Quantitative Trading Module

Price Action and Volatility

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Outline

- **Foundations of Volatility and Range**
  - True Range (TR) and Average True Range (ATR)
  - Volatility-Adjusted Stops and Chandelier Exits
- **Market Sentiment and Synthetic Indicators**
  - Market Volatility Index (VIX) as a 'Fear Gauge'
  - Williams Vix Fix (WVF) for Synthetic Volatility
- **Systematic Detection Strategies**
  - CM-WVF Framework for Bottom and Top Detection
  - MOPOI Strategy: Reversion after Overreaction
- **Regime Transitions and Breakouts**
  - Volatility Squeezes and Compression Regimes
  - Bollinger Oscillator (BOS) for Directional Confirmation

Course Reference:
Futuretesting Quantitative Strategies
`http://ssrn.com/abstract=4647103`

Part II

Volatility and Price Action Trading

Mathematical Definition of Volatility

Volatility measures the dispersion of returns around their mean. For a series of returns R_t over n periods, the realised volatility (standard deviation) is given by:

$$\sigma = \sqrt{\frac{1}{n-1}\sum_{t=1}^{n}(R_t - \bar{R})^2} \tag{1}$$

where:

- R_t: The return at time t.
- $\bar{R}$: The arithmetic mean return over the period n.
- n: The number of observations (lookback window).

Annualised Volatility: To compare volatility across different timeframes, the value is typically annualised:

$$\sigma_{ann} = \sigma \times \sqrt{T}$$

where T is the number of periods in a year (e.g., 252 for daily trading days).

Introduction to Volatility Trading

- **Volatility** measures the dispersion of returns around their mean.
- Expressed as a percentage; reported at various horizons (daily, weekly, annualised).
- **Historical volatility**: estimated from past prices; reflects realised market uncertainty.
- Key distinction in price action trading:
  - **Volatility** $\Rightarrow$ magnitude of price fluctuations (range width)
  - **Momentum** $\Rightarrow$ direction and strength of price trends
- **Volatility Indicators (VIs)** focus on price ranges, not direction:
  - High VI $\Rightarrow$ wide price ranges (unstable market)
  - Low VI $\Rightarrow$ narrow price ranges (compression / consolidation)
- Widely used indicators: ATR, Bollinger Bands, Keltner Channels, Williams Vix Fix (WVF).

Core idea: Volatility regimes govern when trends start, accelerate, or fail.

Price Range and True Range

Let O_t, H_t, L_t, C_t denote the open, high, low, and close prices at time t.

- **Range (intraday variability):**

$$R_t = H_t - L_t$$

  Measures the size of a single candlestick.
  - Large ranges indicate strong intraday participation.
  - Increasing ranges signal growing uncertainty or aggression.
- **True Range (gap-aware variability):**

$$TR_t = \max\big(H_t - L_t,\ |H_t - C_{t-1}|,\ |L_t - C_{t-1}|\big)$$

  - Captures overnight gaps and limit moves.
  - Provides a more realistic measure of price risk.

Key insight: True Range reflects the *maximum price excursion* faced by traders over one period.

Average True Range (ATR): Definition

The **Average True Range (ATR)** measures market volatility by averaging the True Range over a fixed window.

Given the True Range TR_t, define the n-period ATR as:

$$ATR_t(n) = \frac{1}{n} \sum_{i=0}^{n-1} TR_{t-i}$$

To avoid recomputing the full sum at each step, ATR is typically updated recursively:

$$ATR_t(n) = \frac{(n-1)\, ATR_{t-1}(n) + TR_t}{n}$$

- ATR is expressed in **price units** (e.g. dollars, points).
- Large ATR $\Rightarrow$ wide price swings and high uncertainty.
- Small ATR $\Rightarrow$ compressed ranges and quiet markets.

Interpretation: ATR approximates the *expected absolute price move* over one period.

ATR Indicator: Visual Interpretation

The ATR evolves with the size of price movements, independently of trend direction.

Figure 1: Average True Range (ATR) as a volatility indicator.

ATR Indicator: Visual Interpretation

- Rising ATR $\Rightarrow$ expanding price ranges and increasing uncertainty.
- Falling ATR $\Rightarrow$ contracting ranges and volatility compression.
- ATR does **not** predict direction — only the *magnitude* of future moves.
- Sudden ATR spikes often coincide with breakouts, news, or regime changes.

Key takeaway: ATR identifies *when* the market is active, not *where* it is going.

Average True Range (ATR) as a Volatility Indicator

- **True Range (TR)** captures the full price movement, including gaps:

$$TR_t = \max\{H_t - L_t,\ |H_t - C_{t-1}|,\ |L_t - C_{t-1}|\}$$

- **ATR** is the rolling average of TR over n periods:

$$ATR_t(n) = \frac{1}{n}\sum_{i=0}^{n-1} TR_{t-i}$$

- Interpreted in **price units** (e.g. dollars), not percentages.

Why ATR matters in trading

- Adjusts trading rules to current market conditions.
- Accounts for volatility caused by gaps and limit moves.
- Enables volatility-adjusted position sizing and stops.

Average True Range (ATR) as a Volatility Indicator

ATR-based trailing stop (Chandelier Exit)

$$SL_t = HH_t(n) - \alpha \cdot ATR_t(n), \qquad \alpha \in [1, 3]$$

- Stop widens in volatile markets and tightens in calm markets.
- Reduces premature exits during strong trends.

ATR Trailing Stop Indicator

ATR-based trailing stops adapt dynamically to market volatility.

Figure 2: ATR-based trailing stop adjusting to volatility changes.

ATR Trailing Stop Indicator

- Stop-loss moves in the direction of the trade as price advances.
- In high volatility regimes:
  - ATR increases $\Rightarrow$ stop moves further away.
  - Prevents exits due to normal price noise.
- In low volatility regimes:
  - ATR contracts $\Rightarrow$ stop tightens.
  - Locks in profits earlier when momentum weakens.
- Particularly effective in trend-following strategies.

Key insight: ATR trailing stops let *profits run* while cutting losses in a volatility-aware manner.

Choosing the ATR Window and Multiplier

The effectiveness of ATR-based indicators depends critically on parameter choices.

- **ATR window length (n):**
  - Short window (e.g. $n = 5$–10): very responsive, but noisy.
  - Medium window (e.g. $n = 14$): industry standard, balances stability and reactivity.
  - Long window (e.g. $n > 30$): smooth volatility, slower adaptation to regime changes.
- **ATR multiplier (k) for stops:**
  - Small k (e.g. 1–1.5): tight stops, frequent exits.
  - Moderate k (e.g. 2–3): robust to noise, trend-friendly.
  - Large k (e.g. > 4): wide stops, higher drawdowns tolerated.
- Parameters should be calibrated to:
  - Asset class (equities vs FX vs crypto)
  - Trading horizon (intraday vs swing vs long-term)
  - Strategy type (mean-reversion vs trend-following)

Key takeaway: ATR parameters encode a trade-off between *responsiveness* and *robustness to noise*.

Limitations of ATR-Based Indicators

While widely used, ATR-based indicators have important limitations.

- **Backward-looking measure:**
  - ATR is computed from historical price ranges.
  - It reacts to volatility changes but does not anticipate them.
- **No directional information:**
  - ATR measures magnitude, not trend direction.
  - Must be combined with directional signals (trend, momentum).
- **Regime dependence:**
  - Sudden regime shifts (crises, announcements) can invalidate recent ATR estimates.
  - Stops may widen *after* large losses have already occurred.
- **Parameter sensitivity:**
  - Poorly chosen windows or multipliers can lead to overtrading or excessive drawdowns.

Key insight: ATR is a powerful *volatility filter*, not a complete trading or risk model.

ATR in Risk Management and Position Sizing

Beyond indicators, ATR plays a central role in quantitative risk control.

- **Volatility-adjusted position sizing:**

$$\text{Position Size} \propto \frac{1}{\text{ATR}}$$

  - Higher volatility $\Rightarrow$ smaller positions.
  - Lower volatility $\Rightarrow$ larger positions.
- **Constant risk allocation:**
  - ATR allows capital to be distributed so that each trade contributes similar risk.
  - Widely used in CTA and trend-following strategies.
- **Portfolio-level benefits:**
  - Reduces volatility clustering at the portfolio level.
  - Improves drawdown control across regimes.

ATR in Risk Management and Position Sizing

- **Link to theory:**
  - ATR acts as a nonparametric proxy for conditional volatility.
  - Complements GARCH and stochastic volatility models.

Key takeaway: ATR transforms volatility from a *threat* into a *control variable*.

ATR Breakout Trading System

- Breakouts often lead to sharp price moves and higher volatility.
- ATR breakout systems work across different time frames.
- Key idea:
  - If price closes more than one ATR above the previous close $\rightarrow$ volatility shift, possible breakout.
  - Entry and exit levels are defined using the ATR:

$$ATR_t^{En} = C_t + ATR_t(n), \quad ATR_t^{Ex} = C_t - ATR_t(n)$$

    where C_t is the closing price at time t.
- Trading rules:
  - Buy if next day's price trades above ATR_t^{En}.
  - Exit/unwind if price trades below ATR_t^{Ex}.
- Captures volatility cycles: profits from expansion, protects in consolidation.

Combining ATR with Other Indicators

- ATR measures volatility only – combining it with trend indicators improves signals.
- Examples:
  - ATR + Moving Average (MA): Overlay an MA (e.g., 20-period SMA) on ATR as a signal line.
    - ATR above MA $\rightarrow$ confirms strong volatility in trend direction.
    - ATR below MA $\rightarrow$ weak trend or sideways market.
    - ATR and MA clustering together $\rightarrow$ narrow range consolidation.
  - ATR + Stochastics: Stochastics provide overbought/oversold levels; ATR confirms volatility.
    - Low ATR + Stochastic crossovers $\rightarrow$ trading opportunities in range-bound markets.
    - Strong bullish trend: Stochastic > 80 with low ATR (low volatility, high momentum).
    - Strong bearish trend: Stochastic < 20 with high ATR (high volatility, downward pressure).
- Key insight: ATR defines volatility environment, while trend indicators guide direction.

ATR and moving average indicator

Figure 3: ATR (orange) and moving average (blue) indicator.

Summary: ATR and Financial Time Series

ATR-based tools reflect several core properties of financial time series.

- **Time-varying volatility:**
  - ATR adapts to volatility clustering and persistence.
- **Non-Gaussian behaviour:**
  - Large price ranges occur more frequently than Gaussian models predict.
- **Regime awareness:**
  - ATR reacts to transitions between calm and turbulent markets.
- **Model-agnostic robustness:**
  - Does not rely on distributional or stationarity assumptions.

Big picture: ATR exemplifies how simple statistics, grounded in empirical facts, can outperform elegant but fragile theoretical models.

This motivates the next step: *explicit stochastic models of volatility*.

The VIX: Market Volatility Index

The **VIX** measures the market's expectation of future volatility.

- VIX = **30-day IV** extracted from S&P 500 option prices.
- Often called the *"fear gauge"*:
  - High VIX $\Rightarrow$ market stress, risk aversion, rising risk premia.
  - Low VIX $\Rightarrow$ calm markets, volatility compression, complacency.
- Constructed from a wide strip of **out-of-the-money puts and calls**, capturing the entire implied volatility surface.
- Continuous-time representation:

$$VIX = \sqrt{\frac{2e^{r\tau}}{\tau}\left(\int_0^F \frac{P(K,\tau)}{K^2}\,dK + \int_F^\infty \frac{C(K,\tau)}{K^2}\,dK\right)}$$

  where F is the forward index level.
- Strong **negative correlation with equity returns**: volatility spikes often coincide with market drawdowns.

Key insight: VIX is a forward-looking, option-implied measure of *systemic uncertainty*.

Daily VIX: Empirical Behaviour

The VIX exhibits pronounced spikes during periods of market stress.

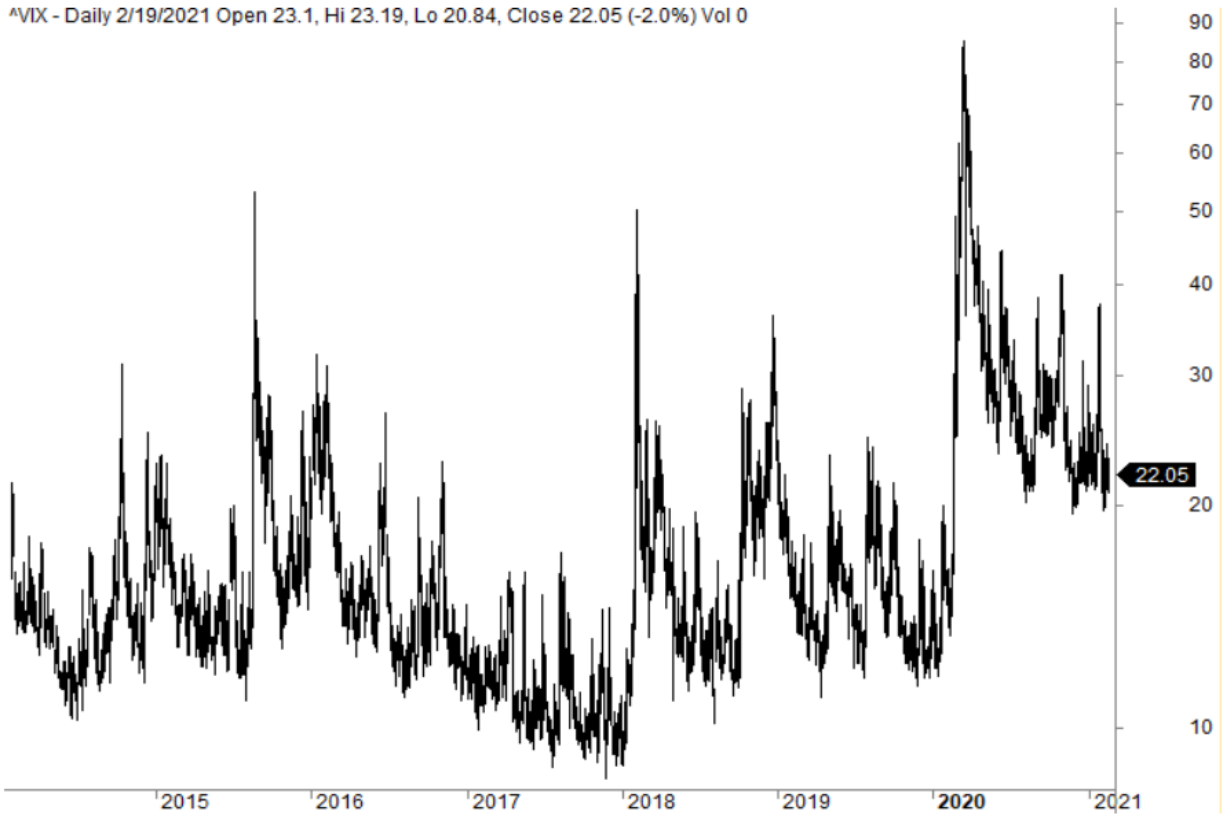

Figure 4: Daily VIX from 2014 to 2021.

Daily VIX: Empirical Behaviour

- Volatility is **mean-reverting** but experiences abrupt jumps.
- Spikes coincide with crises, policy shocks, or liquidity events.
- Calm regimes (low VIX) tend to persist, but end suddenly.
- Highlights the **asymmetry of volatility**: it rises fast, decays slowly.

Stylised fact: Volatility clusters in time and reacts nonlinearly to negative returns.

Williams Vix Fix (WVF) Indicator

The **Williams Vix Fix (WVF)** was designed as a *synthetic VIX* applicable to any asset.

- Motivation:
  - VIX is only available for major indices.
  - WVF replicates volatility spikes using **price data only**.
- Definition:

$$WVF_t = \frac{HC_t(m) - L_t}{HC_t(m)} \times 100$$

  where $HC_t(m)$ is the highest close over the last m periods (typically $m = 22$).
- Interpretation:
  - Large downward moves $\Rightarrow$ high WVF.
  - Captures downside-driven volatility surges.
  - Mimics VIX timing and spikes (though on a different scale).

Williams Vix Fix (WVF) Indicator

- Applications:
  - Synthetic volatility index for any stock or market.
  - Identification of volatility shocks and market stress.
  - Detection of potential market bottoms.

Key idea: WVF is a backward-looking, price-based proxy for implied volatility.

Daily WVF versus VIX

WVF reproduces the timing and clustering of VIX spikes using only price data.

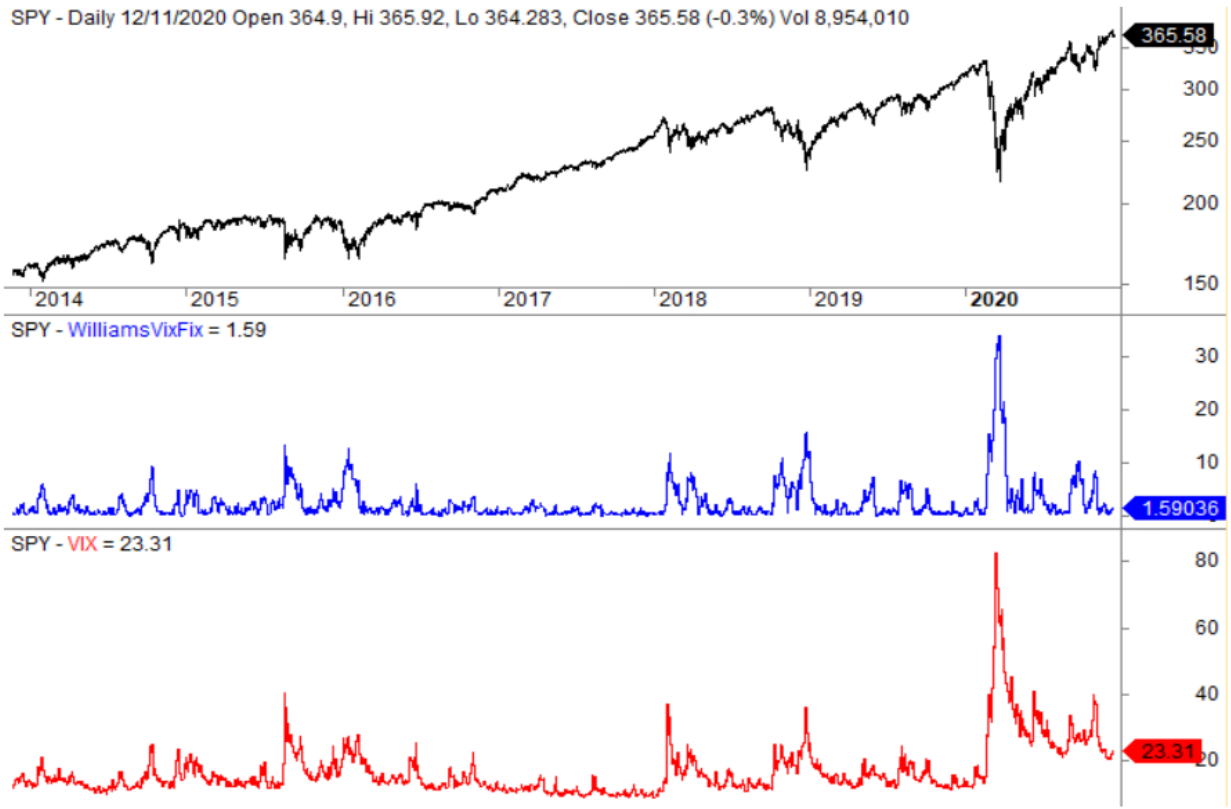

Figure 5: Daily WVF (blue) versus VIX (red).

Daily WVF versus VIX

- Strong co-movement during stress periods.
- Both indicators spike during market drawdowns.
- Differences in scale reflect construction:
  - VIX = option-implied, forward-looking.
  - WVF = price-based, backward-looking.
- WVF is especially useful when option markets are illiquid or unavailable.

Takeaway: Volatility is largely encoded in price dynamics themselves.

WVF and Market Bottom Detection

Volatility peaks often coincide with **market bottoms**.

- High VIX levels historically align with panic-driven sell-offs.
- WVF captures similar stress episodes via downside price pressure.
- WVF spikes indicate:
  - Capitulation selling.
  - Elevated risk aversion.
  - Potential exhaustion of downside momentum.
- WVF is **unbounded** (not an oscillator):
  - Absolute levels are not directly comparable over time.
  - Signals require smoothing or relative thresholds.
- Common enhancements:
  - Bollinger Bands on WVF (Williams, 2007).
  - Stochastic oscillator of WVF ($> 80\%$ near bottoms).
  - Hybrid strategies (Moody (2014), Hestla, MOPOI (2016)).

Caveat: High volatility indicates stress, not an immediate price reversal.

WVF with Bollinger Bands: Empirical Illustration

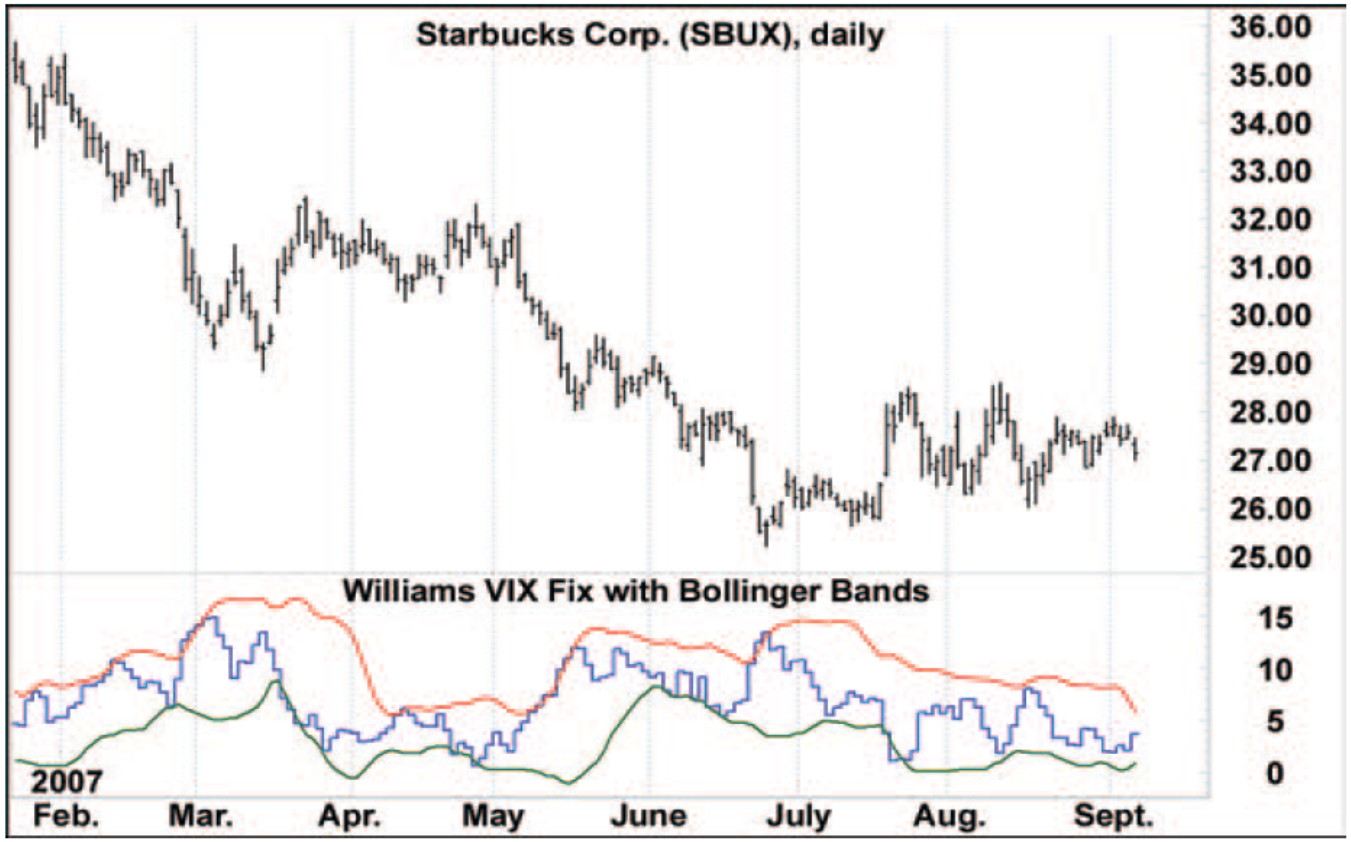

Figure 6: Starbucks: Williams Vix Fix (blue) with Bollinger Bands (red).

- WVF spikes coincide with sharp downside price moves.
- Bollinger Bands provide a **relative volatility threshold**.
- Interpretation:

Chris Moody's CM-WVF: Systematic Bottom Detection

- Chris Moody (2014) extended the **Williams Vix Fix (WVF)** into a **rule-based bottom-detection framework**.
- Objective: reduce discretionary interpretation of WVF spikes.
- Core components:
  - WVF level relative to **Bollinger Bands**.
  - Percentile-based volatility thresholds.
  - Time-frame specific calibration.
- Typical intraday timeframes:

$$\{5, 15, 30\} \text{ minutes}$$

- Visual representation:
  - Histogram format.
  - **Lime bars** $\Rightarrow$ volatility climax (potential bottom).
  - **Grey bars** $\Rightarrow$ neutral / no signal.
- Trading philosophy:
  - Volatility peaks before price reverses.
  - Entries are delayed until volatility **starts to contract**.

CM-WVF Extension: Market Top Detection

- Market tops can be detected by **mirroring the WVF logic**.
- Instead of downside pressure, we measure **upside exhaustion**.
- Define the **Top WVF** (WVFT):

$$WVFT_t = \frac{LC_t(m) - H_t}{LC_t(m)} \times 100$$

  where $LC_t(m)$ is the **lowest close** over the past m periods.
- Interpretation:
  - Strong upward extensions $\Rightarrow$ large negative WVFT.
  - Captures price surges relative to recent downside extremes.
- Statistical normalisation:

$$SM_t(n) = \frac{1}{n} \sum_{i=1}^{n} WVFT_{t-i+1}$$

CM-WVF Extension: Market Top Detection

- Statistical normalisation:

$$SD_t(n) = \sqrt{\frac{1}{n}\sum_{i=1}^{n}(WVFT_{t-i+1} - SM_t)^2}$$

- Bollinger-style thresholds:

$$MidBand_{Top} = SM_t(n), \quad BotBand_{Top} = SM_t(n) - \alpha SD_t(n), \alpha = 2$$

- Optional percentile filter to reduce false signals:

$$rangeLowTop_t = \alpha_L \cdot LWVFT_t(n)$$

CM-WVF Bottom Detection: Signal and Entry Logic

Figure 7: CM-WVF histogram: Lime bars indicate volatility spikes (bottom zones).

CM-WVF Bottom Detection: Signal and Entry Logic

- **Lime bar**: volatility spike $\Rightarrow$ bottom formation likely.
- **Grey bar**: volatility normalisation.
- **Core insight:** bottoms form when panic peaks, not when price reverses.
- **Entry rule:**
  - Enter **long** after the **first Grey bar following a Lime bar**.
  - Confirms volatility contraction after panic.
- Strengths:
  - Captures emotional extremes.
  - Works well across intraday timeframes.
- Limitation:
  - False positives during strong downtrends $\Rightarrow$ requires trend or momentum filter.

MOPOI Strategy: Mean Reversion After Volatility Overreaction

- MOPOI (2016) applies **Bollinger Bands directly to the WVF**.
- Core assumption: WVF behaves approximately as a **mean-reverting process**.
- Statistical intuition:

$$WVF(t,T) \approx \mu\Delta t \pm \alpha\sigma\sqrt{\Delta t}, \qquad \alpha = 2$$

- Overreaction occurs when WVF exceeds its upper statistical envelope.
- Define MOPOI bands over an n-day lookback:

$$SM_t(n) = \frac{1}{n}\sum_{i=1}^{n} WVF_{t-i+1}, \quad SD_t(n) = \text{StdDev}(WVF)$$

$$TopBand_t = SM_t(n) + \alpha SD_t(n), \quad BotBand_t = SM_t(n) - \alpha SD_t(n)$$

MOPOI Strategy: Mean Reversion After Volatility Overreaction

- **Trading logic:**
  - WVF above *TopBand* $\Rightarrow$ panic / overreaction.
  - Entry occurs on **reversion** back inside the band.
- Empirically effective for $n \approx 10$ trading days.

MOPOI Trading Algorithm: Entry and Execution

- Objective: identify **mean-reversion entries** after volatility overreaction.
- **Long entry condition at time t:**

$$WVF_{t-2} > TopBand_{t-2}, \quad WVF_{t-1} < TopBand_{t-1}$$

- Interpretation:
  - $t-2$: panic / overreaction phase.
  - $t-1$: volatility contraction $\Rightarrow$ reversion signal.
- Empirical test:
  - Implemented in **TradingView**.
  - Tested on the $SP500$ (Aug–Dec 2014).
- Visual encoding:
  - Yellow WVF bars: overreaction.
  - Red WVF bars: normal volatility.
  - Green line: WVF moving average.
  - Blue line: MOPOI threshold ($TopBand$).

MOPOI Trading Algorithm: Entry and Execution

- Practical caveat:
  - Performs poorly in strong momentum regimes.
  - Requires trend or regime filter for robustness.

MOPOI Algorithm: Visual Illustration

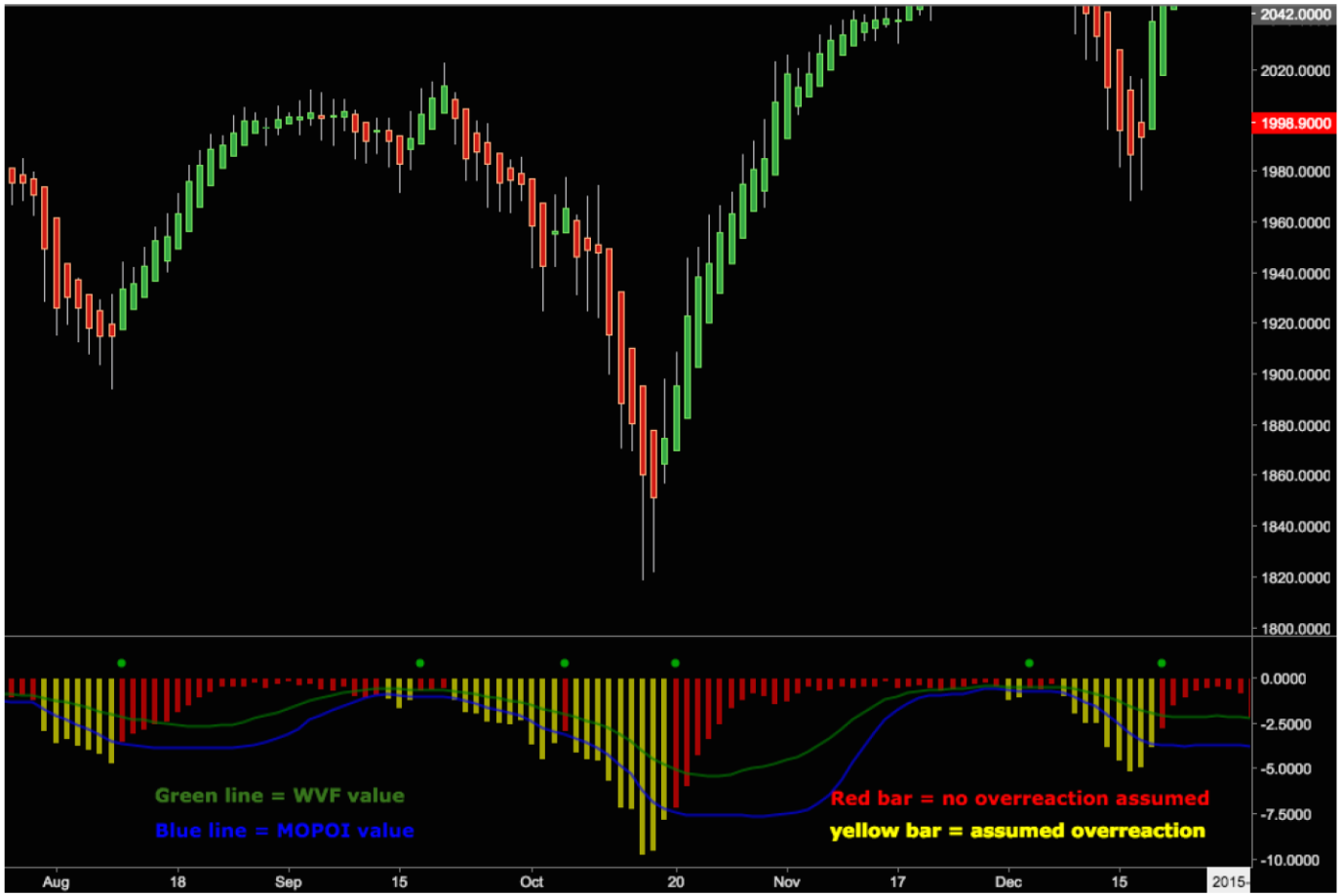

Figure 8: MOPOI strategy applied to the S&P 500 (Aug–Dec 2014).

MOPOI Algorithm: Visual Illustration

- All WVF values and MOPOI bands are multiplied by -1 for visual alignment with price.
- Yellow bars: volatility overreaction (panic phase).
- Red bars: normalised volatility.
- Buy signal occurs when:
  - WVF transitions from yellow $\rightarrow$ red,
  - while remaining above the long-term WVF mean.
- Illustrates the core MOPOI idea:
  - **Do not buy panic**.
  - **Buy the end of panic**.

Market Squeezes: Volatility Compression Regimes

- A **market squeeze** occurs when price pressure builds under constrained liquidity.
- Squeezes often precede **large, asymmetric price moves**.
- Main types:
  - **Long squeeze**: rapid price declines force long positions to liquidate.
  - **Short squeeze**: sharp upward moves force short sellers to cover.
  - **Volatility squeeze**: volatility falls to abnormally low levels while price consolidates.
- Volatility squeeze characteristics:
  - Narrow trading ranges.
  - Reduced realised volatility.
  - Market energy accumulates without clear direction.
- Key insight for traders:
  - Direction is uncertain during the squeeze.
  - **Magnitude** of the breakout is often predictable.

Bollinger Band Squeeze: Quantifying Volatility Compression

- Financial markets alternate between:
  - **Volatility contraction** (range-bound markets),
  - **Volatility expansion** (trending markets).
- Bollinger Bands (BBs) provide a natural volatility envelope.

$$S_t(n) = \frac{\text{TopBand}_t - \text{BotBand}_t}{SC_t(n)}$$

- $SC_t(n)$: simple moving average of closing prices.
- $S_t(n)$ measures **relative band width**.
- Interpretation:
  - Wide BBs $\Rightarrow$ high volatility.
  - Narrow BBs $\Rightarrow$ low volatility.
- A **squeeze condition** is triggered when:
  - $S_t(n)$ reaches a **multi-month minimum** (e.g. 6 months).
- Squeeze $\neq$ direction; it only signals **stored volatility**.

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Bollinger Oscillator (BOS): Risk-Adjusted Momentum

The **Bollinger Oscillator (BOS)** measures how far price deviates from its mean, scaled by current volatility.

$$BOS_t = \frac{M_t - SM_t(n)}{SD_t(n)}$$

- M_t: typical price (e.g. $(H_t + L_t + C_t)/3$).
- $SM_t(n)$: n-period simple moving average.
- $SD_t(n)$: rolling standard deviation.
- Interpretation:
  - Numerator $\Rightarrow$ trend deviation (direction).
  - Denominator $\Rightarrow$ volatility (risk).
- BOS is a **risk-adjusted trend indicator**.
- Large $|BOS|$ values:
  - Strong directional move,
  - Especially informative during low-volatility regimes.
- Complements BB squeeze:
  - Squeeze identifies **when** to trade,
  - BOS helps identify **which direction**.

Volatility Breakouts and Regime Transitions

Periods of low volatility are often followed by abrupt regime changes. Bollinger Bands provide a natural framework to detect such transitions.

- **Volatility compression**:
  - Narrow Boll-Bands indicate uncertainty and order-flow balance.
  - Market participants reduce risk and liquidity dries up.
- **Breakout phase**:
  - Price exits the band with expanding volatility.
  - Information arrival or positioning imbalance triggers repricing.
- **Directional confirmation**:
  - BOS > 0: upward regime shift.
  - BOS < 0: downward regime shift.
- **Interpretation**:
  - Breakouts are *regime transitions*, not isolated price moves.
  - Risk is asymmetric: losses are bounded during compression, gains can be large after release.

This mechanism underlies many trend-following and volatility-based strategies.

TTM Squeeze Volatility Indicator (Carter, 2018)

The TTM Squeeze identifies periods of consolidation and potential explosive breakouts by measuring the relationship between volatility bands and trend channels.

Core Logic:

- Uses **Bollinger Bands (BB)** (based on Standard Deviation) and **Keltner Channels (KC)** (based on Average True Range).
- A **Squeeze** occurs when volatility compresses: $SD < ATR$.

Market Signals:

- **Squeeze On (Consolidation):** BB are inside the KC. Represented by *grey diamonds* on the midline. The market is "coiling."
- **Squeeze Off (Release):** BB expand outside the KC. Represented by *triangles/dots*. Volatility is released, signaling a momentum move.

TTM Squeeze Volatility Indicator (Carter, 2018)

Advanced Variations:

- **Squeeze Momentum:** Adds a histogram to determine move direction.
- **Squeeze PRO:** Includes multiple squeeze levels (Low/Mid/High).
- **Squeeze Deluxe:** Incorporates enhanced volume and trend filtering.

Squeeze Indicator & Momentum Oscillator

The Squeeze indicator is most powerful when combined with a momentum oscillator to determine the direction of the impending volatility release.

Unified Visual Components:

- **Midline Dots:** Represent volatility conditions. *Orange/Red* indicates a Squeeze is 'on'; *Grey/Black* indicates the Squeeze has fired ('off').
- **Momentum Histogram:** Oscillates around the zero line to signal the strength and direction of the breakout.

Trading Signals (Confirmed by 2 consecutive bars):

- **Buy (Long):** Squeeze is active + Histogram bars are increasing **Blue/Green** (Bullish momentum).
- **Sell (Short):** Squeeze is active + Histogram bars are increasing **Red/Yellow** (Bearish momentum).
- **Neutral:** No trade when the indicator is 'off' or momentum is waning.

Squeeze Indicator & Momentum Oscillator

Squeeze PRO: Multi-Level Compression

The Squeeze PRO enhances the standard indicator by differentiating between three distinct levels of volatility compression, allowing for more precise timing.

Indicator Parameters ($n = 14$):

- **Bollinger Bands (BB):** Fixed at $\alpha_{bb} = 2.0$ Standard Deviations.
- **Keltner Channels (KC):** Three levels using $\alpha_{kc} \in \{1.0, 1.5, 2.0\}$ ATR.

The Four Squeeze States (Plotted on Zero Line):

- • **High Compression (S^{High}):** BB inside the 1.0 ATR KC (Orange dots).
- • **Mid Compression (S^{Mid}):** BB inside the 1.5 ATR KC (Red dots).
- • **Low Compression (S^{Low}):** BB inside the 2.0 ATR KC (Black dots).
- • **Squeeze Released (S^{Off}):** BB expand outside the KC

Squeeze PRO: Multi-Level Compression

Execution Strategy:

- **Entry:** Build a position after ≥ 5 consecutive black dots (consolidation) or trigger immediately upon the first green dot (volatility release).

Momentum Histogram Colours

The Histogram shows price momentum:

- Aqua $\rightarrow$ Blue: bullish fading.
- Blue $\rightarrow$ Aqua: bullish increasing.
- Yellow $\rightarrow$ Red: bearish fading.
- Red $\rightarrow$ Yellow: bearish increasing.
- Rapid shift Aqua $\leftrightarrow$ Red: strong reversal.

Squeeze Indicator: Signal Lifecycle

Execution Strategy (John Carter):

- **Entry:** Build a position after ≥ 5 consecutive black dots *or* trigger on the **1st green dot**.
- **Exit:** Take profits on the **2nd weakening momentum bar** (e.g., transition to dark blue or yellow), unless a secondary trend indicator confirms a move extension.

Squeeze Indicator: Signal Lifecycle

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TTM Squeeze: Direction and Trade Rules

The transition from a squeeze to a release determines the trade entry, while the momentum histogram dictates the directional bias.

Visual Signaling (The Release):

- ♦ **Squeeze On:** Grey/Black diamonds indicate low volatility and market coiling.
- ▲ **Squeeze Release Up:** Green triangle indicates volatility expansion to the upside.
- ▼ **Squeeze Release Down:** Red triangle indicates volatility expansion to the downside.

TTM Squeeze: Direction and Trade Rules

Execution Strategy:

- **Entry Trigger:** Wait for the **first triangle** to appear following a sequence of diamonds.
- **Directional Filter:** Trade in the direction of the momentum histogram:
  - **Long:** Histogram > 0 (Bullish momentum).
  - **Short:** Histogram < 0 (Bearish momentum).
- **Exit Protocols:**
  - Momentum color change (signaling exhaustion).
  - Reaching **Fibonacci extension** targets.
  - Key **Support/Resistance** levels.

TTM Squeeze: Direction and Trade Rules

Figure 9: Squeeze release with momentum direction.

The end

Thank You !