

RESEARCH ARTICLE

The Effect of Sustainability Premium on the Relationship Between Investor Sentiment Contagion and Excess Stock Returns in Companies Listed on the Tehran Stock Exchange

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ABSTRACT

Keywords:

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The purpose of this study was to investigate the effect of sustainability premium on the relationship between investor sentiment and excess returns on the Tehran Stock Exchange. In this study, a screening method was employed to select the sample, resulting in an analysis of 118 companies over the period from 2014 to 2023, which provided 1,180 firm-year observations. To test the research hypotheses, multivariate regression analysis was used. The results revealed that investor sentiment has a positive effect on excess returns, and sentiment contagion also positively influences excess returns. The sustainability premium also had a negative impact on the relationship between investor sentiment and excess returns. Sustainability premium also had a positive effect on the relationship between sentiment contagion and excess returns. Based on the findings, investors are advised to incorporate the sentiment atmosphere of stocks and the degree of sentiment contagion into their economic decision-making processes.

Introduction

The capital market is a cornerstone of a nation's economy, playing a vital role in capital allocation and fostering economic growth (Levine, 2005). In recent decades, the traditional view of markets, grounded in the Efficient Market Hypothesis, has been challenged by the emergence of behavioral finance. This paradigm recognizes that financial markets are not always rational and are significantly influenced by psychological factors. A key concept in this domain is "investor sentiment", defined as the propensity to speculate based on beliefs not justified by fundamental news (Baker & Wurgler, 2007). Empirical evidence consistently shows that investor sentiment can drive asset prices away from their intrinsic values, leading to significant mispricing and excess volatility.

Furthermore, sentiment is not an isolated phenomenon; it can propagate through a process known as "sentiment contagion". This refers to the spread of mood and investment attitudes from one group of investors to another, or from one asset class to others, often amplifying market swings and leading to systemic overreactions (Bekaert et al., 2014). The effects of sentiment and its contagion are particularly pronounced in emerging markets, which are often characterized by lower institutional ownership, less stringent regulation, and a dominance of retail investors, making them more susceptible to behavioral biases (Baker et al., 2012). The Tehran Stock Exchange (TSE), as an emerging market, provides a compelling context to study these dynamics.

Parallel to the rise of behavioral finance, the concept of corporate sustainability and Environmental, Social, and Governance (ESG) practices has gained considerable traction. Pioneer companies must show that they pay attention to social and environmental issues to move towards global markets and gain acceptance in global markets. For this reason, one of the important issues at the international level for companies is the issue of social responsibility (Vuong, 2022). Stakeholder theory posits that companies addressing the concerns of a broad range of stakeholders—including employees, communities, and the environment—can achieve superior long-term performance (Freeman, 2010). From a financial perspective, firms with robust sustainability practices are often rewarded by the market with a "sustainability premium", a valuation premium reflecting lower perceived risk and higher expected future cash flows (Eccles et al., 2014). This premium arises because sustainable practices can enhance a firm's reputation, reduce regulatory risks, and foster stronger customer and employee loyalty.

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Although the independent effects of investor sentiment and sustainability on stock returns are well-documented, their interplay remains a theoretical puzzle, particularly in emerging markets. On one hand, the stable fundamentals and long-term orientation of sustainable firms could theoretically insulate them from speculative sentiment, "weakening" the sentiment-return relationship. On the other hand, during periods of high sentiment, these same firms might be perceived as "safe havens", attracting disproportionate attention and thereby "strengthening" the impact of sentiment contagion. This theoretical ambiguity is the core research gap we address. Specifically, it remains unclear how a sustainability premium moderates the relationship between investor sentiment (and its contagion) and excess stock returns. On one hand, the intrinsic value and stable cash flows associated with sustainable firms might make their stock prices less susceptible to the whims of speculative sentiment, thereby weakening the sentiment-return relationship. On the other hand, during periods of high sentiment contagion, sustainable firms might become "safe havens", attracting even more investor attention and strengthening the positive impact of contagion on their returns.

This study makes several key contributions. First, it is among the first to empirically test the moderating role of sustainability premium in the context of an emerging market characterized by high volatility and behavioral biases. Second, it bridges two distinct strands of literature—behavioral finance and sustainable finance—providing a more integrated understanding of asset pricing. Third, our findings offer practical insights for investors in the TSE, demonstrating that sustainability can act as a risk-mitigating factor against sentiment-driven market swings, and for policymakers aiming to promote market stability through improved corporate transparency and ESG practices.

The following is a discussion of the theoretical foundations and background of the research. Then, the research method and research models are introduced and explained. This is followed by the research findings and finally, a discussion and conclusion about the impact of sustainability and investor sentiment on research returns.

Theoretical Foundations

In the context of emerging markets like Iran, which are often characterized by higher volatility, lower liquidity, and a dominance of retail investors, the role of sentiment becomes even more pronounced (Niknafs & Yeganeh, 2019).

Market sentiment is a reflection of investors' general attitude towards the future of a stock, which is often influenced by non-fundamental factors (such as rumors, political news, or herd behavior). These sentiments can take two forms: optimistic and expecting price growth, and pessimistic and expecting price declines. Why investor sentiment, which reflects subjective beliefs rather than economic logic that deviates from fundamental valuation, affects the stock market first, is because of the risk of noisy traders. Sentiment (irrational) traders, if present in large numbers, create systematic risk that prevents arbitrageurs from correcting incorrect pricing, and therefore sentiment continues to influence prices. Second, because of arbitrage constraints. Transaction costs, short-selling constraints, and investor horizon mismatches prevent arbitrageurs from eliminating sentiment-driven mispricing (Shleifer & Vishny, 1997). In Iran's stock market, where short-selling is practically non-existent and arbitrage activities are limited, these constraints are significantly magnified, allowing mispricing to persist for longer periods (Khodadadi & Norouzi, 2016). Accordingly, overpricing for stocks with higher short-selling constraints (i.e., higher specific risk) is more severe during bullish periods (Nagel, 2005).

The influence of emotions in some markets may reach the point where they become a pricing factor. Emotions also disproportionately affect stocks that are difficult to value (e.g., low profitability, high volatility) or that are expensive to arbitrage (Baker & Wurgler, 2007). Accordingly, high emotions predict lower future market returns because emotions persist for a while, after which rationality prevails over emotions, leading to a decrease in buyers' appetite and a return to rational prices in the future (Baker & Wurgler, 2007). Yu and Yuan (2011) concluded in their research that emotions exacerbate market fluctuations, especially during crises. In this regard, Stambaugh et al. (2012) state that stocks with high specific risk, small size, and low profitability are more sensitive to emotions. That is, during periods of high emotions, they perform better than other stocks but subsequently fall. A study on the Tehran Stock Exchange (TSE) confirmed that during the market bubble, small-cap stocks with high idiosyncratic risk experienced the most dramatic rise and subsequent fall, aligning with global findings (Mohammadi, 2013).

But sentiment contagion is a key phenomenon in behavioral finance, in which market emotions (such as fear or greed) are transmitted from one person to another or from one market to another, with systematic effects on the returns of assets, including stocks. Sentiment contagion can affect prices through information cascades, which occur when investors base their decisions on the behavioral signals of others rather than on independent analysis. This leads to directional changes in demand and volatility in returns (Bikhchandani et al., 1992). Shiller's (1984) research showed that sentiment contagion can create price bubbles in which returns temporarily deviate from fundamental value. After the bubble bursts, sharp negative returns appear.

Diebold and Yilmaz's (2009) study, analyzing data from 56 global markets, showed that sentiment contagion was responsible for 55 to 70 percent of the increase in return volatility during crises.

According to Baker et al. (2012), sentiment contagion leads to temporary correlations in returns among unrelated stocks that are not explained by fundamental variables. This reduces the predictability of returns. The contagion of emotions is exacerbated in some cases. In Iran, the simultaneous and herd-like buying and selling by institutional investors and investment funds, often driven by a common interpretation of political or economic news rather than independent analysis, has been documented to amplify market swings (Keshavarz Hadad & Rezaei, 2011).

Shiller (1984) also states that excessive optimism in technology stocks spreads to stocks in related sectors such as clean energy industries. In a study by Tetlock, it was concluded that pessimistic stories on the front pages of economic newspapers cause market-wide selling and spread to unrelated stocks (Tetlock, 2007). In a similar study, Cohen et al. (2022) found that virtual investment analysis rooms led to an additional 5% return, but ultimately carried the risk of future price declines to the last investors. Cookson and Niesner (2020) found that social media platforms such as Twitter and Reddit, by homogenizing user content, accelerate mispricing.

Sustainability means integrating Environmental, Social, and Governance (ESG) criteria into business decisions. Research shows that companies with high ESG scores not only have lower risk but may also generate higher returns. This phenomenon is known as the sustainability premium. Sustainability premium is a dynamic phenomenon that helps companies in the long term by reducing risk and improving profitability, but in the short term, it can be affected by market sentiment (Giese et al., 2021).

Sustainability impacts stock returns in two ways: First, it reduces systematic risk. Sustainable companies are less likely to face operational or legal crises by better managing environmental (e.g., climate change) and social (e.g., labor relations) risks. Second: Attracting institutional investors. Responsible Investment (SRI) funds prefer to invest in sustainable stocks. This demand increases stock prices. According to research by Hartzmark and Sussman (2019), capital inflows into ESG funds generate an additional 0.8% per month return for sustainable stocks.

Despite the expectation of a positive relationship between sustainability and stock returns, empirical evidence has shown contradictory findings.

Friede et al. (2015), with a study of 2200 samples, concluded that there is at least a non-negative relationship between ESG and financial returns. Giese et al. (2021) studied the stock returns of companies during financial crises and found that ESG indicators led to excess returns over other stocks. Helminen (2023) also stated that companies with high ESG had better stock returns over the past 5 years than other companies. On the other hand, there are indications of a negative relationship between sustainability and returns. Pedersen et al.'s (2021) study shows that in Europe, green stocks have had 2% lower returns than traditional stocks during boom periods. Also, in emerging markets, the lack of transparent ESG standards and the lack of diversification may dampen the effect of sustainability on returns (Arayssi et al., 2019).

Sustainability (ESG) as a Modifying variable modifies the relationship between investor sentiment and stock returns in five ways:

1. **Reduced sensitivity of returns to short-term sentiment:** Companies with high ESG scores are less affected by sentiment fluctuations due to the following characteristics:
 - Cash flow stability: Focusing on managing long-term risks (such as climate change or workforce diversity) reduces dependence on short-term shocks.
 - Sustainable institutional shareholders: Attracting investors with a long-term horizon (such as ESG funds) who are more indifferent to market emotions (Edmans, 2011).
2. **Modifying the negative effects of pessimism:** Sustainability, through mechanisms such as reducing the risk of employee lawsuits in labor crises or reducing the risk of natural disasters with environmentally friendly infrastructure, reduces the negative effects of pessimism.
3. **Strengthening the effect of optimistic sentiment:** Sustainability strengthens the effect of positive sentiment by attracting capital inflows, and on the other hand, by increasing brand reputation, it increases the popularity of stocks and strengthens the effect of optimistic sentiment.
4. **The role of information mediation:** Sustainability modifies the sentiment-return relationship by improving reporting transparency. This modification is possible by reducing information asymmetry and neutralizing greenwashing. Vuong and Suzuki's (2021) study of 367 companies showed that negative sentiment in the previous year, both firm and market level, can be a stimulation for the company's commitments to its ESG activities next year.
5. **Sustainability premium weakens the sentiment-return relationship:** 1- Lower Information Asymmetry: Robust ESG disclosure reduces the opacity that sentiment-driven investors often exploit. When information is clearer, there is less room for speculative noise (Dhaliwal et al., 2011). 2- A Stable, Long-term Investor Base: Sustainable firms attract dedicated institutional investors (e.g., ESG funds) who are less likely to engage in herd behavior and more focused on long-term fundamental value than short-term price fluctuations (Edmans, 2011). This stable ownership acts as a buffer against transient sentiment. 3- Resilience to Shocks: Strong governance and social performance reduce firm-specific operational, legal, and reputational risks. This inherent resilience makes their cash flows more predictable and their stock prices less vulnerable to panic or euphoria unrelated to fundamentals. Therefore, while sentiment may sweep the market, the stock prices of high-sustainability firms are anchored more firmly to their intrinsic value, leading to a weaker relationship between investor sentiment and their excess returns.

Based on the theoretical foundations mentioned above, the research hypotheses are stated as follows:

1. Investors' sentiment has a positive effect on excess returns.
2. Investors' sentiment contagion has a positive effect on excess returns.
3. Sustainability premium reduces the intensity of the effect of sentiment on excess returns.
4. Sustainability premium reduces the intensity of the effect of sentiment contagion on excess returns.

Research Method

Statistical population, time period, and sampling method: The statistical population studied in this study includes companies listed on the Tehran Stock Exchange that have been present on the stock exchange for a period of 10 years (2014 to 2023). In order to select the sample, the screening method is used in this study. The limitations imposed on the statistical population include:

1. All information required for the research must be available and accessible to the companies under study.
2. The company's fiscal year must end on March 11 to maintain comparability.
3. It must not include financial institutions, investments, or banks.
4. It must not have changed its fiscal year during the research period.
5. It must not have had a trading suspension on the Tehran Stock Exchange for more than 3 consecutive months.

Considering the above conditions and limitations, a sample of 118 companies was ultimately selected from among the companies listed on the Tehran Stock Exchange, which includes 1180 firm-year observations.

Data collection tools and analysis methods: In this study, the library method was used to express the theoretical foundations and collect the research background. In this context, the study of relevant Persian and English articles was on the agenda. Also, the document mining

method was used to collect the data required to test the research hypotheses. The data required in this study were obtained from several sources. In this research, the codal website, the central bank website, and the Financial Information Processing of Iran (fipiran) website were used. Excel 2019 software was used to prepare the data, and Excel 2019 and Eviews 13 software were used to analyze the data and test the research hypotheses.

Research Variables

Dependent Variables

Excess return: The difference between the return and the expected return is as described in equation (1):

$$R_{i,t} - R'_{i,t} = R_{i,t} - E[R_{i,t}] \quad (1)$$

Equity return ($R_{i,t}$): It includes the difference in stock prices at the beginning and end of the period, cash dividends per share, and benefits from capital increases in the form of pre-emptive rights and dividend or bonus shares. The annual return is as described in equation (2):

$$R_{i,t} = \frac{(1+\alpha)P_{i,t} - P_{i,t-1} - \alpha(1000) + (1+\alpha)D_{i,t}}{P_{i,t-1} + \alpha(1000)} \quad (2)$$

Where:

$R_{i,t}$: Stock return of company i in period t,

$P_{i,t}$: The stock price of company i at the end of period t,

$P_{i,t-1}$: The stock price of company i at the beginning of period t,

$D_{i,t}$: The benefits of owning shares of company i in period t (cash earnings per share),

α : Percentage of company bonus shares.

Expected return: In this study, expected return is calculated through three models: single-factor, CAPM, and three-factor Fama and French.

Expected return of the Fama and French 3-factor model is as described in equation (3):

$$E_{[R_{i,t}, F]} = R_{f,t} + \beta_i^{MKT}(R_{M,t} - R_{f,t}) + \beta_i^{SMB}SMB_t + \beta_i^{HML}HML_t + \varepsilon. \quad (3)$$

Where:

$R_{f,t}$: The risk-free rate of return, which in this study, in accordance with the research of Hajiannejad et al. (2022), is the government bills during the research period.

$MRKT_t$: Capital market risk premium, which is the difference between the market return in the period under review and the risk-free return for the same period (in this study, risk-free return refers to the rate of return on Central Bank bonds).

SMB : The difference between the average returns of a portfolio of small and large company stocks is called the company size factor.

HML : The average return of "High B/M" (Value) portfolios minus the average return of "Low B/M" (Growth) portfolios.

Independent Variables

Investor Sentiment Contagion

In order to calculate this variable at the level of each company, following Xu et al. (2020), the following 3 variables are first calculated, and then the investor sentiment index is estimated at the company level and at the market level through the principal component analysis method:

1. Relative Strength Index ($RSI_{i,t}$): The stock relative strength index (RSI) measures the strength contrast between the long and short positions of a stock by indicating whether the stock is oversold or overbought. The index is calculated as the ratio of the bullish period profit to the bearish period loss over a fourteen-day period (Chong & Ng, 2008; Zhou et al., 2020). Specifically, the RSI of stock i on day t is calculated as follows:

Equation (4):

$$RSI_{i,t} = 100 * \frac{RS_{i,t}}{1 + RS_{i,t}} \quad (4)$$

Equation (5):

$$RS_{i,t} = \frac{\sum_{k=1}^6 MAX(P_t - P_{t-k}, 0)}{\sum_{k=1}^6 MAX(P_{t-k} - P_t, 0)} \quad (5)$$

$P_{i,t}$ is the closing price of stock i on day t, and index k represents the number of days before day t. max is the maximum function selected on each day. In technical analysis, investors usually consider selling a stock if $RSI_{i,t}$ is above 80 and buying it if it reaches around 20.

2. Psychological Line Index ($PSY_{i,t}$): The psychological line index is a measure of investors' psychological volatility in response to booms and busts in stock markets. It is often considered a momentum index. To calculate this variable, the number of upward moves over a twelve-day trading period is counted (Yang & Gao, 2014; Yang & Zhou, 2015). The psychological line index of stock i on day t ($PSY_{i,t}$) is calculated as follows:

Equation (6):

$$PSY_{i,t} = 100 * \frac{TU_{i,t}}{TU + T_{i,t}} \quad (6)$$

$TU_{i,t}$ is the number of days that the closing price of stock i on day t - k is higher than the closing price of stock i on day t - k - 1, and k = 0, 1, 2, ..., 11; T_i is the observed time period and here $T_i = 12$. Stocks with $PSY_{i,t}$ above 75 are considered overbought, and those with $PSY_{i,t}$ below 25 are considered oversold.

3. Turnover rate ($Turnover_{i,t}$): The turnover rate generally reflects the degree of heterogeneity of investor beliefs and can attract liquidity to a particular stock. In particular, when irrational investors are optimistic about markets with short-selling restrictions, investors will actively participate in trading (Baker & Stein, 2004; Hong et al., 2004). The turnover rate is calculated as the ratio of reported stock volume to the average number of shares of stock i on day t .

Equation (7):

$$Turn_{i,t} = \frac{V_{i,t}}{OS_{i,t}} \quad (7)$$

Where $V_{i,t}$ is the share trading volume on day t , and $OS_{i,t}$ is the number of shares of company i on day t .

Each individual sentiment index is likely to include one aspect of sentiment. Given that it is more appropriate to have a composite sentiment index, a composite sentiment index is extracted using principal component analysis, following Baker and Wurgler (2007).

Equation (8):

$$S_{i,t} = \alpha_{i,RSI}RSI_t + \alpha_{i,PSY}PSY_t + \alpha_{i,Turnover}Turnover_t \quad (8)$$

By substituting the market index for the price in models 1 to 3 and estimating it using the principal component analysis method, we can obtain the sentiment index for the market, which can be seen in equation (9).

$$S_{m,t} = \alpha_{m,RSI}RSI_t + \alpha_{m,PSY}PSY_t + \alpha_{m,Turnover}Turnover_t \quad (9)$$

4. Contagion of investor sentiment: To calculate this variable, the steps for calculating investor sentiment in the previous section are repeated for the market index to obtain the index sentiment. Now, model (1) is used to estimate the contagion of investor sentiment in each company:

$$S_{i,t} = \varphi_i S_{m,t} + \varepsilon_{i,t} \quad (10)$$

Where $\varphi_{i,t}$ represents the contagion of sentiment for stock i in month t . Given that the coefficient φ_i represents contagion, the model is estimated for each company-year in the form of a rolling regression, and the desired coefficient is extracted.

Modifier Variable

Sustainability Premium

To calculate this variable, it is first necessary to calculate the Corporate Social Responsibility (CSR) variable each year, which is as follows: Corporate social responsibility, according to Matuszak et al. (2019), is calculated by 4 components, each of which includes indicators for evaluating the information disclosed by companies.

Table 1 shows the classification of these components.

Table 1. Components of Social Responsibility

A.Environmental component	1. Control of water, air, soil, and noise pollution	$ENV = N/4$
	2. Prevent environmental damage	
	3. Recycling, waste reduction, and elimination	
	4. Other related disclosures	
B. Human resources component	1. Employee Health and Safety	$HR = N/6$
	2. Employee Education and Training	
	3. Workplace Health	
	4. Benefits	
	5. Employee Profile	
	6. Other Disclosures	
C. Product and customer component	1. Compliance with quality standards	$PC = N/4$
	2. Customer communication and after-sales service	
	3. Product development	
	4. Other relevant disclosures	
D. Social participation component	1. Cash donations	$CL = N/6$
	2. Donations to charities	
	3. Scholarships	
	4. Support for sports, cultural, and artistic activities	
	5. Participation in public projects	
	6. Other disclosures	
Social responsibility aggregate variable		$CSR = (ENV + HR + PC + CL)/4$

N=Total scores disclosed per company

Finally, by summing the scores of the four components mentioned, the aggregate social responsibility variable of each company is obtained, which is in the form of equation (11):

$$CSR = (ENV + HR + PC + CL)/4 \quad (11)$$

Now, to calculate the sustainability premium, at the beginning of each year, companies are categorized from largest to smallest based on the previous year's CSR score, and two portfolios are formed, including the companies with the highest CSR score and the lowest CSR score (Lowest 30% of companies and top 30% of companies). For each year, the sustainability premium variable is: The difference in returns between the top portfolio and the bottom portfolio.

Control Variables

Asset growth: In this study, asset growth is calculated according to equation (12) following the research of Cooper et al (2008):

$$SSETG_{it} = \frac{bookvalue(i,t) - bookvalue(i,t-1)}{bookvalue(i,t-1)} \quad (12)$$

Where:

$bookvalue(i, t)$: Book value of fixed assets of company i at the end of year t,

$bookvalue(i, t - 1)$: Book value of fixed assets of company i at the end of year t-1,

Idiosyncratic volatility: In this study, idiosyncratic volatility is used in a single-factor model following Bali and Cakici (2008):

$$R_{i,t} = \alpha + \beta_1 R_{m,t} + \varepsilon_{i,t} \quad (13)$$

Where:

$R_{i,t}$: Return on stock i in period t,

$R_{m,t}$: Market return in period t,

$\varepsilon_{i,t}$: Regression residuals.

Equation (13)

$$Idiovolat_{i,t} = (var(\varepsilon_{i,t}))^{1/2} \quad (13)$$

Where:

$Idiovolat_{i,t}$: Specific volatility of stock i in period t.

Gross profit growth: The difference between revenue and the costs of producing a product or providing a service, before deducting expenses such as wages, taxes, and interest. Gross profit is different from operating profit and earnings before interest and taxes. In general, a company's revenue minus the cost of goods sold is called gross profit. In this study, gross profit growth is calculated by dividing the current year's gross profit by the previous year's gross profit minus one.

1. Capital expenditures: Expenses or costs that are spent to generate future profits. Capital expenditures are used to purchase new fixed and productive assets or to add value to existing fixed and productive assets. Examples of capital expenditures include the purchase of land, buildings, equipment and machinery, and fixed and long-term assets.

Equation (14):

$$CAPEX = \frac{Net\ Purchase\ of\ Fixed\ Assets}{Total\ assets\ of\ the\ company\ at\ the\ end\ of\ the\ previous\ year} \quad (14)$$

2. The size is equal to the logarithm of the book value of the assets.

Research Models

Model 1:

$$R_{i,t} - R'_{i,t} = \alpha_0 + \beta_1 S_{i,t} + \beta_2 \sum_{j=1}^k \partial_j control_j + \varepsilon_{i,t}$$

Where:

$R_{i,t} - R'_{i,t}$: Excess return on company i's stock in period t,

$S_{i,t}$: Contagion of investor sentiment for company i in period t,

$control$: Control variables,

$\varepsilon_{i,t}$: Error component.

Model 2:

$$R_{i,t} - R'_{i,t} = \alpha_0 + \beta_1 CS_{i,t} + \beta_2 \sum_{j=1}^k \partial_j control_j + \varepsilon_{i,t}$$

Where:

$CS_{i,t}$: Contagion of investor sentiment for company i in period t.

Model 3:

$$R_{i,t} - R'_{i,t} = \alpha_0 + \beta_1 S_{i,t} + \beta_2 SUS_{i,t} + \beta_3 S_{i,t} * SUS_{i,t} + \sum_{j=1}^k \partial_j control_j + \varepsilon_{i,t}$$

Where:

$SUS_{i,t}$: Sustainability premium for company i in period t.

Model 4:

$$R_{i,t} - R'_{i,t} = \alpha_0 + \beta_1 CS_{i,t} + \beta_2 SUS_{i,t} + \beta_3 CS_{i,t} * SUS_{i,t} + \sum_{j=1}^k \partial_j control_j + \varepsilon_{i,t}$$

Research Findings

Table 2 shows a selection of descriptive statistics for the research variables.

Table 2. Descriptive Statistics of Qualitative Research Variables

Variable Name	Variable Symbol	Mean	Median	Maximum	Minimum	Standard Deviation	Skewness	Kurtosis
Excess return of the single-factor model	$R_{i,t} - E_{[R_{i,t}]}$	3.814	3.198	15.04	-61.42	47.24	0.154	1.96
Excess return of the CAPM model	$R_{i,t} - E_{[R_{i,CAPM}]}$	2.636	2.478	21.986	-20.3	76.40	0.22	3.11
Excess return of the three-factor Fama-French model	$R_{i,t} - E_{[R_{i,FF}]}$	1.420	1.199	34.66	-22.4	27.29	0.047	2.27
Specific volatility	<i>Idiovolate</i>	17.253	13.15	57.691	-29.03	145.14	0.77	2.73
Gross profit growth	<i>GP</i>	1.49	1.26	21.55	-43.26	2.36	-1.32	7.91
Corporate Social Responsibility	<i>CSR</i>	0.796	0.79	2.19	0	0.46	0.39	2.51
Investor sentiments	<i>S</i>	11.13	11.18	12.83	8.90	0.70	0.198	3.35
Contagion of investor sentiments	<i>CS</i>	5.21	6.39	9.15	-2.85	3.26	0.023	2.88
Just for consistency	<i>SUS</i>	12.78	14.15	38.44	3.04	6.07	0.73	3.05
Capital expenditures	<i>CAPEX</i>	0.0484	0.023	1.0726	0	0.0863	1.53	6.87
Size	<i>Size</i>	13.27	12.43	22.7	8.25	1.52	-0.867	1.88
AssetG	<i>AssetG</i>	0/35	0/11	7/29	-0/92	0/78	1/69	4/26

Information on descriptive statistics of research variables related is presented in Table 2. The mean is a central measure that represents the balance point and center of gravity of a distribution. For example, according to Table 2, the mean of the dependent variable (Excess return of the single-factor model) is 3.814, indicating that the data for this variable are mostly concentrated around this point. One of the dispersion measures is the standard deviation, which shows the extent of data spread around the mean. The standard deviation of Capital expenditures is 0.0863, and the standard deviation of Specific volatility is 145.14, which indicates that Capital expenditures have the least dispersion and Specific volatility has the most dispersion.

Stationarity Test of Variables

In panel data, such as time series data, it is necessary to examine the stationarity of variables. In panel data, if the variables are not stationary, the resulting regression model can be considered a spurious model. For this reason, in this study, before estimating the model, the stationarity of variables has been examined, which shows that all variables are stationary at the 5% significance level (Table 3).

Table 3. Results of the Stationarity Test of Model Variables

Variable	Statistics	Probability
$R_{i,t} - R'_{i,t}$ single factor	-6.16	0
$R_{i,t} - R'_{i,t}$ CAPM	-5.11	0
$R_{i,t} - R'_{i,t}$ Fama and French three-factor	-2.91	0.0018
<i>S</i>	-6.49	0
<i>CS</i>	-4.22	0
<i>IV</i>	-16.26	0
<i>GP</i>	-3.80	0.0001
<i>ASSET</i>	-4.67	0

Size	-10.1597	0
SUS	-27.8386	0

In order to identify the type of mixed data, F-limer and Hausman tests were performed for each of the models, and the results are as follows:

Table 4. Lemmer and Hausman F-test

Hausman test			F-limer test			Dependent variable	Hypothesis
Result Test	Prob	Hausman Statistic	Data Kinds	Prob	F-limer Statistic		
Fixed Effect	0.025	4.96	Panel	0	31.62	One-Factor	First hypothesis
Fixed Effect	0.018	5.51	Panel	0	43.10	CAPM	
Random Effect	0.080	3.05	Panel	0	42.32	F.F	
Fixed Effect	0.032	4.77	Panel	0	48.96	One-Factor	Second hypothesis
Fixed Effect	0.038	4.63	Panel	0	41.87	CAPM	
Fixed Effect	0.037	4.61	Panel	0	44.45	F.F	
Fixed Effect	0.00	6.89	Panel	0	39.71	CAPM	Third hypothesis
Fixed Effect	0.00	6.78	Panel	0	36.77	CAPM	Fourth hypothesis

As can be seen in Table 4, only for the third model of the first hypothesis, the data type is a panel with random effects, and for the rest of the models, the data type is a panel with fixed effects.

Table 5. Estimation of the Regression Model of the First Hypothesis

$S_{i,t} + \sum_{j=1}^k \partial_j control_j + \varepsilon_{i,t} + \beta_0 R_{i,t} - R'_{i,t} = \alpha$												
	One factor				CAPM				FF			
variable	Coefficient	Statistic	P-value	VIF	Coefficient	Statistic	P-value	VIF	Coefficient	Statistic	P-value	VIF
$S_{i,t}$	4.38	3.93	0.00	2.14	6.15	4.54	0.00	2.17	4.33	5.66	0.00	2.13
IV	0.25	2.13	0.24	2.31	0.49	1.90	0.11	2.34	0.17	1.68	0.17	2.03
GP	2.1	2.76	0.04	2.11	2.92	3.41	0.00	1.78	2.36	3.17	0.00	1.98
CAPEX	1.72	4.14	0.00	1.96	2.13	5.29	0.00	2.02	1.24	4.57	0.00	2.06
Size	4.18	6.18	0.00	1.10	3.75	6.36	0.00	1.85	3.62	5.73	0.00	1.08
α	0.03	1.62	0.46		0.01	2.01	0.09		0.10	1.37	0.31	
Durbin-Watson test	1.99	Prob (F-statistic)	0	Durbin-Watson test	2.02	Prob(F-statistic)	0	Durbin-Watson test	2.17	Prob(F-statistic)	0	
R-squared	0.23	Adjusted R-squared	0.21	R-squared	2.28	Adjusted R-squared	0.26	R-squared	0.33	Adjusted R-squared	0.32	

First Hypothesis Test

According to this hypothesis, "Investor sentiment has a positive effect on excess returns". In order to test it and for a more detailed analysis of the dependent variable, which was excess returns, three calculation methods were used, including 1- Single Action, 2- CAPM, and 3- Fama and French three-factor. The results of the estimates are shown in a comparative form in Table 5. The probability of Fisher's F statistic for the three models was less than 0.05, which indicates the significance of the research models. Also, the Durbin-Watson statistic for the three models was in the range of 1.5 to 2.5, which indicates the existence of autocorrelation between the error components. The VIF statistic for all variables in all three models was less than 5, which indicates the absence of collinearity between the independent and control variables in each of the models. The coefficient of the investor sentiment variable was positive and significant for all three models, which confirms the first hypothesis. With further analysis, it can be said that the coefficient of the sentiment variable in the second model (CAPM) was 6.15 and was larger than the other two models. In other words, the effect of sentiment on the excess return calculated by the CAPM method was greater than that of the other two models.

Second Hypothesis Test

According to this hypothesis, "The contagion of investor sentiment has a positive effect on excess returns". In order to test it and for a more detailed analysis of the dependent variable, which was excess returns, three calculation methods were used, including 1- single action, 2- CAPM, and 3- Fama and French three-factor. The results of the estimates are shown in a comparative form in Table 6. The probability of Fisher's F statistic for the three models was less than 0.05, which indicates the significance of the research models. Also, the Durbin-Watson

statistic for the three models was in the range of 1.5 to 2.5, which indicates the existence of autocorrelation between the error components. The VIF statistic for all variables in all three models was less than 5, indicating that there was no collinearity between the independent and control variables in each of the models. The coefficient of the investor sentiment contagion variable was positive and significant for both the first and second models, which confirmed the second hypothesis. Although the coefficient of this variable for the third model is positive, it is not statistically significant. With further analysis, it can be said that the coefficient of the sentiment contagion variable in the second model (CAPM) was 1.76 larger than the single-factor model with a coefficient of 1.22. In other words, the effect of sentiment contagion on the excess return calculated by the CAPM method is greater than that of the single-factor model.

Table 6. Estimation of Regression Models for the Second Hypothesis

$R_{i,t} - R'_{i,t} = \alpha_0 + \beta_1 CS_{i,t} + \sum_{j=1}^k \partial_j control_j + \varepsilon_{i,t}$												
	One factor				CAPM				F.F			
Variable name	Coefficient	Statistics t	p-value	VIF	Coefficient	Statistics t	p-value	VIF	Coefficient	Statistics t	P-value	VIF
$CS_{i,t}$	1.22	4.05	0.00	1.78	1.76	4.51	0.00	1.99	1.58	2.01	0.074	1.75
IV	0.03	1.19	0.53	1.96	1.89	2.74	0.03	2.03	2.37	1.36	0.08	1.73
GP	1.08	3.66	0.00	1.83	1.29	3.65	0.00	2.14	1.06	3.49	0.00	1.95
CAPEX	2.39	4.58	0.00	2.18	3.14	4.44	0.00	2.19	3.02	4.84	0.00	2.13
Size	4.61	4.73	0.00	2.03	3.99	5.12	0.00	1.86	4.88	4.96	0.00	2.03
α	0.91	0.99	0.72	-	0.05	1.17	0.63	-	1.13	1.16	0.66	-
		Prob(F-statistic)	0			Prob(F-statistic)	0			Prob(F-statistic)	0	
		R-squared	0.26			R-squared	0.25			R-squared	0.26	

Third Hypothesis Test

According to the third hypothesis, "Sustainability alone reduces the intensity of the effect of sentiments on the acquisition of excess returns". In order to test this hypothesis and according to the results of the previous hypotheses, the second model (CAPM) method was used to calculate excess returns. The results of the estimates are shown in a comparative form in Table 7, Section A. The probability of Fisher's F statistic for the model was less than 0.05, which indicates the significance of the research models. Also, the Durbin-Watson statistic for the three models was in the range of 1.5 to 2.5, which indicates the existence of autocorrelation between the error components. The VIF statistic for all variables in the model was less than 5, which indicates the absence of collinearity between the independent and control variables in each of the models. The coefficient of the interactive variable $S_{i,t} SUS_{i,t}$ determines the test result. This coefficient is equal to -1.13, and its probability value is less than 0.05. Therefore, the third hypothesis, which indicates a reducing effect of the persistence method on the relationship between sentiments and excess returns, is confirmed.

Table 7. Estimation of Regression Models for the Third and Fourth Hypothesis

	$R_{i,t} - R'_{i,t} = \alpha_0 + \beta_1 S_{i,t} + \beta_2 SUS_{i,t} + \beta_3 S_{i,t} * SUS_{i,t} + \sum_{j=1}^k \partial_j control_j + \varepsilon_{i,t}$				$R_{i,t} - R'_{i,t} = \alpha_0 + \beta_1 CS_{i,t} + \beta_2 SUS_{i,t} + \beta_3 CS_{i,t} * SUS_{i,t} + \sum_{j=1}^k \partial_j control_j + \varepsilon_{i,t}$			
Variable name	Coefficient	Statistics t	p-value	VIF	Coefficient	Statistics t	p-value	VIF
$S_{i,t}$	4.88	4.05	0.00	2.14	-	-	-	-
$CS_{i,t}$	-	-	-	-	1.15	3.91	0.00	1.65
$SUS_{i,t}$	1.54	3.83	0.00	2.10	1.39	4.81	0.00	1.54
$S_{i,t} * SUS_{i,t}$	-1.13	-4.12	0.00	2.08	-	-	-	-
$CS_{i,t} * SUS_{i,t}$	-	-	-	-	-2.61	-4.00	0.00	1.73
IV	0.13	2.19	0.22	1.99	1.06	2.31	0.19	1.98
GP	1.62	3.21	0.00	2.05	1.03	3.39	0.00	1.74
CAPEX	2.82	3.77	0.00	1.86	4.17	4.03	0.00	1.91
Size	3.66	3.42	0.00	2.013	3.98	4.92	0.00	1.88
α	1.29	0.12	0.83		0.15	1.42	0.43	
		Prob(F-statistic)	0			Prob(F-statistic)	0	
		R-squared	0.36			R-squared	0.33	

Fourth Hypothesis Test

According to the fourth hypothesis, "Sustainability alone reduces the intensity of the effect of sentiment contagion on the acquisition of excess returns". In order to test this hypothesis and according to the results of the previous hypotheses, the second model (CAPM) method was used to calculate excess returns. The results of the estimates are shown in a comparative form in Table 7, Section B. The probability of Fisher's F statistic for the model was less than 0.05, which indicates the significance of the research models. Also, the Durbin-Watson statistic

for the three models was in the range of 1.5 to 2.5, which indicates the existence of autocorrelation between the error components. The VIF statistic for all variables in the model was less than 5, which indicates the absence of collinearity between the independent and control variables in each of the models. The coefficient of the interaction variable $CS_{it} \times SUS_{it}$ determines the test result. This coefficient was equal to -2.61, and its probability value is less than 0.05. Therefore, the fourth hypothesis, which indicates a reducing effect of persistence on the relationship between sentiment contagion and excess returns, is confirmed.

Other Findings

Among the four control variables of gross profit growth, specific risk, capital expenditure, and size, the specific risk coefficient was not statistically significant in all models, so it can be said that at least this type of calculation of the company's specific risk did not affect excess return. Among the control variables, size had the highest coefficient of influence on excess return in almost all models. Also, the positive and significant coefficients of gross profit growth and capital expenditure show that although these variables are expected to have a direct effect on achieving normal return, they also have a direct effect on achieving excess return.

Discussion and Conclusion

This study examined the interactive effect of the "sustainability premium" on the relationship between investor sentiment, its contagion, and excess returns on the Tehran Stock Exchange. The findings confirm that while behavioral factors are powerful drivers of returns, the sustainability profile of a firm acts as a significant moderating force. The results, therefore, provide a more nuanced understanding of asset pricing in an emerging market by linking observed outcomes to specific theoretical mechanisms. The confirmation of the first hypothesis, that "investor sentiment has a positive effect on excess returns", aligns with the core tenets of behavioral finance. This finding is consistent with Baker and Wurgler (2007) and Stambaugh et al. (2012), who argue that sentiment-driven investors can cause prices to deviate from fundamental value. The positive coefficient suggests that waves of optimism (pessimism) systematically push prices above (below) the level justified by fundamentals, creating measurable excess returns.

Similarly, the support for the second hypothesis on the positive effect of "sentiment contagion" underscores the role of social dynamics in investment behavior. The finding that sentiment spills over from the market to individual stocks indicates that investors in the TSE often rely on the behavioral signals of others—a phenomenon akin to the information cascades described by Bikhchandani et al. (1992). This is likely amplified by the homogenizing influence of social media and news platforms in Iran (Majidi Zavieh & Hajizadeh, 2021), where herd behavior can lead to coordinated buying or selling pressure that is detached from company-specific news.

The core contribution of this study lies in the tested moderating role of the sustainability premium. The results for the third and fourth hypotheses reveal that the sustainability premium reduces the intensity of the relationship between both sentiment and sentiment contagion on excess returns.

In conclusion, this study demonstrates that in the TSE, stock returns are simultaneously driven by behavioral forces and fundamental firm characteristics. While investor sentiment and its contagion are key short-term drivers of excess returns, a "sustainability premium acts as a moderating mechanism". It protects firm value from the distortions of sentiment by fostering a long-term oriented investor base, enhancing transparency, and building perceived operational resilience. The limitations of this study were the method of measuring investors' sentiments, the measurement of the sustainability premium, and the lack of relevant domestic literature.

For investors, these findings emphasize the importance of integrating sustainability criteria into investment strategies not only for ethical reasons but also as a sophisticated risk management tool against market sentiment and herd behavior. For policymakers and corporate managers, the results highlight the tangible financial benefit of improving governance and transparency, as these practices contribute to greater stock price stability in a volatile emerging market. For future research, it is suggested to focus on issues such as materiality-weighted ESG and quasi-natural experiments methods (policy/reporting shocks on Codal and high-frequency sentiment spillovers).

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