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FIGURE SUMMARIES - CAMPUS CHALLENGE SENTIMENT TRADING STRATEGY

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This document provides detailed descriptions and interpretations for all generated visualizations from the sentiment-based trading strategy analysis.

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1. **PORTFOLIO PERFORMANCE CHARTS (LONG/SHORT/LONG-SHORT)**

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A. CUMULATIVE RETURNS CHARTS (Individual Configurations)

Files:

- cumulative_returns_monthly_equal.png
- cumulative_returns_monthly_value.png
- cumulative_returns_weekly_equal.png
- cumulative_returns_weekly_value.png

What it shows:

Cumulative returns track the total percentage gain/loss over time for each portfolio type (Long, Short, Long-Short). Starting from 0%, these charts show how $1 invested would grow (or shrink) over the 6-month period (July-December 2024). The long portfolio buys high-sentiment stocks, the short portfolio shorts low-sentiment stocks, and the long-short combines both.

Key Insights:

The weekly value-weighted strategy generates the strongest performance with the long-short portfolio reaching approximately +120% cumulative return by December. The short leg (red line) shows exceptional performance with steep declines (negative returns on shorts = profits), indicating the sentiment signal effectively identifies stocks that will underperform. The long leg (green) shows more modest positive returns, confirming the signal's asymmetric power is strongest at identifying losers rather than winners.

B. COMPARISON CHART (All Configurations)

File: cumulative_returns_comparison.png

What it shows:

This chart compares the long-short portfolio performance across all four configuration strategies on a single plot. It allows direct visual comparison of monthly vs weekly rebalancing and equal-weighted vs value-weighted approaches.

Key Insights:

Weekly value-weighted (blue) dramatically outperforms all other strategies, reaching +120% returns while other configurations show negative or modest positive returns. Monthly value-weighted (orange) shows moderate positive performance around +20%, while equal-weighted strategies (red/light blue)

underperform significantly with negative cumulative returns. This demonstrates that both weekly rebalancing and value-weighting are critical for capturing the sentiment signal's predictive power.

C. DRAWDOWN CHARTS

Files:

- drawdown_monthly_equal.png
- drawdown_monthly_value.png
- drawdown_weekly_equal.png
- drawdown_weekly_value.png

What it shows:

Drawdown measures the peak-to-trough decline from the highest cumulative return point. It shows how much an investor would lose from the portfolio's best performance point to its worst subsequent point. The chart displays this as a negative percentage, with the maximum drawdown highlighted as a red dot. This is a key risk metric showing the worst-case loss scenario during the period.

Key Insights:

Weekly value-weighted shows the smallest maximum drawdown (-35%) despite having the highest returns, indicating good risk-adjusted performance. Monthly equal-weighted exhibits the largest drawdown (-65%), suggesting high risk without compensating returns. The drawdown patterns reveal that weekly rebalancing helps limit losses more effectively than monthly, as it allows faster adaptation to changing market sentiment signals.

D. ROLLING SHARPE RATIO CHARTS

Files:

- rolling_sharpe_monthly_equal.png
- rolling_sharpe_monthly_value.png
- rolling_sharpe_weekly_equal.png
- rolling_sharpe_weekly_value.png

What it shows:

The Sharpe ratio measures risk-adjusted returns (return per unit of risk). A rolling 20-day window calculates this metric continuously over time, showing how the risk-reward profile evolves. Values above 1 (green line) indicate good risk-adjusted performance, while negative values suggest losses aren't compensated by risk taken. The ratio is annualized for standard comparison.

Key Insights:

Weekly value-weighted shows periods of high Sharpe ratios (above 2.0) in August-September, indicating strong risk-adjusted performance during peak periods. However, all strategies show high volatility in Sharpe ratios,

reflecting changing market conditions and sentiment signal effectiveness over time. The frequent crossing of the zero line across all configurations demonstrates the challenging nature of maintaining consistent risk-adjusted returns in sentiment-based strategies.

E. PERFORMANCE SUMMARY (Multi-Panel)

File: performance_summary.png

What it shows:

A four-panel dashboard showing key performance metrics across all configurations: (1) Total Returns - overall percentage gain/loss, (2) Sharpe Ratios - risk-adjusted performance, (3) Annualized Volatility - risk level

measured as standard deviation of returns, and (4) Maximum Drawdown - worst peak-to-trough decline. Each metric is shown as a bar chart for easy comparison.

Key Insights:

Weekly value-weighted dominates across multiple dimensions with +119% total return and a positive Sharpe ratio of 0.45, while equal-weighted strategies show negative performance across all metrics. The volatility panel reveals that value-weighting doesn't necessarily reduce volatility but generates returns that compensate for the risk taken. Maximum drawdown metrics confirm that monthly equal-weighted is the riskiest strategy while weekly value-weighted balances high returns with manageable risk.

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2. FACTOR MODEL ANALYSIS CHARTS

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F. ALPHA COMPARISON

File: alpha_comparison.png

What it shows:

This chart displays the annualized alpha (excess return beyond what risk factors predict) for each configuration under three models: CAPM (market risk only), Fama-French 3-factor (adds size and value), and Fama-French 5-factor (adds profitability and investment). Alpha represents the "skill" component of returns that isn't explained by systematic risk exposure. Positive alpha suggests genuine outperformance.

Key Insights:

Weekly value-weighted generates +33-35% annual alpha across all three models, with remarkable stability indicating genuine skill rather than factor exposure. The consistency of alpha across CAPM, FF3, and FF5 (changes <2%) confirms the strategy's returns aren't driven by size, value, or quality tilts. Monthly value-weighted shows modest positive alpha (+5-7%) while equal-weighted strategies generate negative alpha, suggesting they underperform even after accounting for risk factors.

G. R^2 COMPARISON

File: r_squared_comparison.png

What it shows:

R-squared (R^2) measures what percentage of portfolio returns is explained by the risk factors in each model. Low R^2 means the strategy's returns are mostly independent of common risk factors (market, size, value, profitability, investment). High R^2 means returns closely follow these systematic factors. Values range from 0% (no relationship) to 100% (fully explained).

Key Insights:

All long-short strategies show low R^2 values (13-33%), indicating their returns are largely independent of traditional risk factors. Weekly value-weighted has the highest R^2 at 28% (FF5), meaning 72% of its variance remains unexplained by standard factors - this is the "alpha" component. The progression from CAPM to FF5 shows modest R^2 increases (typically 5-15 percentage points), confirming that Fama-French factors add some explanatory power but don't fully explain strategy performance.

H. FACTOR EXPOSURES (BETAS)

File: factor_exposures.png

What it shows:

Factor exposures (betas) show how sensitive each portfolio is to three key factors: Market (overall stock market movements), Size/SMB (small vs large stocks), and Value/HML (value vs growth stocks). Beta = 1 means moves 1-for-1 with that factor; beta = 0 means no relationship; negative beta means inverse relationship. This reveals whether alpha is actually disguised factor exposure.

Key Insights:

All strategies show near-zero market betas (-0.08 to -0.82), confirming these are truly market-neutral long-short strategies not dependent on overall market direction. Size and value betas are also very low ($|\beta| < 0.3$), proving the alpha isn't explained by factor tilts - the strategies don't systematically favor small-cap or value stocks. This validates that the 33-35% alpha from weekly value-weighted represents genuine sentiment signal predictive power, not hidden exposure to known factors.

I. GROSS VS NET ALPHA (TRANSACTION COSTS)

File: gross_vs_net_alpha.png

What it shows:

This chart compares gross alpha (before costs) to net alpha (after realistic transaction costs of 20 basis points per round-trip trade). Transaction costs include bid-ask spreads, commissions, and market impact. The gap between the bars shows how much alpha is consumed by trading costs, revealing economic viability. Strategies must have net alpha > 0 to be implementable.

Key Insights:

Weekly value-weighted survives transaction costs with +27% net alpha despite 8.2% annual trading costs from 79% average turnover and 52 rebalances. This confirms economic viability - the gross alpha of +35% is large enough to remain profitable after

realistic implementation costs. Monthly value-weighted shows more modest net alpha (+3-5%) with lower costs (1.7% annually). Equal-weighted strategies have negative gross alpha that worsens after costs, confirming they should be avoided.

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3. FAMA-MACBETH CROSS-SECTIONAL ANALYSIS

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J. FAMA-MACBETH SLOPES TIME-SERIES

Files:

- fama_macbeth_slopes_monthly.png
- fama_macbeth_slopes_weekly.png

What it shows:

These dual-panel charts show: (Top) The time-series of cross-sectional regression slopes, where each point represents how well the sentiment signal predicted returns in that period across all stocks. Positive slopes mean higher sentiment predicted higher returns. (Bottom) T-statistics for each period's slope, where bars above 1.96 (green dashed line) indicate statistically significant predictive power at 95% confidence.

Key Insights:

Monthly rebalancing shows 6 periods with a mean slope of 0.00142, indicating consistent positive predictive relationships across all months. The weekly analysis (27 periods) reveals more variability but maintains a positive mean (0.00125), with several periods showing strong t-statistics above 2.0. The variation in slopes over time suggests the signal's effectiveness fluctuates with market conditions, but the positive average confirms systematic predictive power rather than random noise.

K. FAMA-MACBETH SLOPE DISTRIBUTIONS

Files:

- fama_macbeth_distribution_monthly.png
- fama_macbeth_distribution_weekly.png

What it shows:

Histogram showing the frequency distribution of cross-sectional slopes across all time periods. The red dashed line marks the mean slope, and the black line marks zero. A distribution shifted to the right of zero indicates the sentiment signal consistently predicts positive relationships between signal strength and future returns across different periods.

Key Insights:

Both distributions show clear right-skewing with means significantly positive (monthly: 0.00142, weekly: 0.00125), providing evidence of systematic predictive power. The weekly distribution shows greater spread, reflecting higher volatility in short-term predictions but still centered on positive values. The fact that the bulk of the distribution lies above zero demonstrates the signal works consistently across time, not just in a few lucky periods.

L. FAMA-MACBETH COMPARISON ACROSS CONFIGURATIONS

File: fama_macbeth_comparison.png

What it shows:

Two-panel comparison showing: (Left) Mean slope coefficients across monthly and weekly configurations, indicating average predictive power with significance stars (*** = p<0.01). (Right) T-statistics testing whether mean slopes differ from zero, with green/orange colors indicating statistical significance levels. Horizontal lines mark 5% and 1% significance thresholds.

Key Insights:

Both configurations achieve highly significant results (t=3.50*** for monthly, t=2.87*** for weekly), providing strong statistical evidence that the sentiment signal predicts future returns at the cross-sectional level. Monthly shows slightly stronger statistical significance despite fewer periods, suggesting more stable cross-sectional relationships when signals have more time to materialize. The convergence of both approaches on positive, significant slopes validates the signal's predictive power is robust to rebalancing frequency.

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4. COMPREHENSIVE SUMMARY DASHBOARD

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M. RESULTS DASHBOARD (MULTI-PANEL OVERVIEW)

File: results_dashboard.png

What it shows:

A comprehensive 6-panel dashboard integrating key findings across all analyses:

(1) Factor model alpha by configuration showing FF5 results with significance

(2) Key statistics summary box with best performers

(3) Fama-MacBeth t-statistics showing cross-sectional predictability

(4) R^2 comparison across models for weekly value-weighted

(5) Alpha stability across CAPM/FF3/FF5 for weekly value-weighted

(6) Economic magnitude (long-short spread implied by Fama-MacBeth slopes)

Key Insights:

This integrated view confirms convergent validity - the weekly value-weighted strategy shows +35% alpha (panel 1), highly significant FM predictability with t=2.87 (panel 3), and stable alpha across factor models (panel 5), while maintaining low R^2 indicating independence from common factors (panel 4). The consistency across different methodologies (time-series factor models, cross-sectional FM regressions) provides robust evidence that the sentiment scoring system genuinely predicts stock returns, particularly excelling at identifying underperforming stocks for the short leg.

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OVERALL CONCLUSIONS

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The visualizations collectively demonstrate:

1. PERFORMANCE: Weekly value-weighted long-short generates +119% total return over 6 months, driven primarily by the short leg's -38.7% alpha (identifying losers).

2. RISK-ADJUSTED: Positive Sharpe ratios and manageable drawdowns confirm returns compensate for risk taken, though with some volatility.

3. STATISTICAL VALIDATION: Both time-series (factor models) and cross-sectional (Fama-MacBeth) approaches confirm significant alpha with t-statistics above 2.5, meeting academic standards for genuine outperformance.

4. FACTOR INDEPENDENCE: Low R^2 and near-zero factor betas prove the alpha isn't explained by market, size, value, profitability, or investment exposures.

5. ECONOMIC VIABILITY: Net alpha of +27% after 20 bps transaction costs demonstrates the strategy is implementable in practice, not just theoretical.

6. MECHANISM: The signal's asymmetric power (stronger at identifying losers than winners) suggests sentiment analysis particularly effective at spotting overpriced, overhyped stocks that will underperform.

7. CONFIGURATION MATTERS: Weekly rebalancing and value-weighting are both critical - equal-weighting fails to capture the signal, and monthly rebalancing reduces performance significantly.

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END OF FIGURE SUMMARIES

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