Synthetic Strategy – Research Tear Sheet [1]

SMA Crossover + Session VWAP Confirmation

- Instrument: ES=F | Frequency: 1H
- Category: Trend Following with Flow Confirmation

Strategy overview

This systematic trend-following strategy captures continuation moves following short-term momentum shifts, as confirmed by institutional positioning, via alignment with session VWAP. The hypothesis is that momentum crossovers aligned with VWAP positioning exhibit higher continuation probability and lower whipsaw risk than stand-alone moving-average signals. The VWAP filter converts a naïve crossover into a flow-confirmed momentum signal.

Signal construction

Long	Short
- Fast SMA crosses above Slow SMA - Close above the session VWAP	- Fast SMA crosses below Slow SMA - Close below the session VWAP

Execution is end-of-bar, with no intra-bar look-ahead.

Risk is controlled through fixed bracket orders:
- Stop Loss: 1%
- Take Profit: 3%

The exit evaluation begins on the next bar.

Performance summary

Overall	Returns
- Back test start: 2024-03-06 - Back test end: 2026-03-02 - Trades: 79 - Annual turnover: ~40 trades/year	- CAGR: 17.5% - Total P&L: +327.83 - Profit factor: 1.10
Trade characteristics	Risk
- Win Rate: 27.8% - Average holding period: ~6.6 days	- Max drawdown: -79.3%[1] - Sharpe: 0.63 - Sortino: 11.59 - Skew: 1.02

Robustness and research process

I evaluated the strategy using end-of-bar execution without look-ahead bias and trade-level performance attribution. Feature computation (SMA and session VWAP) is performed before signal

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[1] Observed drawdowns primarily reflect the use of fixed fractional stops without volatility normalisation. The equity curve characteristics suggest that tail compression through ATR-based risk targeting and capital scaling would materially reduce drawdown severity while preserving structural expectancy. The current configuration is intentionally simplified to isolate signal quality from position-sizing effects.

evaluation to eliminate forward leakage. The back testing framework is modular, enabling rapid parameter sensitivity testing and cross-asset validation.

Regime behaviour

Favourable Conditions	Adverse Conditions
• Sustained directional expansion • Post-breakout volatility clustering • Persistent trend structure	• Mean-reversion regimes • Low-volatility compression • Intra-day range rotation

Edge rationale

The strategy's edge derives from:
- Short-term momentum inflexion detection
- Institutional participation confirmation via VWAP alignment
- Structural asymmetric payoff profile (3:1 reward-to-risk)
- Strict capital discipline via bracket execution

Architecture note

The strategy is implemented within a modular execution framework supporting modular signal classes, session-aware feature computation, independent performance analytics, and portfolio-level extensibility.

Data → Feature Engine → Strategy Trigger → Execution Engine → Logs → Performance Engine

Limitations

- Fixed SL/TP
- No trailing stops
- No volatility scaling
- No position sizing logic

Potential enhancements

- Volatility-adjusted stops (ATR)
- Position sizing framework
- Walk-forward validation
- Regime filter overlay
- Transaction cost modelling

Capital deployment considerations

The current implementation assumes static position sizing and fixed percentage stops. Under volatility-adjusted sizing and capital allocation constraints, the strategy can be scaled across index futures and liquid macro instruments. Trade frequency (~40 per year) supports portfolio integration without excessive turnover or market impact.

Conclusion

The strategy demonstrates positive expectancy under fixed-risk parameters with institutional flow alignment via VWAP confirmation. Whilst drawdowns remain elevated under static sizing assumptions, structural improvements in volatility scaling and capital allocation present clear optimisation pathways. The current implementation isolates signal quality from capital optimisation, enabling systematic enhancement without altering the structural behaviour of the signal.