SOL/USDT Anchored VWAP Divergence Study

A Quantitative Analysis of VWAP Zones and Momentum Divergences

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Executive Summary

This report evaluates if the trading methodology that combines **Anchored VWAP** and **momentum divergences** gives us statistically significant trading results on **SOL/USDT**.

This methodology is inspired by the approach that I was taught by my cousin whilst learning from him to trade. The full method includes various indicators and their respective “checklists” in order to increase the probability of success. However, due to the complexity of coding the entire system at once, this project focuses on two of its most important components, **AVWAP and divergences** — as I believe they are core to understanding why the strategy works.

This study uses high-resolution daily data and a systematic grouping methodology to analyze:

- How price reacts around AVWAP anchored at the December 26, 2022 capitulation low
- Whether divergences in **RSI(14)** and **MFI(14)** near VWAP zones predict reversals
- How bull and bear setups perform over various forward return horizons

The results show that bullish setups (long signals) offer a strong and consistent statistical advantage, particularly on the 4-hour and 1-week horizons, delivering meaningful follow-through when the conditions align. Bearish setups (short signals) still provide useful information, but their impact is typically shorter-lived, reflecting the naturally upward bias in SOL during the sample period.

Overall, the analysis supports the idea that AVWAP zones and divergences provide useful structure for discretionary trading on volatile assets such as SOL.

1. Background & Motivation

My interest in trading began with my cousin, who introduced me to cryptocurrency trading and technical analysis using various indicators such as fibs, divergences, fixed volume ranges, and anchored VWAPs. Over time, I've researched how the crypto market follows these signs, and I wanted to write a study report to see if these tools hold up under quantitative testing.

This project formalizes key components of that trading style:

- AVWAP as a dynamic measure of value

- Standard deviation bands as reaction zones
- Divergences as early signals of reversal pressure
- Oversold/overbought filters to separate noise from true exhaustion

The purpose is not to create an automated method, but to verify that the confluences we utilized manually operate as we thought they would.

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2. Data & Preprocessing

2.1 Data Source

- Asset: **SOL/USDT**
- Source: **CryptoCompare – histohour endpoint**
- Resolution: **1-hour OHLCV**
- Range: **2023–2025** (≈ 25k hourly bars)

2.2 Resampling to 4-Hour Bars

Every calculation and signaling take place on the 4-hour timescale, which is created by combining hourly data.

- **Open:** first open
- **High:** maximum high
- **Low:** minimum low
- **Close:** final close
- **Volume:** sum of volumes

Resampling reduces noise and aligns with typical swing-trading horizons.

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3. Anchored VWAP & Volatility Bands

3.1 Anchor Date

The AVWAP is fixed at December 26, 2022, which is the significant capitulation low shown on the weekly charts. This date serves as the "origin" for aggregate price and volume trends.

3.2 Typical Price

$$Price_i = \frac{High_i + Low_i + Close_i}{3}$$

3.3 Anchored VWAP Calculation

$$AVWAP = \frac{\sum(volume)}{\sum(typical \times volume)}$$

3.4 Expanding Volatility & Bands

The standard deviation of *(typical – AVWAP)* expands over time:

$$\sigma_t = expanding\ std(typical - AVWAP)$$

Bands:

- **Upper Band:** AVWAP + 2σ
- **Lower Band:** AVWAP – 2σ

Interpretation

These three lines — AVWAP, Upper Band, Lower Band — form a **reaction zone** where price historically finds support or resistance.

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4. Divergence Construction

4.1 Swing Highs & Lows

- Swing points are identified using a limited time window and a minimum gap rule: a swing high is a local top that is higher than its nearby candles, and a swing low is a local low that is lower than the surrounding candles.

4.2 Indicators

- RSI(14)
- MFI(14)

4.3 Divergence Logic

Bullish Divergence

- A bullish divergence occurs when a price makes a lower low while the momentum indicators (RSI or MFI) form a higher low, signaling a weakening downside pressure.

Bearish Divergence

- A bearish divergence occurs when price makes a higher high while the momentum indicators (RSI or MFI) form a lower high, signaling a potential exhaustion in the upward move.

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5. Setup Definition: VWAP Zone + Divergences + OB/OS

Final setups are defined using three simultaneous conditions:

5.1 Bull Setup

A valid **long** signal requires:

- A valid **long** signal is triggered when a bullish divergence appears in RSI or MFI, price is trading near the AVWAP zone or its upper and lower bands, and momentum shows signs of exhaustion through oversold RSI/MFI indicators.

5.2 Bear Setup

- A valid **short** signal is triggered when a bearish divergence appears in RSI or MFI, price is trading near the AVWAP zone or its upper and lower bands, and momentum is overbought, signalling that the upward move is losing strength.

5.3 Final Count

- Bull setups: **25**
- Bear setups: **24**

Both represent meaningful sample sizes for behavior-based evaluation.

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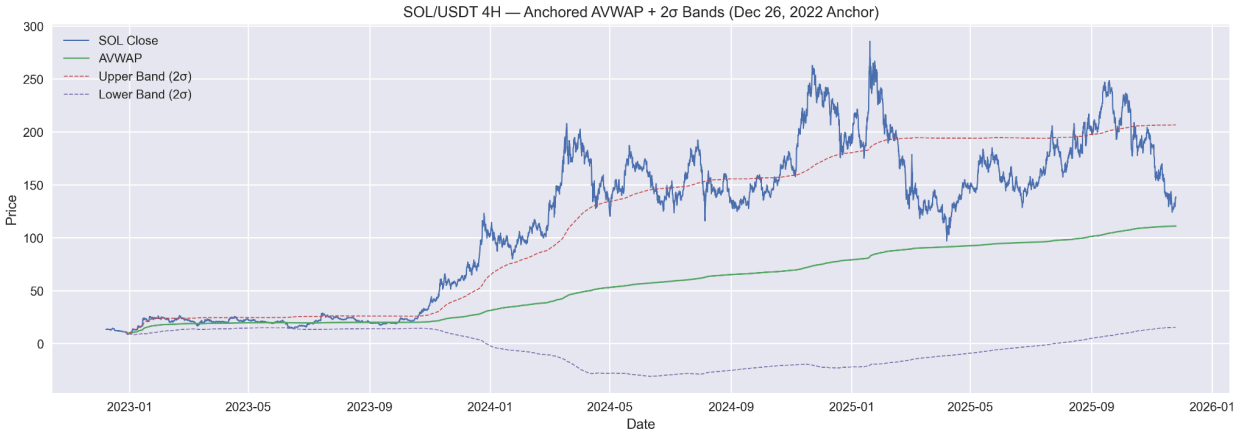
6. Results

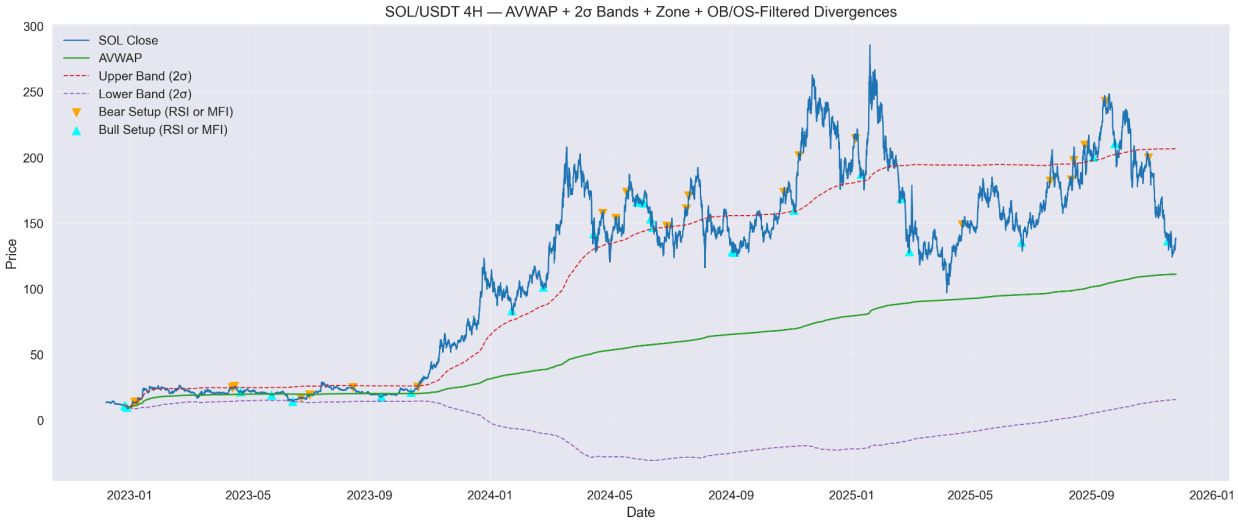
6.1 Key Charts

Figure 1 — AVWAP With 2σ Bands (Full Period)



Shows the anchored VWAP and its reaction zones across 2023–2025.

Figure 2 — Bull & Bear Setups Over Price



Bullish markers appear near large basing structures; bearish markers cluster near overextended rallies.

6.2 Performance Tables

Bull Setups

Forward returns **in the direction of the signal**:

Horizon	Win Rate	Avg Return	Median	Std Dev
4h	**0.80**	0.0124	0.0085	0.0168
1d	0.52	0.0092	0.0037	0.0356
3d	**0.72**	0.0226	0.0198	0.0842
1w	**0.68**	**0.0741**	**0.0637**	0.1392

Bear Setups

Directional returns (short side):

Horizon	Win Rate	Avg Return	Median	Std Dev

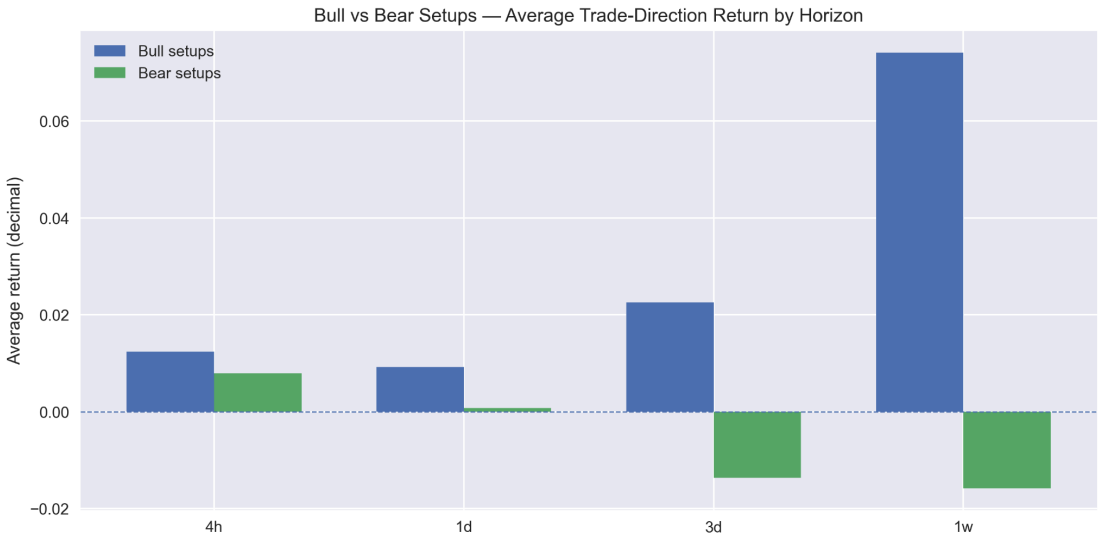
4h	0.708	0.0079	0.0083	0.0146
1d	0.625	0.0008	0.0090	0.0620
3d	0.458	-0.0137	-0.0027	0.0670
1w	0.583	-0.0158	0.0176	0.1922

6.3 Statistical Tests (t-test)

Horizon	Bull t-stat	p-value	Bear t-stat	p-value
4h	**3.68**	**0.0011**	2.65	0.014
1d	1.29	0.206	0.059	0.953
3d	1.34	0.193	-0.99	0.329
1w	**2.66**	**0.0136**	-0.40	0.691

6.3 Visualization of Average Returns by Horizon

Figure 3.- Average trade-direction returns for bull and bear setups across different horizons.



This graph reinforces the numerical results shown in the tables. Bull setups outperform bear setups across every timeframe, and their strengths increase as more time goes by, peaking at the 1 week mark. This suggests that bullish divergences that form near the VWAP zones tend to identify not only local lows, but also to predict sustainable longer term moves. In contrast, the bear setups show only minor short term benefits and decline over time, which is consistent with Solana's bullish trend during the majority of the sample.

7. Interpretation

7.1 Bull Setups

- Bull setups show a significant statistical edge, with the best performance occurring on the 4-hour and 1-week horizons. Many of these signals occur during deep retests of the AVWAP and its upper band, as SOL has been selling at these upper levels of the VWAP due to its bullish trend over the last few years, where the combination of divergences and oversold momentum helps in identifying actual exhaustion points. Overall, bull setups serve as **strong swing reversal indications.**

7.2 Bear Setups

- Bear setups showed only a weak short term edge and an overall loss of statistical significance beyond the first 4 hour window. This makes sense as when we dive into the broader context, throughout most of the sample used, **SOL has been in a structural uptrend**, recovering very strongly from its late 2022 lows. In a market with a bullish bias, bearish divergences will always struggle to produce sustained downside follow through, and their signals will fade quicker instead of developing into full trend reversals. As a result, bear setups are better suited for short lived trades rather than deeper swing shorts. Overall, they are **weaker and more short lived** than bull setups.

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8. Limitations

- This study comes with several limitations worth noting. The results do not account for trading fees, slippage, or execution delays, and each trade assumes an entry at the exact close of the signal candle. The AVWAP is anchored at a single date and never re-anchored, which may

overlook regime shifts in the trend. SOL also experienced a strong uptrend through much of the dataset, naturally favoring long setups over shorts. The divergence logic used here is strict and unsmoothed, meaning some signals may be missed or triggered late. Finally, this is not a complete trading system—rather, it is a focused study designed to understand how AVWAP zones and divergences behave in practice.

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9. Final Conclusion

This study provides strong evidence that the **Anchored VWAP** and its upper/lower bands are meaningful **support/resistance levels** for SOL/USDT. Bullish divergences forming near this zones consistently leado to positive gains, especially over multi-day timelines, whilst bearish divergences have a tendency to work mostly for short term trades. This asymmetry is not random, it reflects the broader market context.

Over the great majority of this sample, **Solana has been in an uptrend**, recovering very sharply from the late 2021-2022 collapse and trending higher throughout the 2023,2025 time-period. In a market that is naturally biased to the upside, bearish signals will always have a harder time showing multi-day results. On the other hand, bullish signals align with both the indicator logic **and** the dominant trend, which is why in this study they deliver stronger and more consistent results.

Overall, the findings support the main trading strategy that inspired this effort. AVWAP zones and divergences are significant, and together they give a meaningful, data-driven framework for understanding and trading SOL. When thoroughly examined, the methods my cousin taught me, particularly the confluence of VWAP levels and momentum divergences, have **statistical validity.**

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10. Contact

If you're interested in trading analytics, quant work, or crypto research:
Feel free to reach out.