Trader Performance vs Market Sentiment Analysis

This Report explores the relationship between trader performance on Hyperliquid and Bitcoin market sentiment (Fear-Greed Index).

Data Exploration

Trader Performance Data

This dataset contains historical trading data from Hyperliquid. Key columns include:

- **Timestamp IST**: The time of the trade.
- **Asset**: The asset traded (e.g., BTC).
- **Trader**: A unique identifier for the trader.
- **P&L**: The profit or loss for the trade.
- **Volume**: The volume of the trade.
- **date**: The date extracted from the timestamp for merging.

We'll be focusing on the `P&L` column to assess trader performance.

Market Sentiment Data

This dataset contains the Bitcoin Fear & Greed Index. Key columns include:

- **date**: The date for the sentiment reading.
- **value**: The numerical value of the Fear & Greed Index (not used in this analysis, using classification).
- **classification**: The classification of the market sentiment based on the index (e.g., 'Extreme Fear', 'Fear', 'Neutral', 'Greed', 'Extreme Greed').

We are particularly interested in the `classification` column to categorize market sentiment on each trading day.

Merged Data

The `merged_df` combines the trader performance data and the market sentiment data based on the trading date. This allows us to analyze trader performance within different market sentiment categories.

```
Missing values in Trader Data:
Account           0
Coin              0
Execution Price   0
Size Tokens       0
Size USD          0
Side              0
Timestamp IST     0
Start Position    0
Direction         0
Closed PnL        0
Transaction Hash  0
Order ID          0
Crossed           0
Fee               0
Trade ID          0
Timestamp         0
date              0
dtype: int64

Missing values in Sentiment Data:
timestamp         0
value             0
classification    0
date              0
dtype: int64

Duplicate rows in Trader Data: 0

Duplicate rows in Sentiment Data: 0

Duplicate rows in Merged Data: 0

Unique values in Sentiment Data 'classification': ['Fear' 'Extreme Fear' 'Ne
utral' 'Greed' 'Extreme Greed']
```

Data is now merged based on matching date columns from trader execution logs and market sentiment index.

Out[ ]:

	classification	avg_closed_pnl	avg_fee	trade_count
0	Extreme Fear	34.537862	1.116291	21400
1	Extreme Greed	67.892861	0.675902	39992
2	Fear	54.290400	1.495172	61837
3	Greed	42.743559	1.254372	50303
4	Neutral	34.307718	1.044798	37686

Insight:

- Traders perform best (highest PnL) during 'Extreme Greed', followed by 'Fear'.
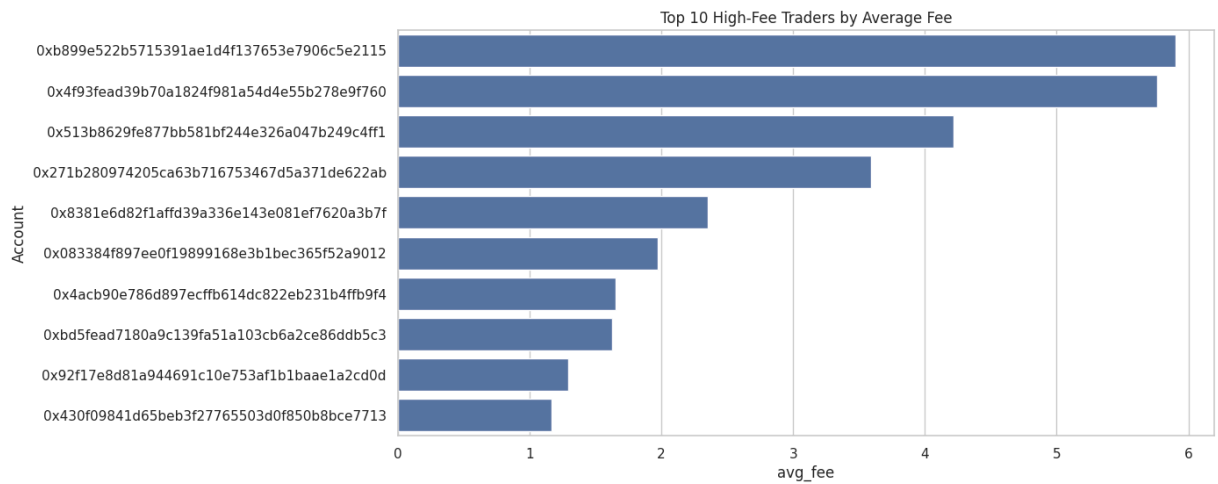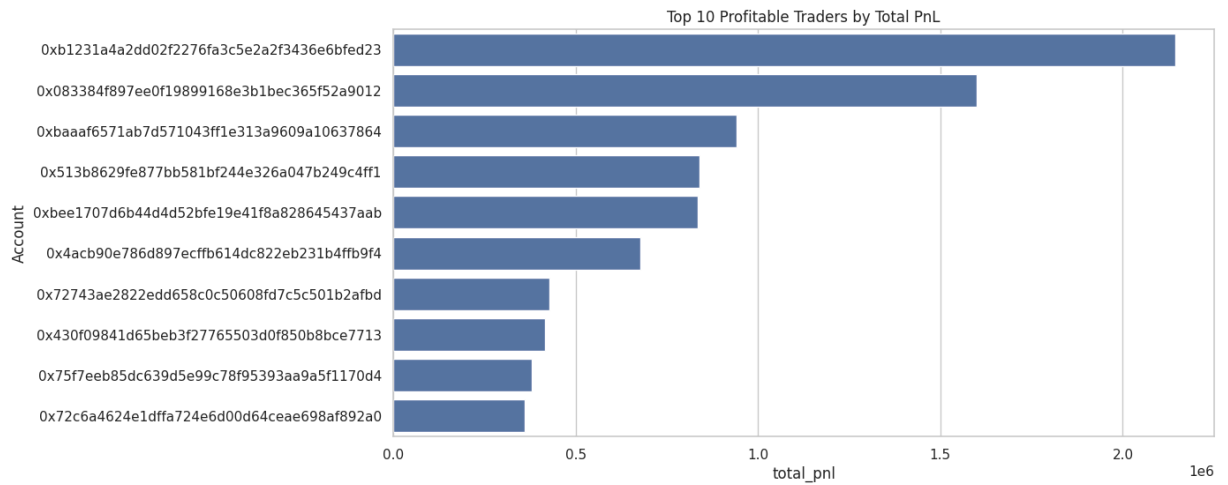- Fee efficiency is also better during Extreme Greed, suggesting smarter trades.

Average Closed PnL by Market Sentiment

Average Fee by Market Sentiment
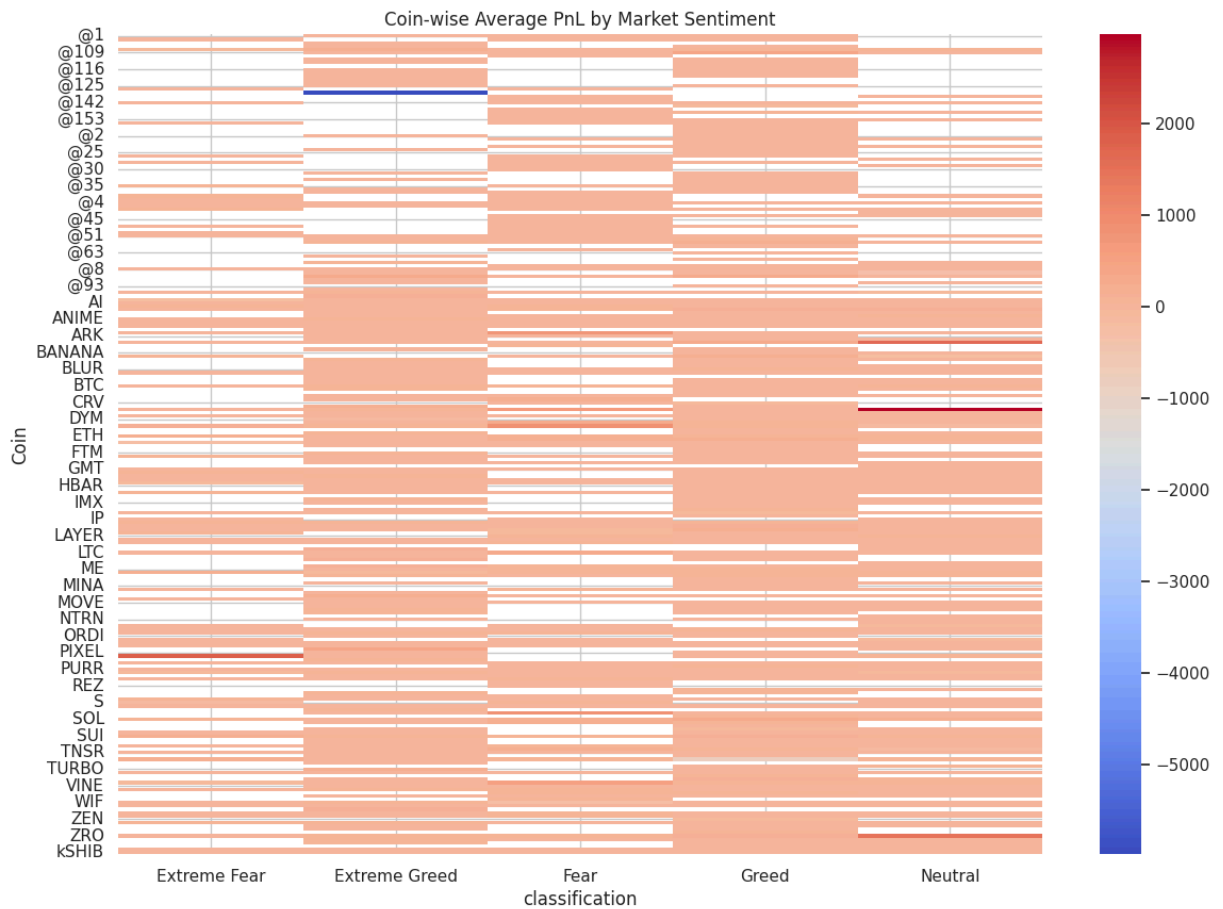
Trade Count by Market Sentiment
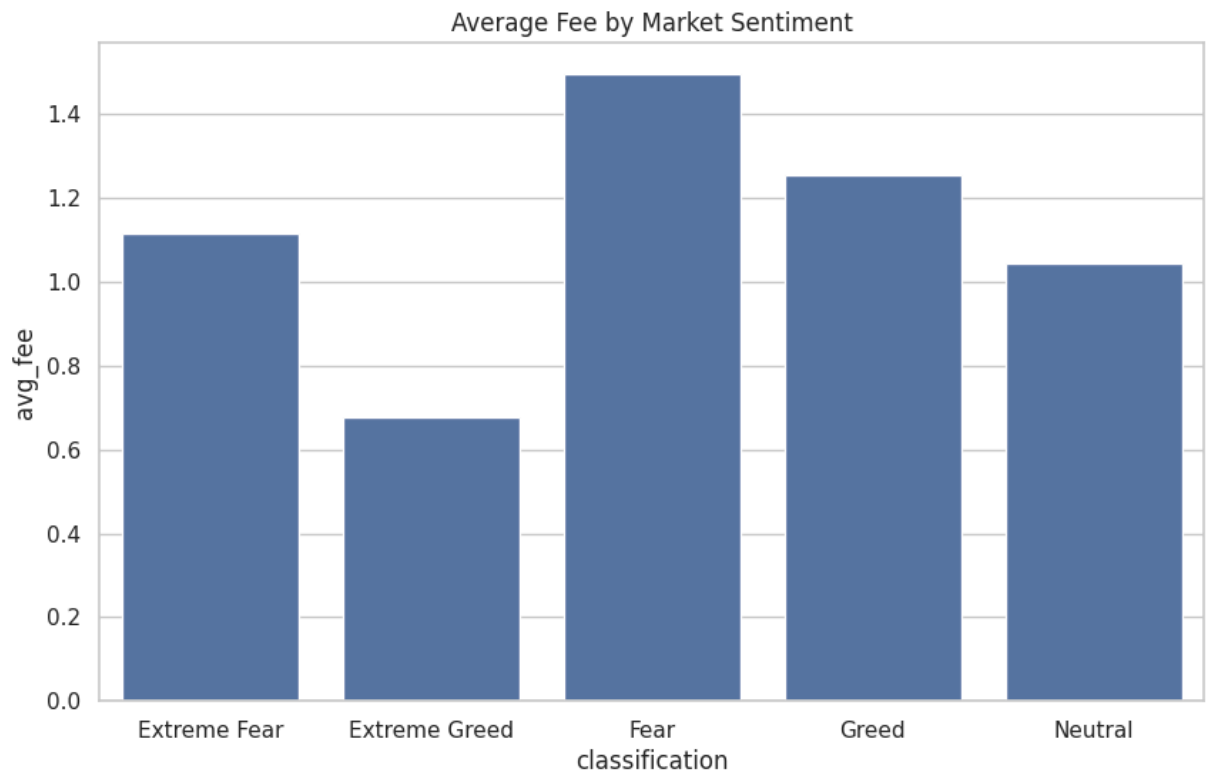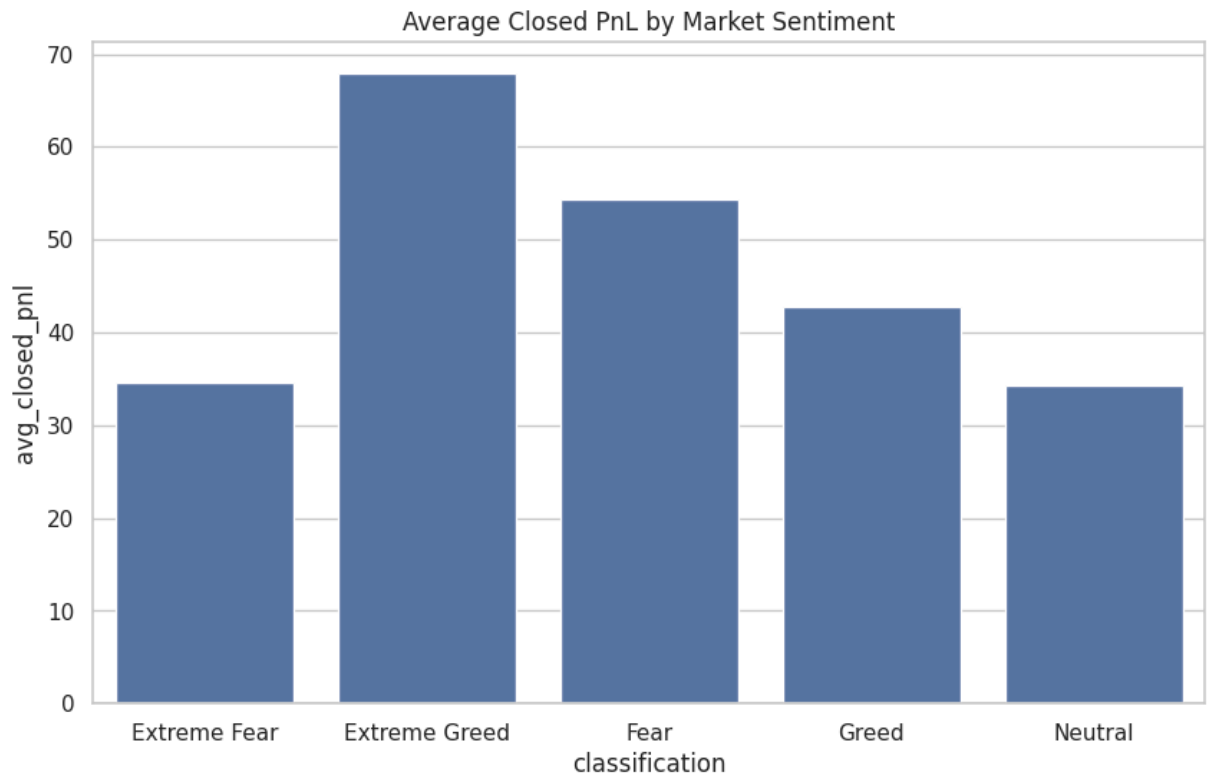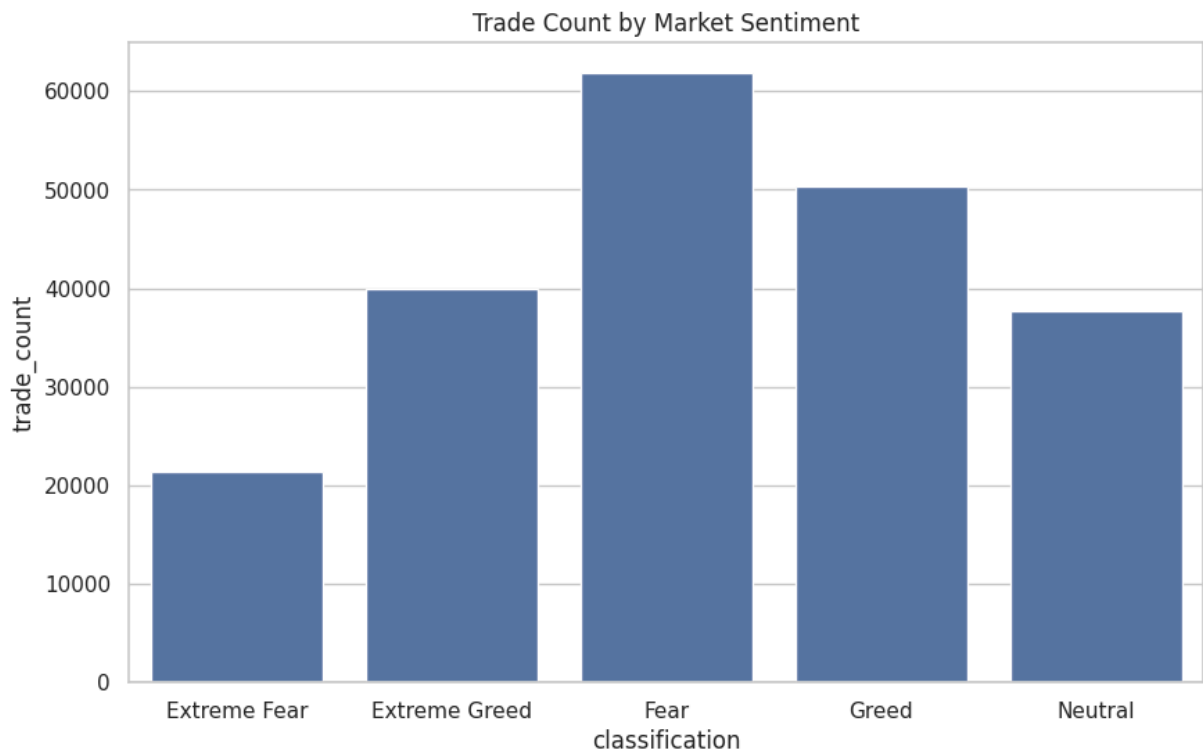
Insight:

- Most trading activity happens during 'Fear' and 'Greed' phases.
- Fee structure is lowest during 'Extreme Greed'.
- Volatility often triggers both high activity and high returns.

```
Out[ ]:  (                                          Account       total_pnl
         27  0xb1231a4a2dd02f2276fa3c5e2a2f3436e6bfed23  2.143383e+06
         0   0x083384f897ee0f19899168e3b1bec365f52a9012  1.600230e+06
         29  0xbaaaf6571ab7d571043ff1e313a9609a10637864  9.401638e+05
         13  0x513b8629fe877bb581bf244e326a047b249c4ff1  8.404226e+05
         31  0xbee1707d6b44d4d52bfe19e41f8a828645437aab  8.360806e+05
         11  0x4acb90e786d897ecffb614dc822eb231b4ffb9f4  6.777471e+05
         15  0x72743ae2822edd658c0c50608fd7c5c501b2afbd  4.293556e+05
         9   0x430f09841d65beb3f27765503d0f850b8bce7713  4.165419e+05
         17  0x75f7eeb85dc639d5e99c78f95393aa9a5f1170d4  3.790954e+05
         16  0x72c6a4624e1dffa724e6d00d64ceae698af892a0  3.605395e+05,
                                                    Account    avg_fee
         28  0xb899e522b5715391ae1d4f137653e7906c5e2115  5.901165
         12  0x4f93fead39b70a1824f981a54d4e55b278e9f760  5.762443
         13  0x513b8629fe877bb581bf244e326a047b249c4ff1  4.214105
         2   0x271b280974205ca63b716753467d5a371de622ab  3.588026
         20  0x8381e6d82f1affd39a336e143e081ef7620a3b7f  2.351755
         0   0x083384f897ee0f19899168e3b1bec365f52a9012  1.971302
         11  0x4acb90e786d897ecffb614dc822eb231b4ffb9f4  1.653406
         30  0xbd5fead7180a9c139fa51a103cb6a2ce86ddb5c3  1.626607
         22  0x92f17e8d81a944691c10e753af1b1baae1a2cd0d  1.290200
         9   0x430f09841d65beb3f27765503d0f850b8bce7713  1.163404)
```
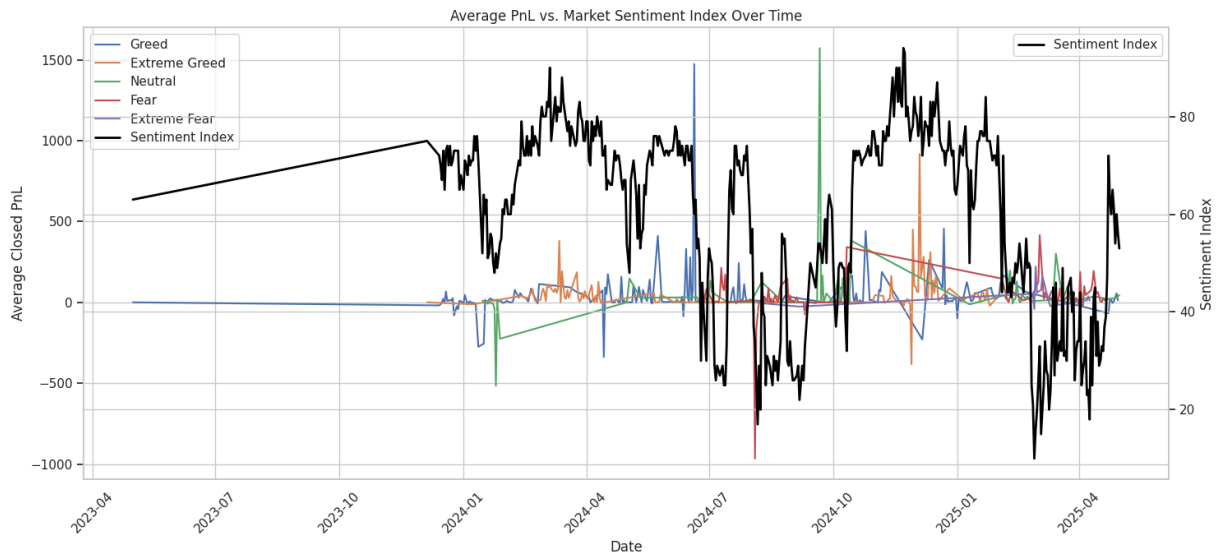
Insight:

- Top traders by PnL can be used as benchmarks.
- High-fee traders may need optimization in execution strategy.

Top 10 Profitable Traders by Total PnL

Top 10 High-Fee Traders by Average Fee

Coin-wise Average PnL by Market Sentiment

Insight:

- Some tokens are highly profitable in specific sentiment phases.

- The heatmap reveals how the average PnL for different coins varies across market sentiment classifications.
- This visualization helps identify which coins perform better or worse in specific market conditions (e.g., Extreme Fear, Greed).
- Traders can use this insight to tailor their strategies, potentially focusing on certain coins during particular sentiment phases to maximize profitability.

Average PnL vs. Market Sentiment Index Over Time

Insight:

- PnL tends to rise with sentiment index peaks, especially during greed phases.
- This correlation is useful for timing entries.

```
/tmp/ipython-input-8-2288965539.py:1: FutureWarning: DataFrame.fillna with
'method' is deprecated and will raise in a future version. Use obj.ffill() o
r obj.bfill() instead.
  pivoted_pnl = timeline_df.pivot(index='date', columns='classification', va
lues='avg_pnl').fillna(method='ffill')
```


7-Day Rolling Average: PnL and Sentiment Index

7-Day Rolling Volatility (Std Dev) of PnL by Sentiment
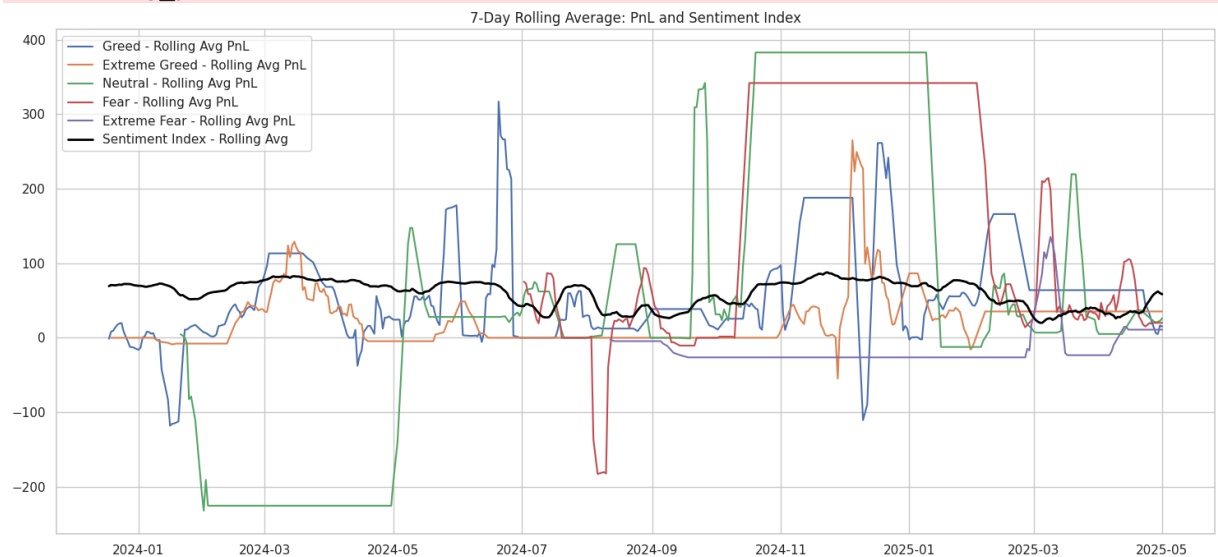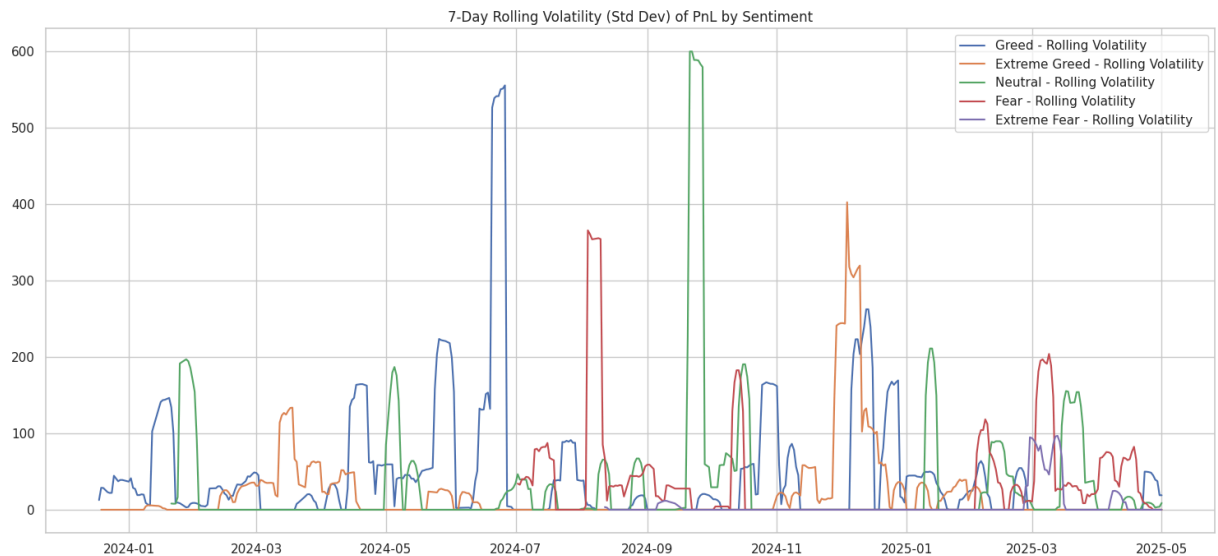
Insight:

- Rolling averages provide smoother insight into trader performance trends.
- Volatility spikes align with shifting sentiment zones, identifying periods of risk or opportunity.

	Side	classification	avg_pnl	total_pnl	trade_count
0	BUY	Extreme Fear	34.114627	3.730434e+05	10935
1	BUY	Extreme Greed	10.498927	1.883508e+05	17940
2	BUY	Fear	63.927104	1.935073e+06	30270
3	BUY	Greed	25.002302	6.144566e+05	24576
4	BUY	Neutral	29.227429	5.544151e+05	18969
5	SELL	Extreme Fear	34.980106	3.660668e+05	10465
6	SELL	Extreme Greed	114.584643	2.526821e+06	22052
7	SELL	Fear	45.049641	1.422082e+06	31567
8	SELL	Greed	59.691091	1.535673e+06	25727
9	SELL	Neutral	39.456408	7.385056e+05	18717

Insight:

- Analyzing trade 'Side' (BUY/SELL) against sentiment reveals strategies employed by traders during different market phases.
- Understanding which 'Side' is more profitable or frequent in certain sentiments can inform trading decisions.

Average Closed PnL by Trade Side and Market Sentiment

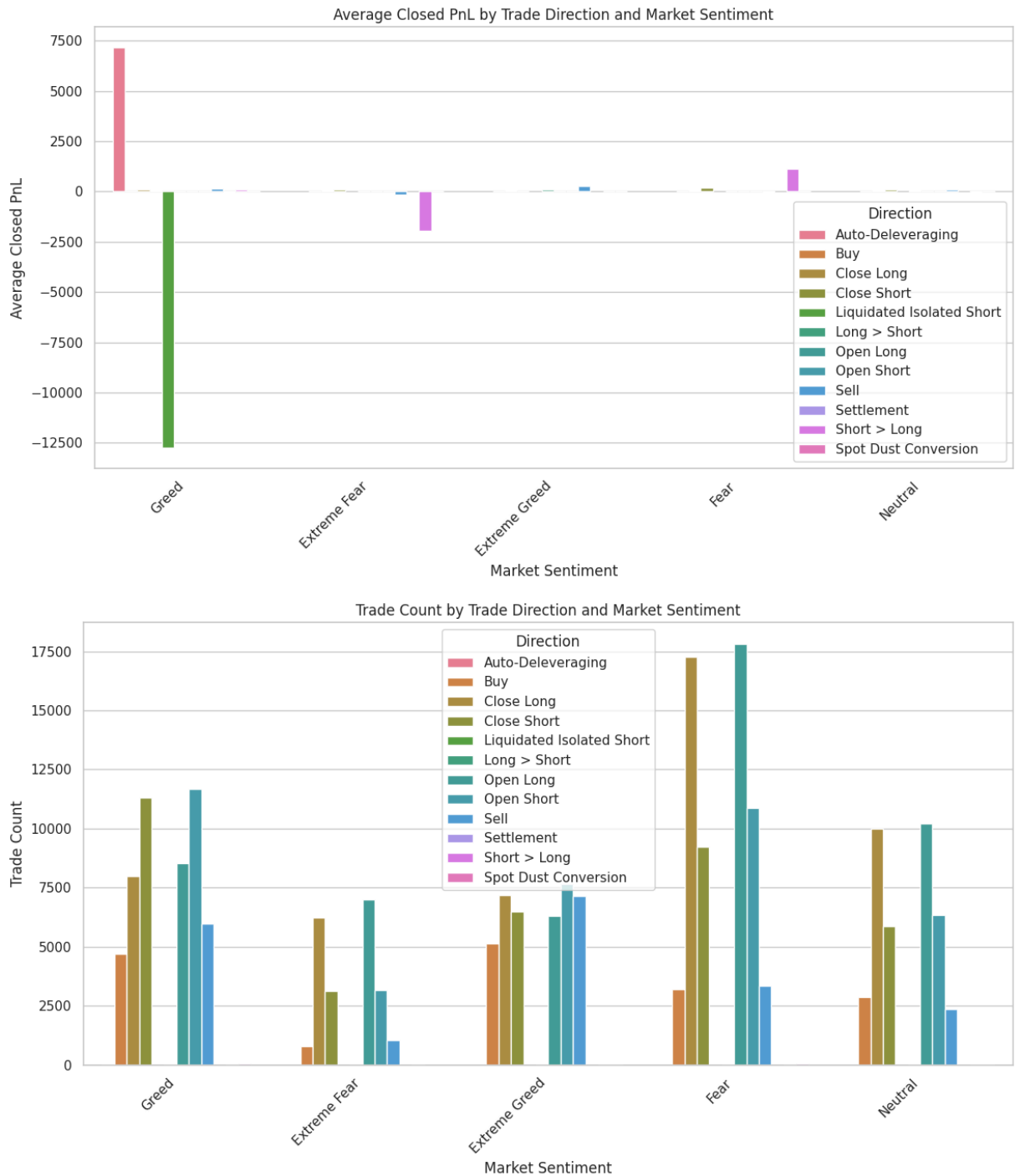## Trade Count by Trade Side and Market Sentiment
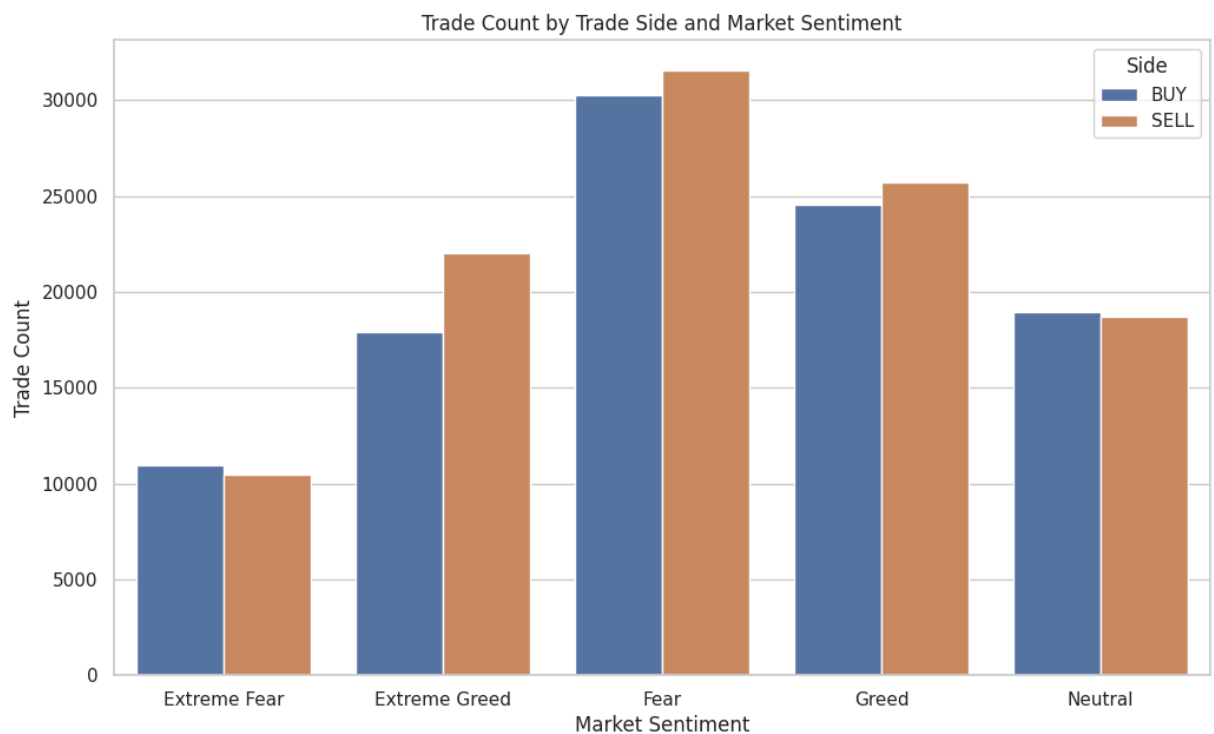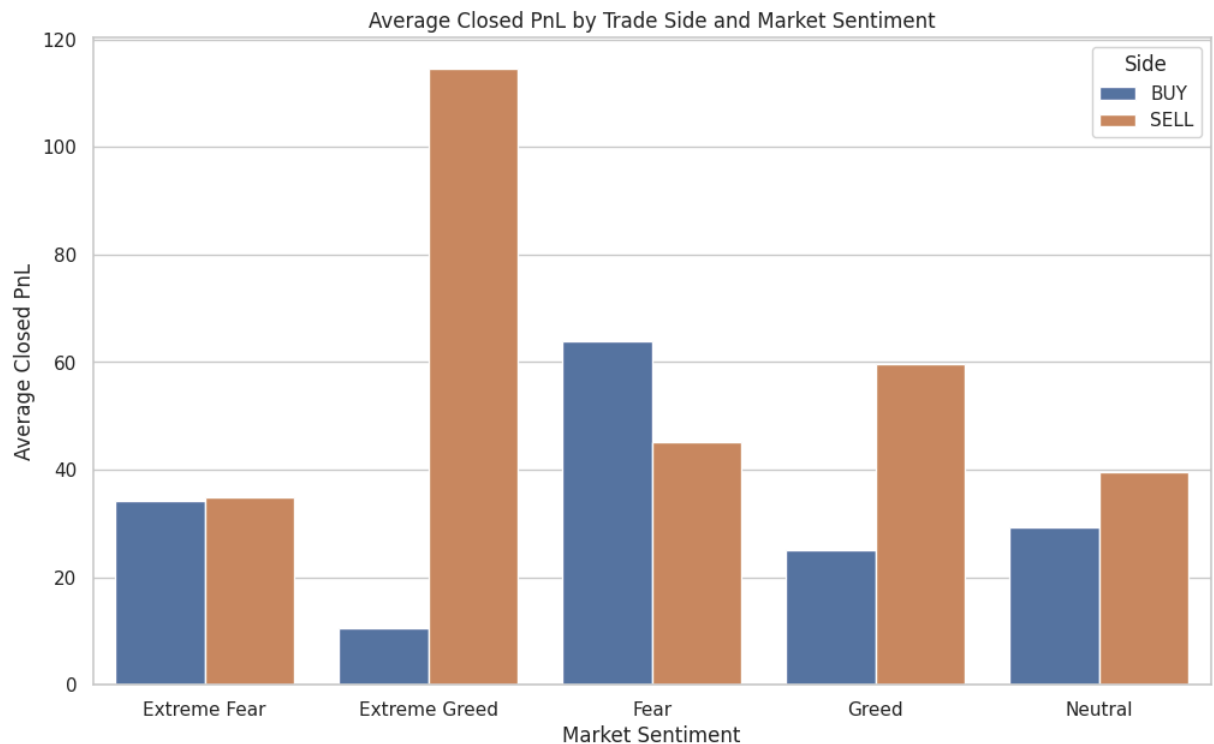
Insight:

- The visualizations confirm that average PnL varies significantly for BUY and SELL trades across different sentiment categories.
- Trade count also shows distinct patterns for BUYs and SELLs depending on the prevailing market sentiment, highlighting potential sentiment-driven trading volumes and strategies.

	Direction	classification	avg_pnl	total_pnl	trade_count
0	Auto-Deleveraging	Greed	7184.807003	5.747846e+04	8
1	Buy	Extreme Fear	0.000000	0.000000e+00	807
2	Buy	Extreme Greed	0.000000	0.000000e+00	5132
3	Buy	Fear	0.000000	0.000000e+00	3207
4	Buy	Greed	0.000000	0.000000e+00	4685
5	Buy	Neutral	0.000000	0.000000e+00	2885
6	Close Long	Extreme Fear	81.197371	5.067528e+05	6241
7	Close Long	Extreme Greed	61.830783	4.443160e+05	7186
8	Close Long	Fear	83.000111	1.432582e+06	17260
9	Close Long	Greed	88.958554	7.114905e+05	7998
10	Close Long	Neutral	52.815787	5.277882e+05	9993
11	Close Short	Extreme Fear	123.400238	3.846385e+05	3117
12	Close Short	Extreme Greed	28.970490	1.882213e+05	6497
13	Close Short	Fear	207.676658	1.914986e+06	9221
14	Close Short	Greed	55.195496	6.249234e+05	11322
15	Close Short	Neutral	94.796313	5.545584e+05	5850
16	Liquidated Isolated Short	Greed	-12752.913040	-1.275291e+04	1
17	Long > Short	Extreme Fear	1.331956	6.659778e+00	5
18	Long > Short	Extreme Greed	120.600968	8.442068e+02	7
19	Long > Short	Fear	4.795642	6.713898e+01	14
20	Long > Short	Greed	22.711911	3.633906e+02	16
21	Long > Short	Neutral	47.332193	7.099829e+02	15
22	Open Long	Extreme Fear	0.000000	0.000000e+00	7005
23	Open Long	Extreme Greed	0.000000	0.000000e+00	6300
24	Open Long	Fear	0.000000	0.000000e+00	17824
25	Open Long	Greed	0.000000	0.000000e+00	8544
26	Open Long	Neutral	0.000000	0.000000e+00	10222
27	Open Short	Extreme Fear	0.000000	0.000000e+00	3174

	Direction	classification	avg_pnl	total_pnl	trade_count
28	Open Short	Extreme Greed	0.000000	0.000000e+00	7663
29	Open Short	Fear	0.000000	0.000000e+00	10887
30	Open Short	Greed	0.000000	0.000000e+00	11664
31	Open Short	Neutral	0.000000	0.000000e+00	6353
32	Sell	Extreme Fear	-135.021730	-1.406926e+05	1042
33	Sell	Extreme Greed	290.572354	2.081660e+06	7164
34	Sell	Fear	-3.141217	-1.056705e+04	3364
35	Sell	Greed	128.022106	7.663403e+05	5986
36	Sell	Neutral	89.517239	2.100074e+05	2346
37	Settlement	Greed	-29.215368	-2.921537e+01	1
38	Short > Long	Extreme Fear	-1932.516940	-1.159510e+04	6
39	Short > Long	Extreme Greed	11.771238	1.294836e+02	11
40	Short > Long	Fear	1115.943156	2.008698e+04	18
41	Short > Long	Greed	100.665716	2.315311e+03	23
42	Short > Long	Neutral	-11.945100	-1.433412e+02	12
43	Spot Dust Conversion	Extreme Fear	0.000000	0.000000e+00	3
44	Spot Dust Conversion	Extreme Greed	0.000000	0.000000e+00	32
45	Spot Dust Conversion	Fear	0.000000	0.000000e+00	42
46	Spot Dust Conversion	Greed	0.000000	0.000000e+00	55
47	Spot Dust Conversion	Neutral	0.000000	0.000000e+00	10

Average Closed PnL by Trade Direction and Market Sentiment

Trade Count by Trade Direction and Market Sentiment

Insight:

- Analyzing trade 'Direction' (Long/Short) against sentiment reveals distinct profitability and activity patterns.
- For example, 'Close Short' trades appear highly profitable during 'Fear' sentiment, while 'Sell' trades show high average PnL during 'Extreme Greed'. This suggests specific strategies might be more effective depending on the prevailing market sentiment and trade direction.
- The trade count visualization shows which directions are favored during different sentiment phases, indicating potential sentiment-driven trading

biases.

	classification	win_rate	average_trade_duration
0	Extreme Fear	37.060748	2.406449
1	Extreme Greed	46.494299	0.536382
2	Fear	42.076750	0.771819
3	Greed	38.482794	0.052780
4	Neutral	39.699093	8.180438

Win Rate by Market Sentiment

Average Trade Duration by Market Sentiment
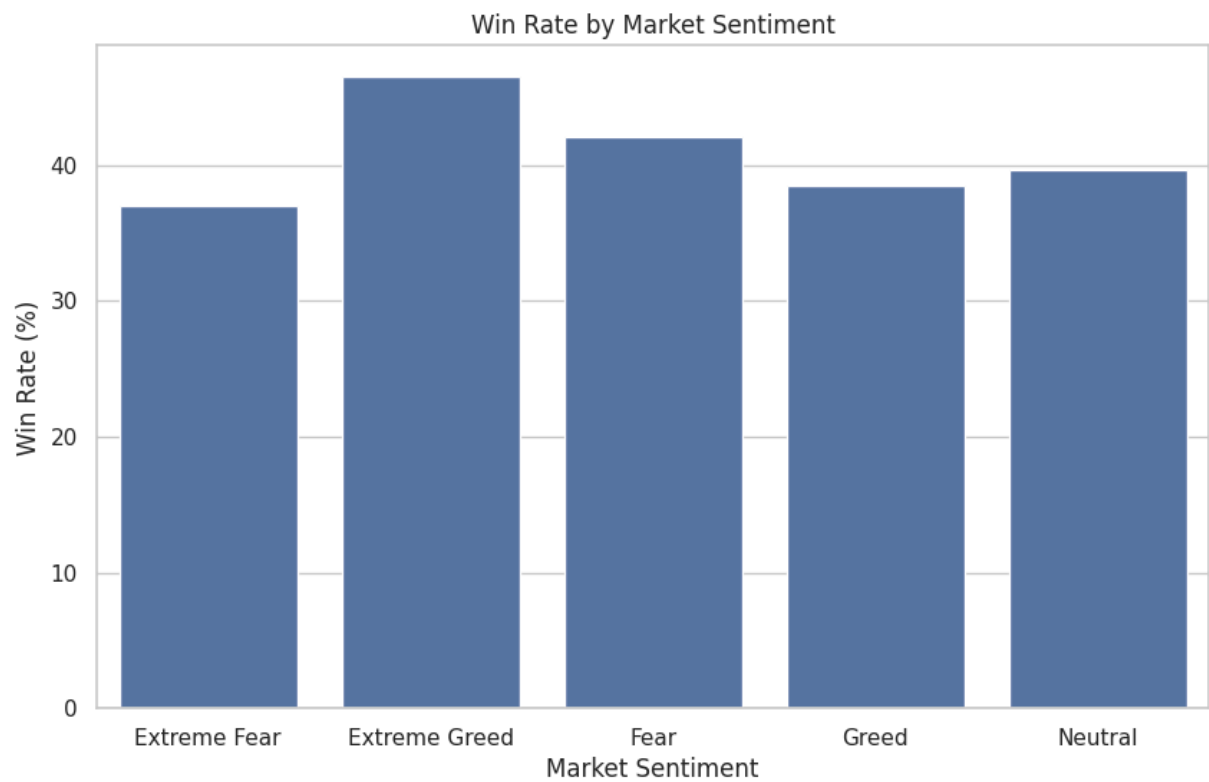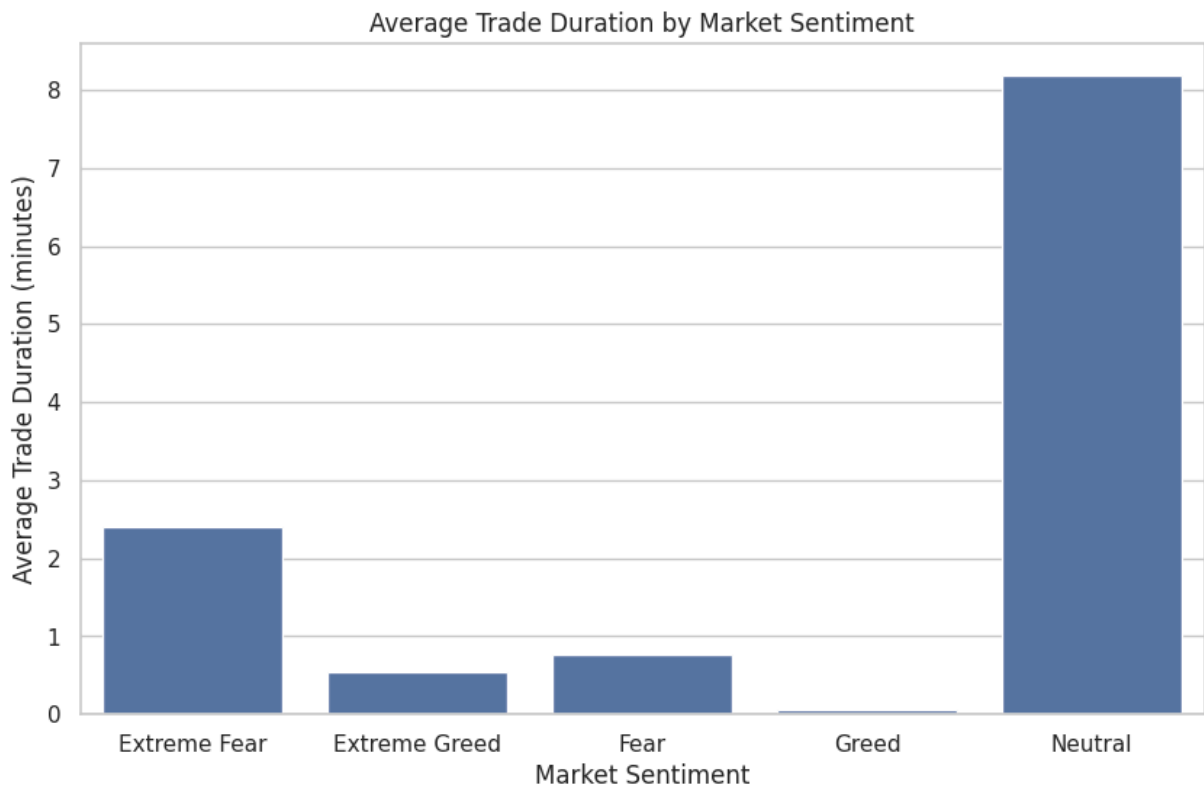
Insight:

- The visualizations of win rate and average trade duration by market sentiment provide further insights into trader behavior and performance during different market conditions.
- Win rates tend to be higher during 'Extreme Greed' and 'Fear' phases, suggesting these might be more favorable conditions for profitable trades.
- Average trade duration varies significantly across sentiment categories, potentially indicating different trading strategies or market volatility levels associated with each sentiment. For example, shorter durations during 'Greed' might suggest quick, opportunistic trades, while longer durations during 'Neutral' could indicate longer-term strategies or less volatile periods.

Summary of Key Insights:

Correlation between Trader Performance Metrics and Market Sentiment Classifications:

Average Closed PnL:

- Traders perform best (highest PnL) during 'Extreme Greed', followed by 'Fear'.
- PnL tends to rise with sentiment index peaks, especially during greed phases.
- 'Sell' trades show high average PnL during 'Extreme Greed'.

- 'Close Short' trades appear highly profitable during 'Fear' sentiment.

Average Fee:

- Fee efficiency is better (lower fee) during 'Extreme Greed', suggesting potentially smarter trades.
- Fee structure is lowest during 'Extreme Greed'.

Trade Count:

- Most trading activity happens during 'Fear' and 'Greed' phases.
- Trade count also shows distinct patterns for BUYs and SELLs depending on the prevailing market sentiment, highlighting potential sentiment-driven trading volumes and strategies.
- Different trade directions are favored during different sentiment phases, indicating potential sentiment-driven trading biases.

Win Rate:

- Win rates tend to be higher during 'Extreme Greed' and 'Fear' phases, suggesting these might be more favorable conditions for profitable trades.

Average Trade Duration:

- Average trade duration varies significantly across sentiment categories, potentially indicating different trading strategies or market volatility levels associated with each sentiment.
- Shorter durations during 'Greed' might suggest quick, opportunistic trades, while longer durations during 'Neutral' could indicate longer-term strategies or less volatile periods.

Overall Noteworthy Correlations and Patterns:

- 'Extreme Greed' appears to be the most favorable sentiment for average PnL and fee efficiency.
- 'Fear' and 'Greed' sentiments are associated with the highest trade counts.
- Specific trade sides and directions show varying profitability and activity across different sentiment classifications.
- PnL generally correlates positively with the sentiment index over time.
- Volatility in PnL (rolling standard deviation) spikes align with shifting sentiment zones.
- The heatmap shows that profitability for specific coins is highly dependent on the market sentiment.