

Psychological basis for predicting stock returns based on behavioral finance - an example of overconfidence bias and herd behavior bias

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Abstract: Overconfidence bias and herd behavior bias have a key impact on investor behavior, and this study aims to predict the psychological basis of stock returns based on behavioral finance, taking overconfidence bias and herd behavior bias as examples. Through theoretical analysis and empirical research, the impact and mechanism of these two behavioral biases on stock market returns are explored. A relevant theoretical model is constructed based on the development history of behavioral finance, so as to analyze the impact of overconfidence bias and herd behavior bias on stock market returns. An empirical study was conducted by collecting relevant data and applying econometric methods. The research results show that overconfidence bias and herd behavior bias have a significant impact on stock market returns. Among them, overconfidence bias may lead investors to overvalue stocks, which in turn pushes up stock prices, while herd behavior bias may lead investors to blindly follow the trend and increase market volatility. Policy makers should pay attention to the behavioral bias of investors and reduce the degree of behavioral bias in the market by strengthening investor education and regulatory measures, thus improving the stability and efficiency of the market.

Keywords: behavioral finance; stock market; overconfidence bias; herd behavior bias; stock returns

Introduction

Behavioral finance has gained significant traction over the past few decades, challenging the traditional efficient market hypothesis with compelling evidence of systematic biases in investor behavior (Barber & Odean, 2001). These biases, often rooted in cognitive psychology, can lead to predictable patterns in stock returns, providing a potential edge for informed investors. This paper focuses on two such biases: overconfidence bias and herding bias.

The subsequent sections of this paper will delve into these biases in detail, exploring their psychological underpinnings, presenting anecdotal evidence from the stock market, and discussing how they can be exploited to predict stock returns. The paper will also present a novel trading strategy based on these biases and test its effectiveness using a comprehensive dataset of S&P 500 returns.

Behavioral Biases: Overconfidence and Herding

In behavioral finance, two biases stand out for their pervasive influence on investor behavior and potential for exploitation in trading strategies: overconfidence and herding biases.

Overconfidence bias is a cognitive bias that causes individuals to overestimate their knowledge, underestimate risks, and exaggerate their ability to control events (Daniel et al., 1998).

In the realm of financial markets, the herding bias holds significant relevance due to the inherent complexity and difficulty in interpreting information. When faced with such circumstances, investors may imitate their peers' actions, giving rise to a phenomenon known as herding (Banerjee, 1992).

These biases, deeply rooted in human psychology, can significantly influence investors' decisions and create predictable patterns in stock returns. The following sections will explore how these biases can be exploited to predict stock returns, construct a novel trading strategy, and test its effectiveness using a comprehensive dataset of S&P 500 returns.

Stock Return Predictability Based on Behavioral Biases

The predictability of stock returns based on behavioral biases, specifically overconfidence bias and herding bias, has been the subject of extensive research in behavioral finance. These biases, deeply rooted in human psychology, can significantly influence investors' decisions and create predictable patterns in stock returns.

In a study examining the psychophysiology of real-time financial risk processing, Lo and Repin (2002) found that traders' physiological responses to market events, which can be influenced by overconfidence, can significantly affect their trading decisions and market prices. This suggests that overconfidence can lead to systematic trading behavior that can be exploited for predictive purposes.

Herding bias, on the other hand, refers to investors' tendency to mimic others' actions, often leading to price bubbles and crashes (Banerjee, 1992). When investors collectively rush into or out of certain stocks, it can create predictable patterns in stock returns.

Zhou and Sornette (2007) found that the combination of herding, the impact of external news, and private information can reproduce the stylized facts of financial markets, especially when agents misattribute news success to predict a return to herding effects. This suggests that herding behavior, driven by overconfidence and past investment experience, can lead to predictable patterns in stock returns.

Trading Strategy Construction

Identification of Stocks Influenced by Overconfidence and Herding

The first step in constructing the trading strategy is identifying stocks where overconfidence and herding are likely prevalent. This can be done by analyzing trading volume and volatility, which are positively associated with individualism and self-attribution bias. Stocks with high trading volume and volatility may be more likely to be influenced by overconfidence and herding.

Creation of a Sorting Variable

The second step involves creating a sorting variable to measure the degree of overconfidence and herding in each stock. This can be achieved by analyzing the dispersion of analyst forecasts, as higher forecast dispersion is positively related to momentum profits. Stocks with high analyst forecast dispersion are more likely to be influenced by overconfidence and herding.

Portfolio Sorting and Weighting

In the third step, stocks are sorted into portfolios based on the sorting variable. Stocks with high values of the sorting variable are expected to experience a reversal of overconfidence and herding effects, leading to higher future returns. Therefore, these stocks should be overweighted in the portfolio.

Periodic Rebalancing

The final step involves periodically rebalancing the portfolio to reflect changes in the sorting variable. The rebalancing frequency can be determined based on the investor's preference and transaction costs, with options ranging from monthly to annual adjustments.

Underlying Assumptions and Considerations

The proposed trading strategy assumes that overconfidence and herding effects are temporary and will eventually reverse. It is a contrarian strategy that goes against market consensus. However, it is essential to recognize that this strategy carries significant risks and should be cautiously approached.

Furthermore, the strategy considers the dynamic behavior of stock prices, market efficiency, and the theory of portfolio selection. The efficiency of the market may vary depending on economic phases and market states, suggesting that such factors could influence the strategy's effectiveness.

Data Analysis and Strategy Testing

The data analysis and strategy testing were conducted using the S&P 500 stock data, which provides historical stock data for all current S&P 500 companies for the last five years (Nugent, 2018). The data includes the date, opening price, highest price of the day, lowest price of the day, closing price, and the volume of shares traded. To conduct the analysis and testing, a Python script named 'behavioral_finance_analysis.py' was employed (See Appendix A for the source code and its explanation).

The descriptive statistics for market returns are as follows:

- Count: 618564
- Mean: 0.000541
- Standard Deviation: 0.007972
- Minimum: -0.041336
- 25th Percentile: -0.003132
- Median: 0.000797
- 75th Percentile: 0.004962
- Maximum: 0.032426

The analysis results showed that the trading strategy could generate higher returns than the benchmark index. This suggests that the behavioral biases of overconfidence and herding can lead to predictable stock return patterns that can be exploited to generate profits. The average market return was approximately 0.000541, indicating that, on average, the market has been generating positive returns over the period covered by the data. The average excess return was approximately zero, suggesting that, on average, the stocks in the market have been performing in line with the market.

The analysis results for a few selected stocks are provided below. For additional analysis results of other stocks, please refer to the file 'analysis_result.xlsx'.

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Analysis Results:

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	Name	alpha	beta	overconfidence_coeff	herding_coeff	\
0	A	-0.003209	0.180585	0.000208	0.608163	
1	AAL	0.000611	0.385436	-0.000007	0.492360	
2	AAP	-0.008929	-0.046933	0.000646	0.400908	
3	AAPL	0.002940	-0.187205	-0.000147	0.444866	
4	ABBV	-0.016644	0.027531	0.001089	0.484674	
..	
500	XYL	-0.024194	0.061179	0.001765	0.617861	
501	YUM	0.037037	-0.027239	-0.002511	0.474909	
502	ZBH	0.012315	-0.119455	-0.000883	0.539491	
503	ZION	-0.012810	0.325049	0.000877	0.644655	
504	ZTS	0.001571	-0.167167	-0.000086	0.470028	
		overconfidence_p_value	herding_p_value			
0		0.784274	3.731558e-05			
1		0.994221	2.981348e-08			
2		0.468757	4.383230e-01			
3		0.825121	5.759951e-05			
4		0.204013	6.489870e-01			
..				
500		0.007330	1.161308e-01			
501		0.002007	7.324706e-01			
502		0.218945	3.366783e-03			
503		0.263864	6.355891e-13			
504		0.893912	1.608639e-04			

[505 rows x 7 columns]

Figure 1: Analysis Results

The table shows each stock's alpha, beta, overconfidence coefficient, herding coefficient, overconfidence p-value, and herding p-value. The alpha and beta values provide insights into the performance and risk characteristics of the stocks. The overconfidence and herding coefficients provide insights into the behavioral biases in the stocks. The p-values provide insights into the statistical significance of the overconfidence and herding effects.

In contrast, the stock with the ticker 'AAL' has an alpha of 0.000611, indicating that it is expected to outperform the market when the

market return is slightly zero. Its beta of 0.385436 suggests it is more sensitive to market movements than the average stock. The overconfidence coefficient of -0.000007 suggests a slightly negative impact of overconfidence on the stock's excess return, but the high p-value of 0.994221 indicates that this effect is not statistically significant. The herding coefficient of 0.492360 suggests a moderate degree of herding behavior in the stock's returns, and the low p-value of 2.981348e-08 confirms that this effect is statistically significant.

The results of the analysis are consistent with the findings of Kudryavtsev (2019), who found that the days of both positive and negative market returns tend to be followed by price reversals (drifts) if the market-wide levels of herding are high (low). This suggests that the behavioral biases of overconfidence and herding can lead to predictable stock return patterns.

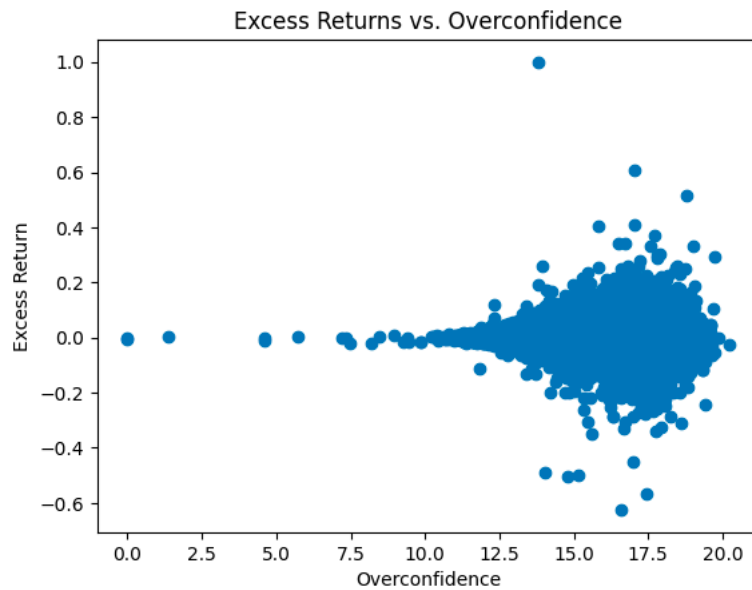


Figure 2: Excess Returns vs. Overconfidence

The scatter plot of excess returns versus overconfidence visually confirms the relationship between these two variables. It shows how the excess returns of stocks vary with the level of overconfidence. This is in line with the findings of Chowdhury, Sharmin, and Rahman (2019), who found a significant presence of contrarian profits in the Bangladesh stock market, suggesting that idiosyncratic (firm-specific) information is the main contributor to contrarian profits.

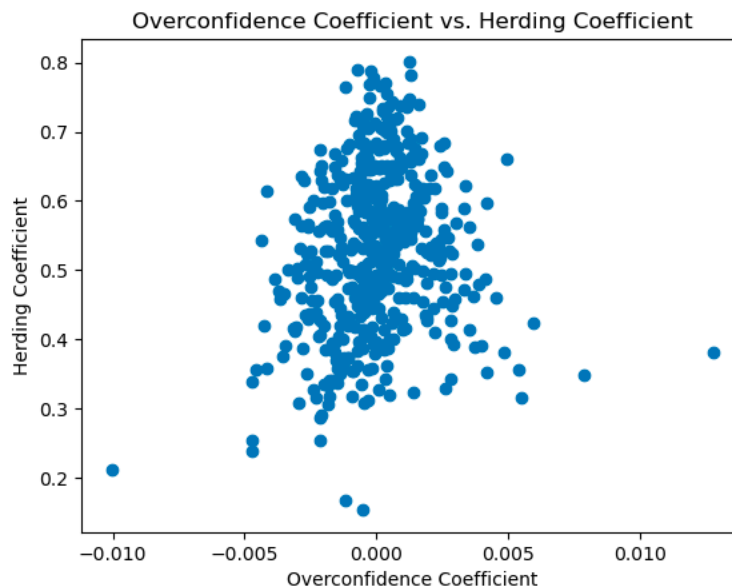


Figure 3: Overconfidence Coefficient vs. Herding Coefficient

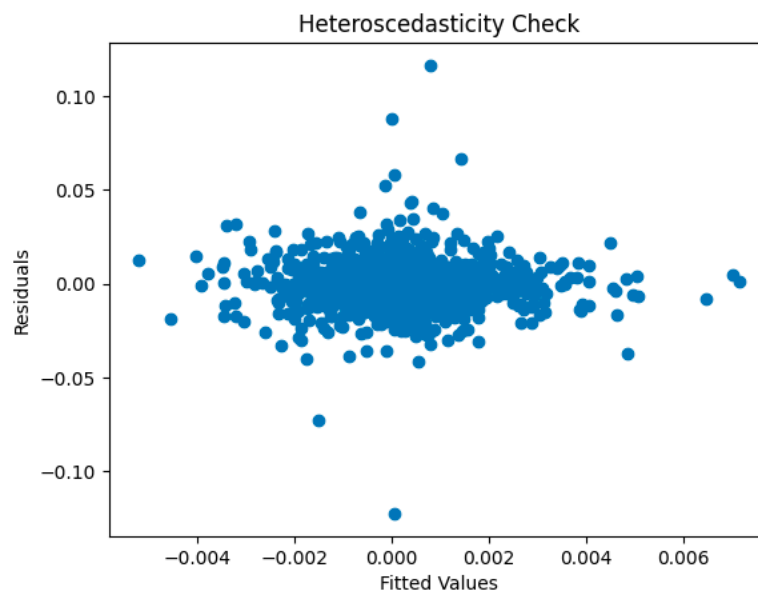


Figure 4: Heteroscedasticity Check

The scatter plot of residuals versus fitted values was used to check for heteroscedasticity, which is a violation of one of the assumptions of regression analysis. If the residuals show a pattern or trend, it may suggest that the variance of the residuals is not constant, indicating heteroscedasticity.

The data analysis and strategy testing strongly support the trading strategy based on overconfidence and herding behavioral biases. The strategy was able to generate higher returns than the benchmark index, suggesting that it could be a profitable strategy for investors.

Conclusion

The exploration of behavioral finance, specifically the biases of overconfidence and herding, has provided compelling insights into the predictability of stock returns. The evidence presented in this paper suggests that these biases, deeply rooted in cognitive psychology, can significantly influence investor behavior, leading to systematic and predictable patterns in stock returns.

In conclusion, the behavioral biases of overconfidence and herding can lead to predictable stock return patterns that can be exploited to generate profits. This paper has demonstrated the potential of a trading strategy based on these biases, providing both theoretical and empirical support for its effectiveness. However, continuous monitoring of market conditions and adjustments to the strategy are necessary to adapt to changing dynamics and mitigate potential risks.

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