AM Project - Crypto Trading

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Requirements: Implementation of economically senseful trading strategies using machine learning techniques.

1. Introduction

2. Basic model and statistical analysis

2.1 Approach

2.2 Implementation

Backtesting here? or in another section

2.3 Results

2.4 Interpretation

3. Extensions

3.1 Approaches

3.2 Implementation

Backtesting here? or in another section

3.3 Results

3.4 Interpretation

4. Conclusion

In this analysis, we investigated whether there are significant differences in market participation during periods of high and low market concentration. We utilized data from the **Commodity Futures Trading Commission (CFTC)** to classify concentration levels based on the gross long positions held by the four largest traders. High-concentration periods were defined as those where these positions exceeded a specific threshold, while lower values indicated periods of low concentration.

To assess the differences in market participation, we conducted a **Welch Two-Sample t-test**. This test compared the average market participation levels across the two concentration categories. The results indicate a statistically significant difference, with a t-statistic of -18.05 and a p-value of less than 0.001. The average market participation during high-concentration periods was substantially lower (mean = 195,277) than in low concentration periods (mean = 390,792). These findings suggest that when the market is dominated by a few large players, overall activity tends to decrease. Despite the significant result, it was essential to validate the assumptions underlying the t-test. First, we confirmed that market participation, our dependent variable, is continuous. Second, although the data did not meet the normality assumption, we relied on the central limit theorem due to the large sample sizes ($n > 350$), allowing us to proceed confidently with the t-test. Lastly, the sample sizes in both groups were sufficiently large, ensuring the robustness of our analysis.

To further illustrate these findings, we visualized the data using a histogram, comparing market participation distributions during high and low concentration periods. The high-concentration periods were skewed toward lower participation levels, with minimal overlap with the low-concentration periods. A time series plot of the gross long positions held by the four largest traders further supported these findings, demonstrating fluctuations in concentration and its correlation with periods of reduced market participation.

The results have important implications for understanding market dynamics. High market concentration may lead to reduced liquidity, as fewer participants dominate the market, potentially creating challenges for smaller traders. This reduced activity can also hinder efficient price discovery, as diverse participation is critical to establishing fair market prices. Moreover, the dominance of a few large players increases systemic risk, as sudden shifts in their position could disrupt the broader market.

While our analysis establishes a **significant relationship between market concentration and participation**, it is important to note that causality cannot be definitively determined. **Future research** could explore additional factors that may drive these patterns (e.g., regulatory changes or economic shocks). Furthermore, more granular data on trader behavior could offer deeper insights into the mechanisms driving these dynamics and help refine our understanding of market participation in different concentration contexts.