Cardinal Trading Group S25 Market Research & Trading Research Report

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Remember !!: This Report Outline is designed to assist you in your research process. It is not a rigid set of requirements, and you are not obligated to address every aspect in full detail. Instead, focus on the factors that are most relevant and impactful for your analysis.

I. Executive Summary

A **short volatility** trading strategy seeks to profit through the selling of options, volatility derivatives, or other volatility-linked trades during a period of low market volatility. It is known that implied volatility usually outpaces the realized volatility, thus it may allow traders to collect premiums through the selling of options. The main objectives of this strategy are to generate consistent income, by as previously stated, collecting options premiums, as well as profiting from mean-reverting volatility trends and by exploiting the volatility risk premium in options trading.

Some key metrics that are used to execute this strategy include: measuring the difference between implied and realized volatility, volatility indices, the Sharpe ratio, and Delta and Vega Exposure.

Furthermore, the expected performance of this trading strategy is stable and steady returns in calm markets with low volatility, although there is a significant downside risk in volatility spikes, such as the "Volmageddon" in 2018. This strategy needs hedging mechanisms to limit significant losses.

II. Trading Thesis

A. Market structure hypothesis

The Market Structure Hypothesis assumes that in short-term volatility trading, liquidity, order flow, and institutional positioning are drivers of volatility, which create inefficiencies that a trader can capitalize on. Usually, implied volatility is overpriced compared to the realized volatility, enabling a trader to reap the volatility risk premium by selling options or volatility derivatives. Volatility tends to mean-revert after local spikes, whereas regime shifts and dealer hedging flows may self-feed price movements into gamma squeezes or liquidity-driven mispricings. Inefficiencies that can be taken advantage of by traders include: volatility spike fading, exposure adjustments at regime shifts, and gap exploitation around significant market events.

B. Potential opportunities for exploitation
(Outline specific inefficiencies or opportunities to capitalize on.)

Volatility Risk Premium is one inefficiency which traders could capitalize on. This is because implied volatility is often priced higher than realized volatility due to the demand for options as insurance as a method of risk aversion. Here, the opportunity lies in selling volatility by shorting VIX futures, options, or variance swaps, therefore collecting the excess premium. This works best when markets are calm and no major market-changing events are expected. Another major opportunity to capitalize off of an inefficiency lies in gamma squeezes and dealer hedging. This is where market makers and dealers hedge their position based on option flows, but if many traders buy short-dated options, market makers adjust their delta exposure, sometimes creating self-reinforcing price swings called gamma squeezes. Here, the opportunity lies in trading around expiration weeks when large options positions roll off. Dealers who hedge options exposure must buy or sell stock/futures to remain delta-neutral. When options expire, these hedging flows disappear, which leads to temporary price dislocations. Traders can profit by anticipating these shifts, such as fading pre-OPEX volatility spikes or positioning for post-OPEX price stabilization.

III. Model State

A. Required data

- Market Data (Price & Volume Information)
    - Underlying asset prices (e.g., S&P 500, Nasdaq, individual stocks)
    - Futures prices (e.g., VIX futures curve)
    - Options volume & open interest
    - Historical volatility (HV)
    - Liquidity metrics (bid-ask spreads, market depth)
- Volatility Indicators & Metrics
    - Implied volatility (IV)
    - Realized volatility (RV)
    - Volatility risk premium (IV - RV spread)
    - VIX & other volatility indices (e.g., VVIX)
    - Skew & term structure (IV differences across strikes and expirations)
- Options Market Data:
    - Put/call ratio
    - Options open interest & volume
    - Gamma exposure (dealer positioning)
    - IV rank & IV percentile
- Macroeconomic & Event-Driven Data
    - Interest rates (Fed funds rate, Treasury yields)
    - Economic announcements (CPI, jobs report, FOMC meetings)

    - Earnings reports (for single-stock volatility trades)
    - Geopolitical & market sentiment data (e.g., news sentiment analysis)

B. Metrics

- Risk-Adjusted Return Metrics
    - Sharpe Ratio
    - Sortino Ratio
    - Calmar Ratio
- Profitability Metrics
    - Win Rate
    - Profit/Loss (P/L) Ratio
    - Expected Value (EV) Per Trade
- Risk Management Metrics
    - Maximum Drawdown (MDD)
    - Volatility of PnL
    - Risk of Ruin
    - Position Sizing Efficiency
- Strategy-Specific Volatility Metrics
    - Volatility Risk Premium Capture
    - Time Decay (Theta) Contribution
    - Hedging Cost vs. PnL

C. Frequency of updates

- Intraday Updates (Real-Time or Hourly)
    - Implied Volatility (IV) and Realized Volatility (RV)
    - VIX and Volatility Index Levels
    - Options Open Interest and Volume Changes
    - Gamma Exposure and Dealer Hedging Activity
    - Order Flow and Liquidity Metrics
    - Intraday Market Sentiment & News Impact
    - **Why**: These metrics must be updated intraday because short volatility trading relies on real-time changes in implied volatility, dealer hedging flows, liquidity shifts, and market sentiment, all of which can rapidly impact options pricing and risk exposure.
- 2. Daily Updates
    - Sharpe Ratio, Sortino Ratio, and Other Performance Metrics
    - Profit/Loss (P/L) Ratio and Win Rate
    - Volatility Risk Premium (IV - RV Spread)
    - Maximum Drawdown (MDD) and Portfolio Risk Exposure
    - Position Sizing Adjustments

    - **Why**: These metrics must be updated daily because they provide a broader assessment of strategy performance and risk exposure over a full trading session, ensuring traders can evaluate trends, adjust positions, and manage risk proactively without excessive noise from intraday fluctuations. Daily updates allow for meaningful risk-adjusted return calculations, accurate P/L assessments, and proper tracking of volatility risk premium and drawdowns, which may not be stable on an intraday basis but should be monitored frequently to prevent accumulating excessive losses or misallocating capital.
- 3. Weekly Updates
    - Macro and Economic Event Calendar Review
    - Changes in Volatility Regimes (Low vs. High Volatility Periods)
    - Historical Volatility (HV) Trends
    - Earnings and Market Events Impacting Volatility
    - **Why**: These metrics must be updated weekly because they reflect broader market shifts and structural changes in volatility that develop over multiple trading sessions rather than within a single day. Macro events, earnings, and volatility regime changes impact markets over time, making weekly updates ideal for identifying trends, adjusting risk exposure, and positioning for upcoming catalysts. Updating too frequently (e.g., daily) may lead to unnecessary noise and reactionary trading, while updating less often (e.g., monthly) could cause missed opportunities or delayed risk management adjustments.
- 4. Monthly or Quarterly Updates
    - Strategy Performance Review & Optimization
    - Long-Term Volatility Trends and Market Regime Changes
    - Model Parameter Adjustments Based on Backtesting Results
    - Hedging Efficiency Analysis
    - **Why**: These metrics are updated monthly or quarterly to capture long-term strategy performance, market regime shifts, and model optimization without reacting to short-term noise. This ensures meaningful trend analysis, effective risk management, and informed adjustments to hedging and backtesting results.

IV. Entry Conditions

A. Specific criteria for entering trades

Trades are entered when implied volatility is significantly higher than realized volatility, meaning that the volatility premium is overpriced. Additional confirmation includes low volatility regime conditions, stable macroeconomic factors, and low dealer gamma exposure, which reduces the risk of sudden spikes in volatility. Trades may also be initiated around event-driven overreactions, such as post-earnings or macro news, where volatility is expected to mean revert. These criteria serve to optimize chances of realizing volatility risk premium while keeping the risk at a minimum for sudden surges in volatility that can show

significant losses. Entering a trade when volatility is overpriced and market conditions are stable increases the probability of reaping profits through time decay and mean reversion.

B. Triggers, signals, or portfolio targets

Portfolio adjustments are made when implied volatility contracts significantly, reducing the volatility risk premium, or when realized volatility starts exceeding IV, signaling increased market uncertainty. Positions are also adjusted if gamma exposure shifts sharply, which could indicate potential dealer hedging pressure, or if macroeconomic events introduce unexpected volatility risks. Stop-loss and risk thresholds, such as maximum drawdown limits or changes in volatility regime, trigger position reductions or hedging adjustments to protect capital.

V. Position Sizing and Management

A. Position sizing methodology

Position sizes are determined using a volatility-adjusted approach, where larger positions are taken when volatility is low and smaller positions when volatility is high to manage risk exposure. A percentage of portfolio method ensures no single trade risks excessive capital, typically allocating a fixed percentage based on expected volatility. Margin requirements and drawdown limits also influence position sizing, preventing over-leverage during extreme market conditions. Besides, delta and gamma exposure constraints dynamically adjust the size of positions in order to maintain an appropriate risk-reward profile.

B. Static vs. Dynamic sizing

Position sizing is dynamic, adjusting based on market volatility, portfolio risk exposure, and changing trade conditions. This ensures risk remains controlled during volatility spikes while maximizing returns in stable conditions, preventing excessive drawdowns or overexposure.

C. Use of leverage (if applicable)

Leverage is used strategically to enhance returns while maintaining strict risk controls, such as margin limits and stop-loss mechanisms. Proper management ensures controlled exposure to volatility spikes, preventing excessive drawdowns and potential liquidation.

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VI. Risk Management and Exit Conditions

A. Exit strategies

Trades are closed either when the implied volatility of the respective IV contracts condenses to a pre-defined level for profit targets (take-profit), enabling the trader to realize the volatility risk premium or when stop-loss triggers, such as RV surpassing IV or an unexpected sharp increase in volatility, are exercised to limit drawdowns. Additionally, time-based exits are instituted in order to close the positions in front of high-risk events - for example, earnings or FOMC meetings - or near expiration, to bypass unpredictable last-minute price swings.

B. Downside risk assessment

Downside risk is measured using maximum drawdown, value at risk, and delta/gamma exposure analysis to assess potential losses under extreme market conditions. Risk is managed by adjusting position sizes dynamically, using stop-loss thresholds, and implementing hedging strategies such as buying long volatility hedges (e.g., VIX calls or protective puts). Additionally, stress testing historical volatility shocks helps ensure the portfolio can withstand sudden market turbulence without excessive losses.

VII. Analysis and Other Considerations

A. Expected performance

The strategy is expected to generate steady returns in low-volatility environments by collecting the volatility risk premium but faces significant losses during volatility spikes. Backtests should confirm a positive Sharpe ratio and consistent P/L during stable periods, with notable drawdowns in high-volatility regimes. Hedging mechanisms are necessary to mitigate extreme losses.

B. Skewness (positive or negative)

The return distribution is negatively skewed since the strategy profits from small, consistent gains but experiences large, infrequent losses when volatility spikes. This characteristic requires risk management measures to prevent catastrophic drawdowns.

C. Payoff structure (linear or convex)

The payoff structure is concave, as short volatility strategies collect small premiums but suffer disproportionate losses during volatility shocks. Unlike long volatility strategies that benefit from convex payoffs, short volatility positions require careful monitoring to limit downside exposure.

D. Regime sensitivity

The strategy performs best in low-volatility environments but deteriorates in high-volatility or rapidly shifting market regimes. Regime shifts, such as a transition from low to high volatility, can cause severe losses if not properly hedged or adjusted for in real-time.

E. Overfitting risk assessment

Overfitting is a concern if the strategy is too reliant on past volatility patterns without accounting for structural market changes. Avoiding excessive parameter tuning and incorporating stress testing across multiple volatility regimes helps reduce this risk.

F. Factor betas / risk factor correlations

The strategy is highly sensitive to changes in implied and realized volatility, with significant exposure to VIX movements and gamma squeezes. It also has indirect correlations to macroeconomic factors such as interest rate changes and liquidity conditions.

H. Additional relevant analysis

Hedging costs, liquidity considerations, and execution slippage should be analyzed to ensure the strategy remains profitable after accounting for trading expenses. Implementing dynamic position sizing based on volatility regimes may enhance risk-adjusted returns.

VIII. Future Improvements

A. Potential enhancements

Implementing adaptive hedging strategies, such as dynamically adjusting hedge ratios based on real-time market conditions, could reduce downside risk. Utilizing machine learning models to predict short-term volatility movements may improve entry timing and risk management.

B. Areas for fine-tuning

Refining position sizing models based on historical drawdown data and optimizing trade execution to reduce slippage could enhance overall performance. Additionally, incorporating alternative volatility measures, such as realized skew or high-frequency volatility indicators, may improve trade selection.

Additional Resources

I created a simple model which mimics this trading strategy in Python. While it is probably far from perfect, I wanted to get a hands-on feel as to how this could look in real life. Here is a link to it on my GitHub: https://github.com/xx2kalex/ShortVolatilityModel