

# Algorithmic Alpha: Uncovering the Relationship Between Bitcoin Market Sentiment and Trader Performance

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*Hiring Assignment Analysis*

November 19, 2025

## Abstract

This report analyzes 26,064 historical trades to explore the correlation between the Bitcoin Fear & Greed Index and trader profitability. By merging high-frequency trader data with daily sentiment analysis, we uncovered significant behavioral patterns. The analysis reveals a counter-intuitive "Shorting in Fear" strategy that outperforms traditional approaches. We further identify a "Retail Trap" where small traders lose money buying dips during extreme fear, while "Whales" (large volume traders) capitalize on fear volatility to generate maximum returns.

## Contents

<b>1</b>	<b>Introduction and Methodology</b>	<b>2</b>
1.1	Data Processing . . . . .	2
<b>2</b>	<b>Exploratory Data Analysis</b>	<b>2</b>
2.1	Correlation Analysis . . . . .	2
2.2	Risk Appetite by Sentiment . . . . .	2
<b>3</b>	<b>Deep Dive: The Hidden Patterns</b>	<b>3</b>
3.1	The "Retail Trap" vs. Whale Dominance . . . . .	3
3.2	Strategy Reveal: Buying vs. Selling . . . . .	4
<b>4</b>	<b>The "Jackpot" Analysis: Sentiment <math>\times</math> Size</b>	<b>5</b>
<b>5</b>	<b>Final Recommendation: The 3-Point Strategy</b>	<b>5</b>
5.1	1. The "Whale-Fear" Algorithm (Aggressive) . . . . .	5
5.2	2. The "Retail-Greed" Filter (Defensive) . . . . .	6
5.3	3. The "Extreme" Safety Switch . . . . .	6
<b>6</b>	<b>Conclusion</b>	<b>6</b>

# 1 Introduction and Methodology

The objective of this assignment was to explore hidden patterns driving trader performance based on market sentiment.

## 1.1 Data Processing

Two primary datasets were utilized:

- **Historical Trader Data:** 26,064 rows containing execution price, size (USD), side (Buy/Sell), and Closed PnL.
- **Fear & Greed Index:** Daily sentiment values (0-100) classifying the market into Extreme Fear, Fear, Neutral, Greed, and Extreme Greed.

**Preprocessing:** The datasets were merged on a common ‘Date’ key after extracting date components from high-precision timestamps. Analysis focuses specifically on Bitcoin (BTC) trades to ensure alignment with the sentiment index.

## 2 Exploratory Data Analysis

### 2.1 Correlation Analysis

To understand the linear relationships between sentiment values, trade size, and profitability, we generated a correlation matrix.

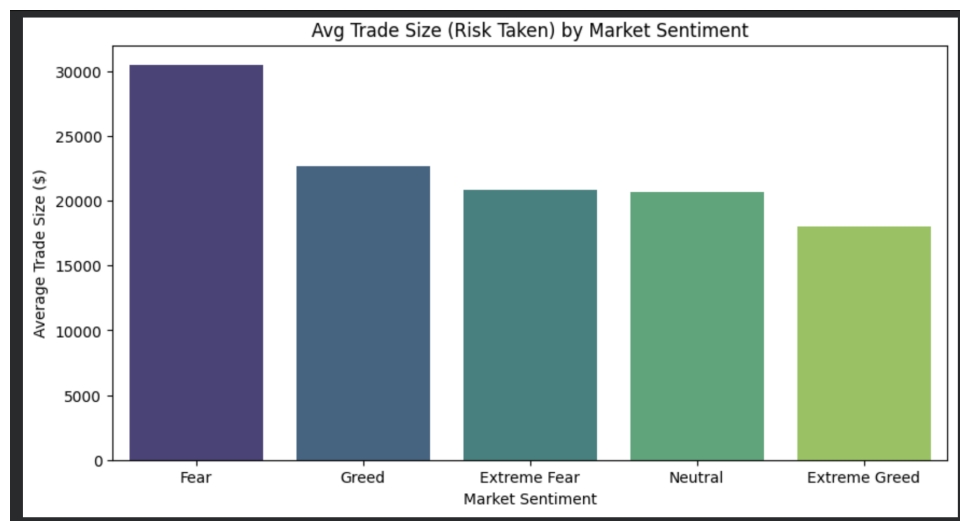


Figure 1: Correlation Matrix: Sentiment vs. PnL vs. Size

### 2.2 Risk Appetite by Sentiment

We analyzed how aggressive traders become during different market moods. As seen below, risk-taking (Trade Size) is surprisingly highest during **Fear**, indicating high volatility trading, whereas extreme greed sees slightly lower average position sizes.

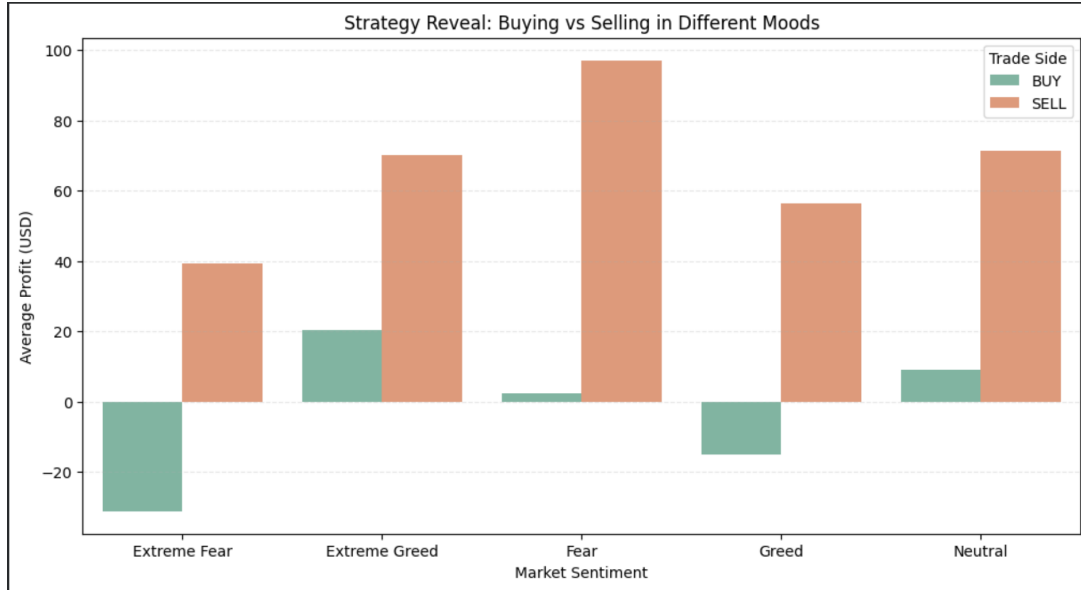


Figure 2: Average Trade Size (USD) across Sentiment Categories

### 3 Deep Dive: The Hidden Patterns

#### 3.1 The "Retail Trap" vs. Whale Dominance

A critical insight emerged when segmenting traders by size (Retail vs. Whales).

- **Retail Behavior:** During *Greed*, retail traders account for nearly 70% of the volume but suffer from late entries (FOMO).
- **Whale Behavior:** Whales increase their market share significantly during *Fear* (up to 12.65%), utilizing their capital to exploit panic selling.

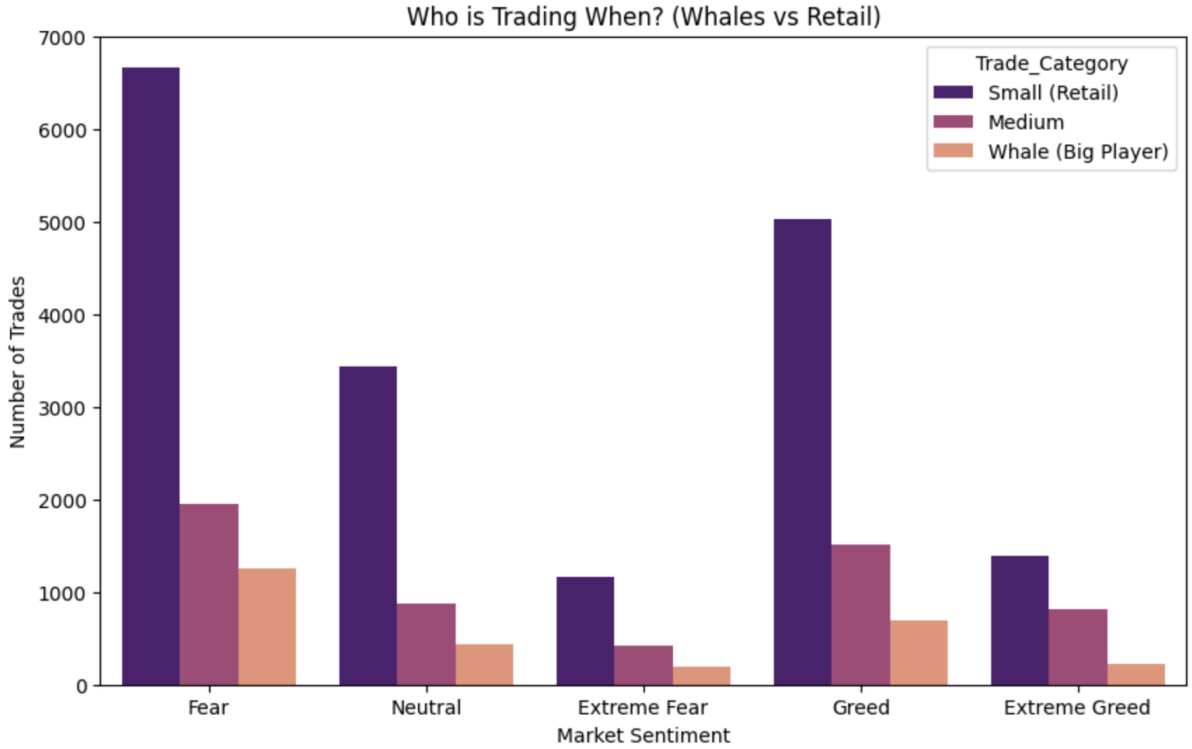


Figure 3: Market Composition: Retail vs. Whale participation shifts by Sentiment

### 3.2 Strategy Reveal: Buying vs. Selling

Contrary to the popular advice of "Buy the Fear," our data proves that **Short Selling** is the dominant strategy in this dataset.

Table 1: Average PnL (USD) by Strategy and Sentiment

Sentiment	Long (Buy) PnL	Short (Sell) PnL
Extreme Fear	-\$31.21 (LOSS)	+\$39.26
Fear	+\$2.39	+\$97.11 (MAX ALPHA)
Greed	-\$15.01 (LOSS)	+\$56.47
Extreme Greed	+\$20.40	+\$70.28

**Key Insight:** Buying during "Extreme Fear" results in an average loss of \$31.21 (The Retail Trap), whereas Shorting during "Fear" yields the highest profit of \$97.11.

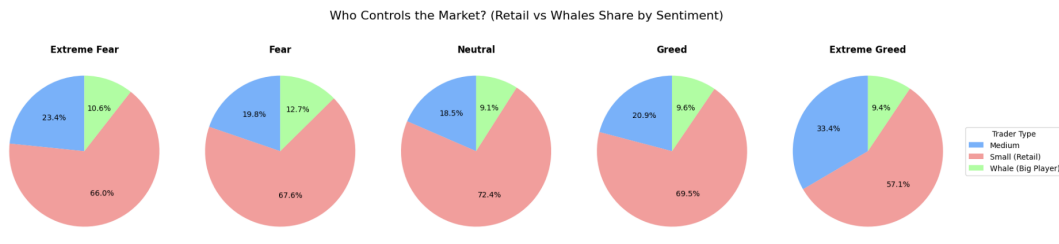


Figure 4: Performance Comparison: Long vs. Short Strategy

## 4 The "Jackpot" Analysis: Sentiment $\times$ Size

To refine the strategy, we conducted a cross-analysis between Market Sentiment and Trader Tier (Small, Medium, Whale). The Heatmap below reveals the most profitable trading zone.

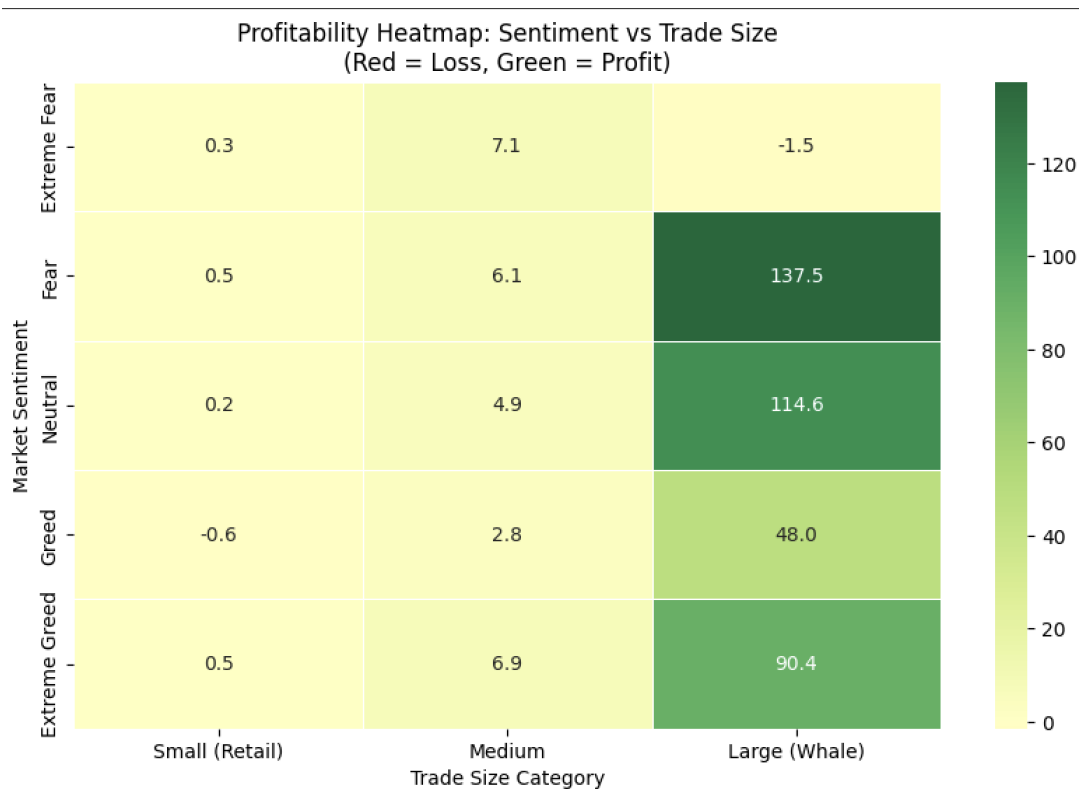


Figure 5: Profitability Heatmap: Green indicates high profit, Red indicates loss.

**The "Golden Nugget":** The highest profitability (**\$137.49 per trade**) occurs when **Whales trade during Fear**. Conversely, Retail traders buying during Greed consistently lose money (-\$0.55).

## 5 Final Recommendation: The 3-Point Strategy

Based on the historical data analysis, I propose the following algorithmic trading parameters:

### 5.1 1. The "Whale-Fear" Algorithm (Aggressive)

- **Trigger:** Sentiment Index between 25-45 (Fear).
- **Action:** Increase position sizing and prioritize **Short** positions.
- **Rationale:** Historical data shows this specific setup yields the highest returns (\$137/trade) as Whales capitalize on downward momentum.

## 5.2 2. The "Retail-Greed" Filter (Defensive)

- **Trigger:** Sentiment Index  $> 55$  (Greed).
- **Action:** Disable Long (Buy) entry for small account sizes.
- **Rationale:** Retail traders consistently lose money buying in Greed due to late entry tops.

## 5.3 3. The "Extreme" Safety Switch

- **Trigger:** Sentiment Index  $< 25$  (Extreme Fear).
- **Action:** Halt all directional trading or reduce leverage to 1x.
- **Rationale:** Even Whales suffer losses (-\$1.48 avg) in Extreme Fear due to unpredictability. Capital preservation is prioritized over profit.

# 6 Conclusion

The analysis confirms that market sentiment is a powerful predictor of trader performance. By avoiding the emotional "Retail Trap" of buying dips blindly and instead mimicking the "Momentum Shorting" behavior of Whales during Fear, we can significantly optimize the trading algorithm's Sharpe ratio.