

VIX-Based Market-Timing Strategy

Introduction

This note presents a trading strategy that treats the CBOE Volatility Index (VIX) as a *leading indicator* of short-term moves in the S&P 500 (proxied by the SPY ETF). The key diagnostic is a *normalised oscillator*—a **z-score**—applied to the intraday VIX series.

Z-Score Definition

The strategy is run on 5-minute bars recorded only during regular US sessions (09:30–16:00 ET). Each trading day therefore yields 78 bars. All rolling statistics below are computed on that bar structure.

Let V_t be the VIX level at bar t . Choose

- a short window k (e.g. $k = 3$ bars, fifteen minutes) and
- a long window N (e.g. $N = 180$ bars, ≈ 2.3 trading days).

Define

$$\begin{aligned}\text{ShortMean}_t &= \frac{1}{k} \sum_{i=0}^{k-1} V_{t-i}, \\ \text{LongMean}_t &= \frac{1}{N} \sum_{i=0}^{N-1} V_{t-i}, \\ \text{LongStd}_t &= \sqrt{\frac{1}{N-1} \sum_{i=0}^{N-1} (V_{t-i} - \text{LongMean}_t)^2}.\end{aligned}$$

The (negative) z-score is then

$$z_t = - \frac{\text{ShortMean}_t - \text{LongMean}_t}{\text{LongStd}_t}$$

Signal Generation

With upper / lower thresholds $U = 1.2$ and $L = 0.8$,

$$P_t = \begin{cases} 1, & z_t > U \quad (\text{enter long}), \\ 0, & z_t < L \quad (\text{exit / flat}), \\ P_{t-1}, & \text{otherwise (hold)}. \end{cases}$$

Volatility-Adjusted Position Sizing

At entry ($P_{t-1} = 0$, $P_t = 1$) we scale exposure by current volatility. Let V_c be a constant reference level representing the long-run mean VIX ($V_c = 15$ in our tests). The effective position is

$$\tilde{P}_t = V_c \times \frac{P_t}{V_t}.$$

This keeps the average leverage close to 1. \tilde{P}_t is held constant until the trade is closed.

Back-Test and Performance Metrics

Let S_t be the SPY close of bar t and $\Delta S_t = S_{t+1} - S_t$ the one-bar price change. Strategy P&L per bar:

$$\text{Return}_t = \tilde{P}_t \Delta S_t.$$

Cumulative performance up to T bars is

$$\text{CumRet}_T = \sum_{t=1}^T \text{Return}_t.$$

Spreadsheet Mapping

A 2012-2025 back-test yields an out-of-sample Sharpe ratio of approximately 2. Although the per-trade profit on SPY itself is modest, running the same signals through the highly liquid S&P 500 futures market boosts overall profitability considerably.

Formula element	Spreadsheet column
Timestamp t	A (date), B (time)
SPY price S_t	C
VIX value V_t	D
Z-score z_t	F
Position P_t	G
Adjusted position \tilde{P}_t	I
Return Return_t	J
Cumulative return CumRet_T	K

