represents the momentum-sorted premiums. The SQ1, SQ2, SQ3, and SQ4 are average returns from size sorted quartile portfolios. Q1 represents the bottom 25% of stocks, and Q4 shows the top 25% of stocks sorted based on

size. The t-statistics are presented in brackets []. The F-Statistics with probability in [] of each equation are presented in the rightmost column.

Results from OLS on Quartile Portfolios of Book-to-Market Sorts

Table 4 displays the results from OLS for book-to-market portfolio returns. The performance of sentiment is encouraging, too, in book-to-market quartile portfolios. The investor sentiment index is significant in predicting the quartile returns of all portfolios at a 5% significance level. The signs of coefficients are also consistent throughout regressions individually and with sequential regressions. In all the portfolios, the sentiment predicts positive returns. As in the case of size-sorted returns, the market factor does well in predicting value-sorted returns. Interestingly, the size premium fails to explain value-sorted returns in each case. The book-to-market premium explains the returns of quartile two to quartile four but fails to explain the returns of the first quartile. Momentum explains the book-to-market sorted quartile returns better than it predicts the returns of size sorted portfolios.

The adjusted R-square shows that the market factor performs very well when controlled individually. It is also apparent in the size of sorted portfolio returns. On average, it explains almost 35% of the variability in stock returns. The sentiment index explains almost 23% variability in value-sorted returns. It is steady in regressions of all quartiles. When the sentiment index is controlled with market factors, it explains 53% variability in first-quartile returns, 42% in second-quartile returns, 37% in third-quartile reruns, and 32% in fourth-quartile returns. That is almost at par with size and book-to-market returns when controlled with market factors explaining 44%, 34%, 40%, and 43% returns from bottom to top quartiles, respectively.

Table 4

Ordinary least square regressions for value-sorted portfolios

	Alpha	Sent	CSI	MKT	Size	BMV	WML	Adjusted R2
	. .008***			-.451***				0.4447
	[2.72]			[-14.01]				
	.004	.042***	-1.072***					0.2272
	[1.37]	[6.44]	[-4.89]					
VQ1	.006**	.028***	-.751***	-.390***				0.5338
	[2.48]	[5.49]	[-4.38]	[-12.73]				
	.008***			-.448***	-.028	-.011		0.4402
	[2.71]			[-12.40]	[-0.22]	[-0.11]		
	.007**			-.442***	-.023	.015	-.212***	0.4693
	[2.52]			[-12.44]	[-0.19]	[0.15]	[-3.17]	
	.007**	.029***	-.763***	-.376***	-.007	-.093		0.5318
	[2.57]	[5.54]	[-4.40]	[-10.94]	[-0.06]	[-0.95]		
	.007**	.029***	-.600***	-.376***	.012	-.070	-.139**	0.5383
	[2.59]	[5.60]	[-3.22]	[-1102]	[0.10]	[-0.71]	[-2.12]	
	.009***			-.300***				0.300
	[3.61]			[-10.29]				
	.006**	.029***	-1.080***					0.2271
	[2.46]	[5.52]	[-6.10]					
	.008***	.020	--.875***	-.250***				0.4202
	[3.34]	[4.36]	[-5.64]	[-9.00]				
VQ2	.008***			-.345***	-.120	.364***		0.3449
	[3.20]			[-10.89]	[-1.06]	[3.90]		
	.007***			-.337***	-.114	.401***	-.283***	0.3955
	[2.99]			[-11.12]	[-1.05]	[4.47]	[-4.94]	
	.007***	.019***	-.819***	-.288***	-.078	.287***		0.4407
	[3.04]	[4.14]	[-5.31]	[-9.45]	[-0.74]	[3.28]		
	.007***	.019***	-.616***	-.288***	-.083	.327	-.208***	0.4661
	[2.95]	[4.26]	[-3.78]	[-9.66]	[-0.78]	[3.78]	[-3.64]	

	Alpha	Sent	CSI	MKT	Size	BMV	WML	Adjusted R2
VQ3	.011*** [3.89]			-.341*** [-11.02]				0.3305
	.008*** [2.65]	.040*** [6.97]	-.832*** [-4.33]					0.2311
	.010*** [3.65]	.004** [2.29]	-.619*** [-3.60]	-.296*** [-9.10]				0.3732
	.009*** [3.36]			-.414*** [-12.60]	.014 [0.12]	.491*** [5.08]		0.4019
	.008*** [3.18]			-.408*** [-12.69]	.018 [0.16]	.519*** [5.47]	-.212*** [-3.50]	0.4309
	.008*** [3.26]	.028*** [5.74]	-.537*** [-3.36]	-.353*** [-11.15]	.023 [0.22]	.412*** [4.52]		0.4877
	.008*** [3.19]	.028*** [5.82]	-.370** [-2.16]	-.353*** [-11.28]	.025 [0.23]	.442*** [4.86]	-.164*** [-2.73]	0.4995
VQ4	.011*** [3.47]			-.275*** [-7.37]				0.1825
	.008*** [2.64]	.040*** [6.21]	-1.049*** [-4.96]					0.2210
	.009*** [3.15]	.032*** [5.25]	-.874*** [-4.37]	.009*** [-5.96]				0.3219
	.007*** [2.75]			-.430*** [-12.41]	-.007 [-0.06]	1.055*** [10.34]		0.4364
	.007** [2.56]			-.423*** [-12.48]	-.002 [-0.02]	1.08*** [10.81]	-.220*** [-3.44]	0.4606
	.006** [2.59]	.026*** [5.26]	-.730*** [-4.36]	-.363*** [-10.96]	.016 [0.14]	.975*** [10.21]		0.5297
	.006** [2.57]	.027*** [5.32]	-.564*** [-3.14]	.363*** [-11.06]	.028 [0.24]	1.002*** [10.48]	-.152** [-2.40]	0.5380

Note: The results for Newey-West standard errors are obtained from different equations. Where the **Sent** is the sentiment index from the six sentiment proxies, **MKT** represents the market premium (RM-Rf), Size represents the size-sorted premiums, BMV shows the value-sorted premiums, and MOM represents the momentum-sorted premiums. The VQ1, VQ2, VQ3, and VQ4 are average returns from size-sorted quartile portfolios. Q1 represents the bottom 25% of stocks, and Q4 shows the top 25% of stocks sorted based on size. The t-statistics are presented in brackets []. The Adjusted R-square of each equation is presented in the rightmost column.

Results from Newey-West Regressions on Quartile Portfolios of BMV Sorts

Table 5 presents the results for Newy-West standard errors for book-to-market sorted portfolio returns. It shows that results for all the factors remain like the OLS with a mild difference in coefficients and t statistics. The sentiment index is significant for all portfolios. Once again, the market factor has the highest F statistics when regressed on returns of all book-to-market quartile sorted returns.

The size premium is unable to predict returns. The value premium explains the returns of all quartiles except the first one. Momentum predicts contrary returns, as explained by the OLS. The Newey-West standard error confirms that the results for all the factors are well tolerated.

Table 5

Newey-west standard errors for value-sorted portfolios

	Alpha	Sent	MKT	Size	BMV	WML	F – Statistics
VQ1	.004	.042***					20.81
	[1.19]	[5.22]					[0.00]
	.008**		-.448***	-.028	-.011		60.18
	[2.59]		[-11.79]	[-0.16]	[-0.10]		[0.00]
	.007**		-.442***	-.023	.015	-.212**	46.15
	[2.36]		[-11.22]	[-0.14]	[0.13]	[-2.23]	[0.00]
	.007**	.029***	-.376***	-.007	-.093		46.82
	[2.42]	[4.29]	[-10.04]	[-0.05]	[-0.75]		[0.00]
	.007**	.029***	-.376***	.012	-.070	-.139*	32.96
	[2.43]	[4.27]	[-9.76]	[0.08]	[-0.57]	[-1.80]	[0.00]
VQ2	.009***		-.300***				89.85
	[3.16]		[-10.48]				[0.00]
	.006**	.029***					20.37
	[2.12]	[4.02]					[0.00]
	.008***	.020***	-.250***				37.29
	[3.05]	[3.17]	[-9.29]				[0.00]
	.008***		-.345***	-.120	.364***		40.21
	[2.98]		[-10.82]	[-0.88]	[3.78]		[0.00]
	.007***		-.337***	-.114	.401***	-.283***	34.23
	[2.70]		[-10.64]	[-0.90]	[4.04]	[-3.63]	[0.00]
	.007***	.019***	-.288***	-.078	.287***		33.67
	[2.86]	[2.89]	[-10.11]	[-0.70]	[2.71]		[0.00]
	.007	.019	-.288	-.083	.327	-.208	25.83
	[2.75]	[2.94]	[-9.85]	[-0.72]	[3.07]	[-3.07]	[0.00]
VQ3	.011***		-.341***				100.25
	[3.42]		[-10.01]				[0.00]
	.008**	.040***					18.49
	[2.35]	[4.84]					[0.00]
	.010***	.004**	-.296***				38.71
	[3.30]	[1.93]	[-8.48]				[0.00]
	.009***		-.414***	.014	.491***		41.80
	[3.15]		[-11.02]	[0.10]	[4.29]		[0.00]
	.008***		-.408***	.018	.519***	-.212**	33.33
	[2.92]		[-10.54]	[0.12]	[4.39]	[-2.45]	[0.00]
	.008***	.028***	-.353***	.023	.412***		31.58
	[3.08]	[3.85]	[-10.23]	[0.17]	[3.48]		[0.00]
	.008***	.028	-.353***	.025	.442***	-.164**	24.65
	[3.02]	[3.85]	[-9.93]	[0.19]	[3.76]	[-2.24]	[0.00]
VQ4	.011***		-.275***				58.42
	[3.05]		[-7.64]				[0.00]
	.008**	.040***					24.70
	[2.38]	[5.47]					[0.00]
	.009***	.032***	.009***				28.58
	[2.93]	[4.87]	[-6.21]				[0.00]
	.007***		-.430***	-.007	1.055***		55.64
	[2.60]		[-12.18]	[-0.04]	[9.38]		[0.00]
	.007**		-.423***	-.002	1.08***	-.220**	43.98
	[2.37]		[-11.70]	[-0.02]	[9.54]	[-2.40]	[0.00]
	.006**	.026***	-.363***	.016	.975***		53.54
	[2.43]	[4.17]	[-10.43]	[0.12]	[8.02]		[0.00]
	.006**	.027***	.363***	.028	1.002***	-.152**	38.97
	[2.44]	[4.18]	[-10.14]	[0.20]	[8.31]	[-1.98]	[0.00]

Note: The results for Newey-West standard errors are obtained from sequential regressions. Where the **Sent** is the sentiment index from the six sentiment proxies, **MKT** represents the market premium (RM-Rf), Size represents the size-sorted premiums, BMV shows the value-sorted premiums, and MOM represents the momentum-sorted premiums. The VQ1, VQ2, VQ3, and VQ4 are average returns from book-to-market sorted quartile portfolios. Q1 represents the bottom 25% of stocks, and Q4 shows the top 25% of stocks sorted based on size. The t-statistics are presented in brackets []. The F-statistics with probability in [] of each equation are presented in the rightmost column.

Factor Regression with Sentiment on Anomaly Excess Returns

Finally, the sentiment is regressed with the factor model of Fama and French (2018) on excess returns of eight prominent anomalies. In Panel A of Table 5, the regression outcomes for excess returns of bottom deciles of anomalies are displayed. The R-Square and F-statistics show that the model captures variation in excess returns of the anomalies. The CMA captures variation only in net operating assets and distress, while the RMW fails to capture variation in excess returns of any anomaly portfolios. HML and momentum capture three and five out of eight anomaly portfolio excess returns at a 5% significance level. SMB captures variation in excess returns of seven anomalies, while the market factor explains variation in all portfolios. At last, the sentiment index captures variation in bottom deciles excess returns of all anomaly portfolios at a 1% significance level, except for the price-earnings ratio.

Panel 2 presents the regression results for top decile anomaly portfolio excess returns. The factors perform slightly better in explaining the top decile portfolio excess returns. The RMW explains variation in excess returns of three anomaly portfolios, MOM and HML explain five, CMA and SMB explain six, and market factors explain seven. The sentiment index explains variation in excess returns of all anomaly portfolios at a 5% significance level. The outcomes endorse the sentiment index as a relevant attribute in the Pakistan stock exchange.

Table 6

Regression on anomaly portfolio returns

	Panel A								
	Alpha	MKT	Sent	SMB	HML	RMW	CMA	MOM	R-Sq/F-stat
PF	.0051 [0.95]	.0981*** [2.94]	.0435*** [3.34]	-.3724*** [-4.32]	-0.0188 [-0.18]	-.8829 [-0.72]	-.6184*** [-4.99]	-.2973*** [-2.83]	0.24 [10.00]
ROE	.0079 [1.15]	.1798*** [4.23]	.0476*** [2.87]	-.2341** [-2.13]	.1381 [1.04]	1.5873 [1.01]	.0520 [0.33]	-.3295** [-2.46]	0.22 [9.33]
ROA	.0123* [1.73]	.2051*** [4.66]	.0488*** [2.84]	-.2317** [-2.04]	.3048** [2.21]	-.2833 [-0.17]	-.0172 [-0.11]	-.6892*** [-4.97]	0.33 [15.64]
PER	.0086 [1.06]	.1619*** [3.21]	.0320 [1.62]	-.0849 [-0.65]	.5099*** [3.23]	1.1205 [0.60]	-.1468 [-0.78]	-.0391 [-0.25]	0.15 [5.56]
NSI	.0172 [3.86]	.0716** [2.60]	.0406*** [3.76]	-.2782*** [-3.90]	-.1257 [-1.45]	1.1686 [1.15]	-.1637 [-1.60]	-.1561* [-1.80]	0.18 [7.06]
ACRL	.0124** [2.37]	.1345*** [4.15]	.0486*** [3.84]	-.2094** [-2.50]	-.2273** [-2.24]	-.6546 [-0.55]	-.1129 [-0.94]	-.2903*** [-2.94]	0.19 [7.78]
NOA	.0116** [2.46]	.0989*** [3.38]	.0428*** [3.75]	-.3216*** [-4.26]	.0155 [0.17]	.2415 [0.22]	-.2506** [-2.31]	-.1690* [-1.84]	0.21 [8.75]
AG	.0065 [1.17]	.1236*** [3.60]	.0571*** [4.26]	-.2404*** [-2.71]	.1509 [1.40]	2.3924* [1.89]	-.0323 [-0.25]	-.2412** [-2.23]	0.27 [11.69]

Panel A									
	Alpha	MKT	Sent	SMB	HML	RMW	CMA	MOM	R-Sq/F-stat
PF	.0028	.1319***	.0454***	-.2201**	.0591	4.4105***	-.0875	-.4154***	0.25
	[0.43]	[3.21]	[2.83]	[-2.07]	[0.46]	[2.91]	[-0.57]	[-3.21]	[10.47]
ROE	.0133***	.0669**	.0387***	-.4468***	-.1750**	1.0769	-.2619***	-.3377***	0.31
	[3.21]	[2.61]	[3.86]	[-6.74]	[-2.18]	[1.14]	[-2.75]	[-4.18]	[14.57]
ROA	.0117***	.0908***	.0404***	-.5923***	-.3018***	1.5493	-.2863***	-.2491***	0.43
	[2.62]	[3.28]	[3.74]	[-8.28]	[-3.48]	[1.58]	[-2.78]	[-2.86]	[16.65]
PER	.0039	.1205***	.0403***	-.1928**	.0908	2.9450**	-.1464	-.1117	0.22
	[0.79]	[3.88]	[3.32]	[-2.40]	[0.93]	[2.57]	[-1.27]	[-1.14]	[9.09]
NSI	.0088*	.1287***	.0502***	-.6723***	-.3203***	1.4331	-.2902**	-.4624	0.41
	[1.82]	[4.29]	[4.28]	[-8.67]	[-3.41]	[1.30]	[-2.61]	[-4.89]	[22.26]
ACRL	.0074	.0518*	.0554**	-.0145	.2109**	.6351	-.3215***	-.1867*	0.21
	[1.52]	[1.70]	[4.66]	[-0.19]	[2.21]	[0.57]	[-2.84]	[-1.95]	[8.63]
NOA	.0042	.0860***	.0468***	-.1763**	.2259**	5.1142***	-.2698**	-.4962***	0.41
	[0.85]	[2.76]	[3.85]	[-2.19]	[2.31]	[4.45]	[-2.33]	[-5.06]	[22.41]
AG	.0157***	.1400***	.0475***	-.3349***	.0598	-1.0637	-1.0637***	-.3766***	0.26
	[2.80]	[4.03]	[3.50]	[-3.73]	[0.55]	[-0.83]	[-4.52]	[-3.44]	[11.69]

Note: In June, each anomaly is divided into ten decile portfolios. The excess returns of decile portfolios are obtained by subtracting the monthly risk-free rate from portfolio returns. The factors SMB, HML, RMW, CMA, and Momentum are formed by 2X3 sorts, as shown by Fama and French (1993: 2015: and 2018). Sent is the sentiment index formed from six sentiment proxies.

Discussion and Conclusion

The descriptive statistics and graphical presentations illustrate that the sentiment index and its proxies mimic the momentum of the Pakistan Stock Exchange. The bearish market of 2008-2009, 2017-2018, and the decline of the market post-COVID-19 are depicted in the premiums on dividends, relative strength index, turnover ratio, price-earnings ratio, and advances to declining ratio. The market illiquidity in 2008 is captured by money flow.

The results from OLS and Newey-West standard errors show that sentiment can describe stock returns. It explains returns in size, book-to-market, and anomaly portfolios. Moreover, it remains significant in all sequential regressions. Sentiment predicts positive stock returns, which is aligned with the findings of (McLean et al., 2009). Furthermore, Stambaugh and Yuan (2017) show that sentiment performs well in asset pricing models. Some studies from Pakistan (Khan & Ahmad, 2018; Rashid, 2017; Muhammad, 2022; Andleeb, 2023; and Tauseef and Suman, 2023) show that investor sentiment explains market outcomes. Rashid et al. (2019) also identify that it performs well in asset pricing models. Thus, in an extended asset pricing analysis, this study finds that investor sentiment should be considered when making investment decisions.

The results from sentiment are promising, as it explains more than 20% of the variability in stock returns. Though the variation explained by sentiment is smaller than the size effect in size-sorted portfolios and smaller than the value effect in book-to-market portfolios, it is significant in all regressions. Additionally, the sentiment index performs better than other factors on excess returns of decile portfolios of anomalies.

The findings of this study show that investor sentiment is a risk factor influencing stock prices. The price variation resulting from investor sentiment is reflected in systematic risk. Diversification eliminates the idiosyncratic risk but not the systematic risk. Investors must adjust their portfolios considering the risk posed by investor sentiment. The risk of investor sentiment is sourced from the market. Therefore, buying markets at low and selling at high sentiment shall be the most optimal investment decision. Since it is not straightforward to identify the peak and bottom of investor sentiment, the investor may include the sentiment index in the pricing models when making investment decisions. Furthermore, Future research may incorporate more factor models such as q-factor and mispricing factors with investor sentiment. Researchers may also consider identifying the portfolios most or least affected by investor sentiment.

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