

Dissecting Volatility:

Analyzing Binance ETH-USDT Order Book and Tradebook Data During the Yen Carry Trade Unwind

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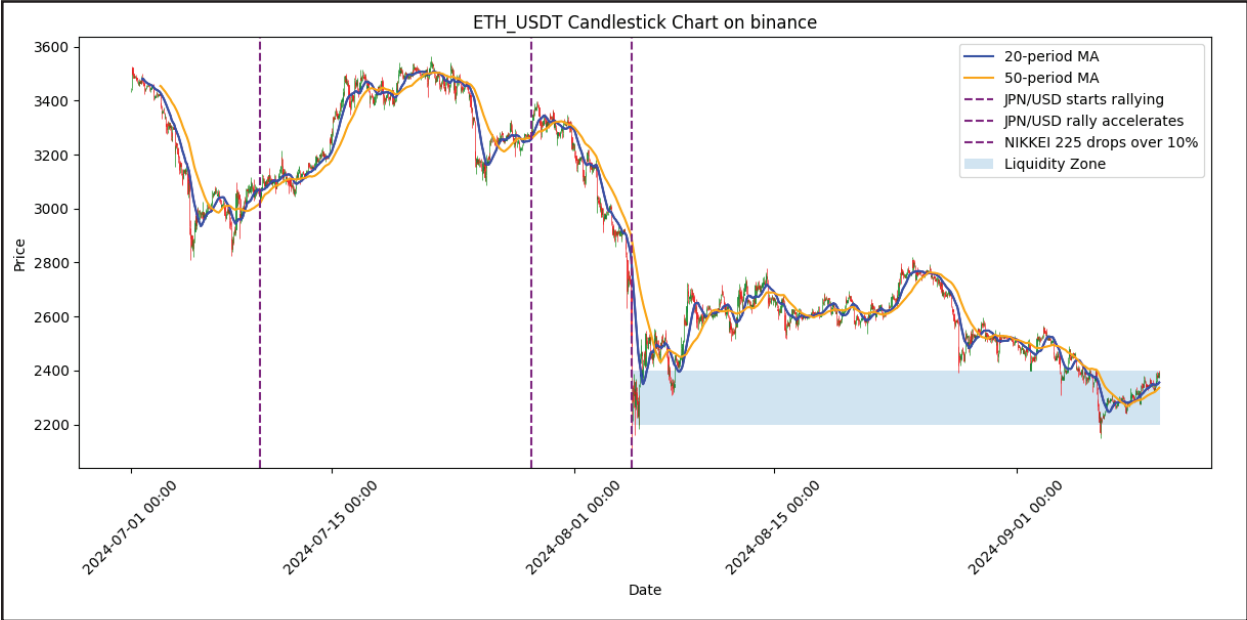
In global finance, unexpected connections can have wide-reaching effects. A recent example is the unwinding of the yen carry trade, which has impacted not just traditional markets but also cryptocurrencies. This shows how closely connected financial markets have become, raising questions about whether cryptocurrencies are really the safe-haven assets they are often considered to be.

The yen carry trade involves borrowing yen at low interest rates to invest in higher-yielding assets. However, recent changes in Japan's policies and global interest rates forced many traders to unwind these positions, causing significant disruptions across various markets. While stocks and bonds were affected first, the impact quickly spread to crypto, with Bitcoin dropping 8%, far more than gold's 1% decline. This sharp drop in crypto highlights how vulnerable digital assets can be to major global financial events.

Could we have seen this coming? Were there signs in the market—like changes in order book behavior, shifts in liquidity, or spikes in trading activity—that hinted at the coming volatility? By looking at these indicators, traders can gain valuable insights into market conditions before big price moves happen.

In the following sections, we'll explore how these tools can help traders spot potential risks and opportunities, and whether they could have warned us about the effects of the yen carry trade unwinding before the price action unfolded. Understanding these signals is key to navigating the increasingly connected world of traditional finance and crypto.

Understanding the Price Action



The chart above illustrates the ETH/USDT price action on Binance over a volatile period, marked by key events in the Japanese Yen’s appreciation and the impact on global markets, including cryptocurrency. Three major points on this chart highlight how interconnected global traditional financial movements can be with crypto price trends:

- 1. Yen Appreciation Begins (July 10th):** The first vertical event line corresponds to the start of the Japanese Yen’s appreciation on July 10th. Here, we observe a relatively swift 10-15% increase in ETH/USDT, indicating that the market may have been slow to react to the Yen’s early rise. This suggests that, initially, traders and investors were largely unaware of the broader macro changes driving price movements.
- 2. Yen Acceleration (July 29th):** A notable acceleration of the Yen’s strength occurred on July 29th, coinciding with the first significant drop in ETH/USDT prices. This suggests that the market began factoring in macroeconomic shifts more seriously, triggering sell-offs. From this point, the price fell by another 15%, signalling that the broader market was preparing for further downside.
- 3. Nikkei Drops 10% (August 5th):** The most significant price action occurs around August 5th, as the Nikkei 225 dropped by over 10%. At this moment, ETH/USDT experienced large liquidations as the broader market panic spread. Prices plunged quickly before finding support, as highlighted by the liquidity zone between 2200 and 2400, where a consolidation took place, forming a clear range after the price sweep.

To better understand these market dynamics, we will be looking at structural components and behavior during significant price moves. Observing key metrics before, during, and after such drops can offer a holistic perspective for traders and risk managers.

This can help in:

- **Decision-Making:** Understanding when and how to react based on unfolding trends.
- **Risk Management:** Spotting early signs of volatility to mitigate potential losses.
- **Identifying Opportunities:** Recognizing patterns that repeat during extreme events, thus providing actionable insights.

Key Metrics for Analyzing Crypto Market Structure During Volatility

To better understand the price dynamics observed during periods of heightened volatility, this piece will examine a variety of key trading and order book metrics. These indicators provide insights into how participants react to major market moves and how liquidity shifts under stress, offering a comprehensive view of the market structure during extreme events.

From the tradebook (taker side), we will explore:

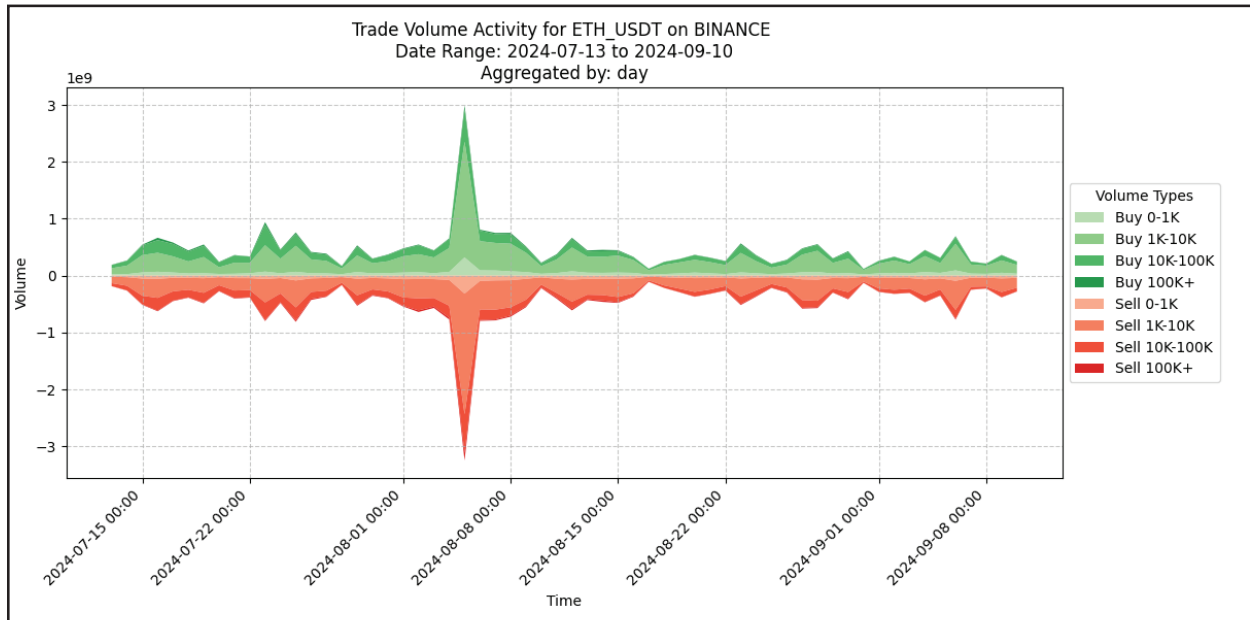
- **Total Traded Volume:** Sudden spikes in volume often signal increased market participation, potentially driven by liquidations or aggressive buying/selling.
- **Net Trading Pressure:** This shows the balance of buy and sell pressure, highlighting which side is dominant during market drops or rallies.
- **Trade Count:** The number of trades can reveal shifts in participant behavior, such as increased retail activity or institutional involvement.
- **Bid-Ask Spread and Volatility:** A widening spread indicates reduced liquidity, making trades harder to execute efficiently and increasing slippage.
- **Liquidity-Weighted Price vs. Volume-Weighted Price:** Comparing these can expose imbalances in liquidity and trading activity, often leading to higher volatility.

From the order book (maker side), we will focus on:

- **Order Book Depth (1% and 5%):** This measures available liquidity near the current price, often showing sharp declines during volatile periods.
- **Liquidity Fragmentation:** Thinly spread liquidity across various price levels can signal a higher risk of price swings.
- **Order Book Pressure:** Imbalances between buy and sell orders often signal market direction, with high sell-side pressure preceding drops.
- **Order Book RSI:** This metric helps identify overbought or oversold conditions within the order book, indicating potential reversals.
- **Order Book Turnover Rate:** High turnover indicates rapid changes in the order book, often correlating with increased market volatility.
- **Price Impact/Slippage:** Measures how much the market moves in response to trades, with high slippage showing low liquidity and difficulty executing large orders efficiently.

These metrics will help identify patterns in market behavior, liquidity stress, and potential turning points during times of market turbulence.

Total Traded Volume



Total traded volume measures the total number of assets traded within a specific time frame, summing up all buy and sell transactions. It is calculated by adding all executed trades during the chosen period, and is typically represented as a bar chart or cumulative total.

This metric is crucial because it reveals market activity and liquidity. Higher volume shows stronger interest and participation, indicating more volatility and bigger price swings. Conversely, lower volume suggests weaker market engagement. Volume also acts as a confirmation tool for price movements: when prices change on high volume, the move is considered more reliable due to broad market involvement. Spikes in volume can indicate shifts in sentiment or impending volatility.

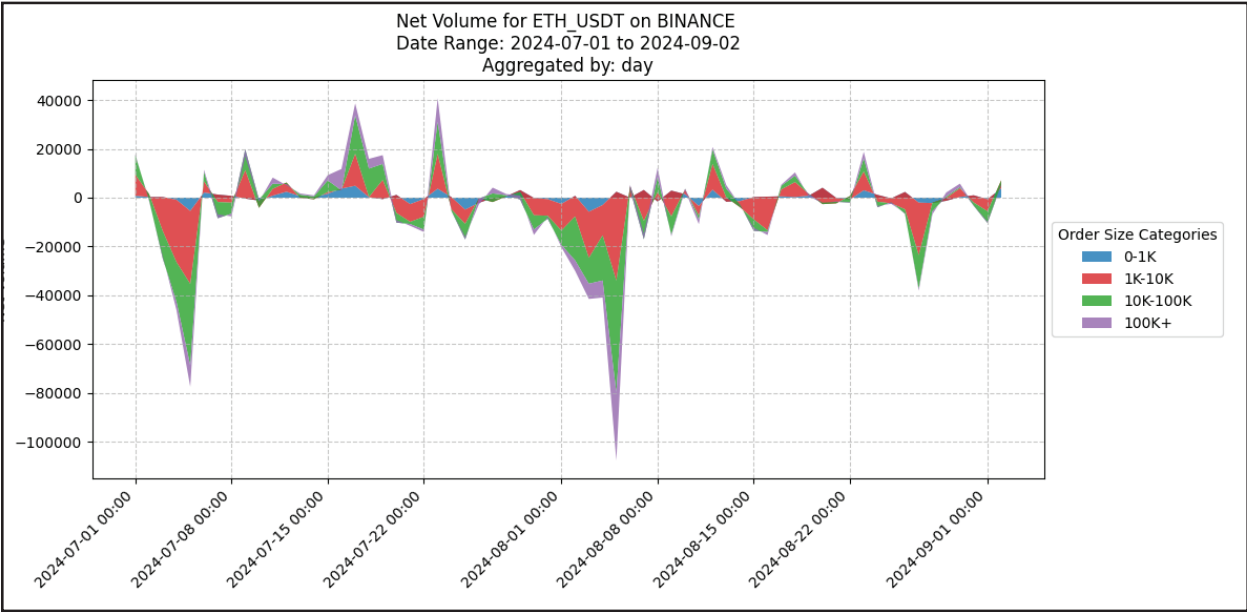
For example, during the recent price drop, total traded volume spiked to \$8 billion, compared to the usual \$2-4 billion daily range. This surge in activity, particularly in the 1-10k order range, shows increased fear or opportunity-driven trading. As the chart below highlights, this volume spike correlates with sharp price movements, giving insight into market sentiment.

However, volume can be misleading if distorted by off-peak hours or large, one-off trades. A single large trade can cause a spike without reflecting broader sentiment, and isolated volume increases may not always signal sustained market moves. It's essential to look at whether volume spikes are consistent and aligned with other factors like price action.

After the initial spike, average daily volume dropped to \$1-1.5 billion, a 20% reduction from normal levels, suggesting that the market dried up in the aftermath of the price drop.

To get a clearer understanding, traders often pair volume analysis with metrics like VWAP (volume-weighted average price), which shows the average price relative to trade volume, and the bid-ask spread. When volume spikes are accompanied by widening spreads, it can signal market stress and liquidity challenges.

Net Trading Pressure



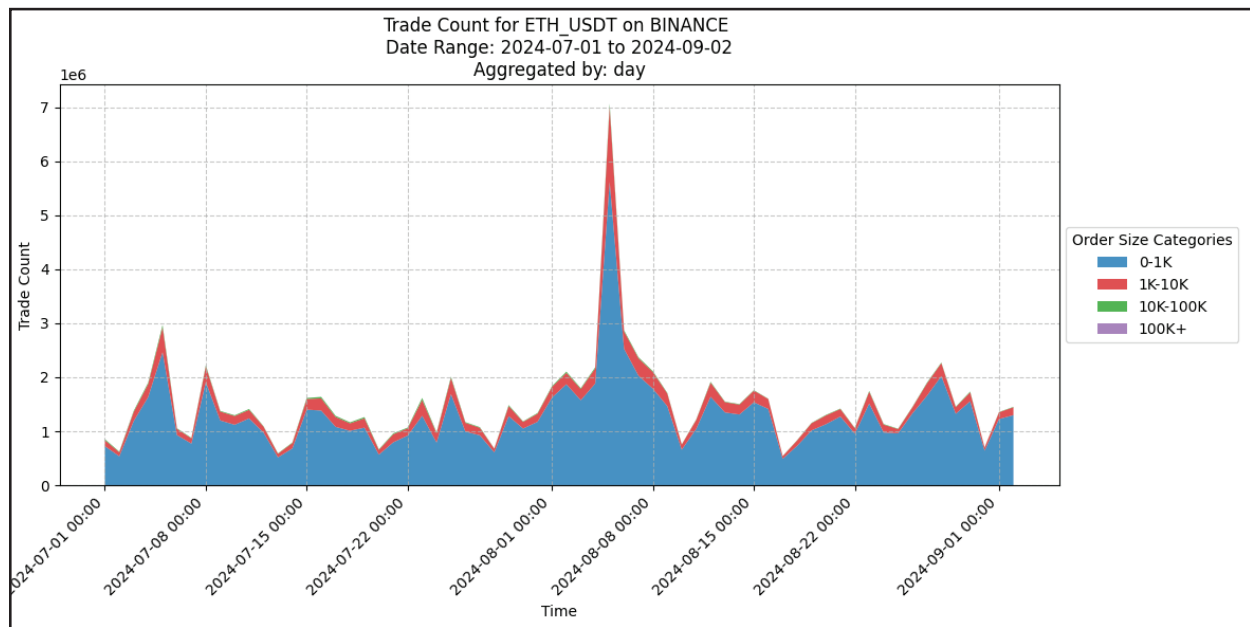
Net trading pressure measures the difference between buying and selling volume, providing insight into which side of the market is dominating. It's calculated by subtracting total selling volume from buying volume and can be broken down by trade size. This breakdown helps identify which participants are driving the market — retail, institutions, or larger players.

Net buying pressure is particularly useful for gauging sentiment and understanding who's behind significant moves. Mid-size trades (1-10k and 10-100k) often move first, and watching these sizes can give early signs of market direction. These trades likely represent more informed participants or institutions that face fewer liquidity constraints compared to larger orders. The 10-100k range, for example, typically represents 50-60% of total volume, making it a key category to watch for shifts in sentiment.

Larger trades (+100k) tend to appear only during extreme moves, and while they're less frequent, they can be used as confirmation of strong market trends. These larger trades, often executed by institutions or whales, typically show up when the market is facing significant pressure.

Divergences between different trade sizes are important. For example, if mid-size trades are showing strong buying pressure but large trades are still selling off, this could indicate a temporary move before a larger trend shift. Pairing this metric with order flow data can provide a fuller picture of market dynamics and help spot shifts before they fully materialize.

Trade Frequency and Count

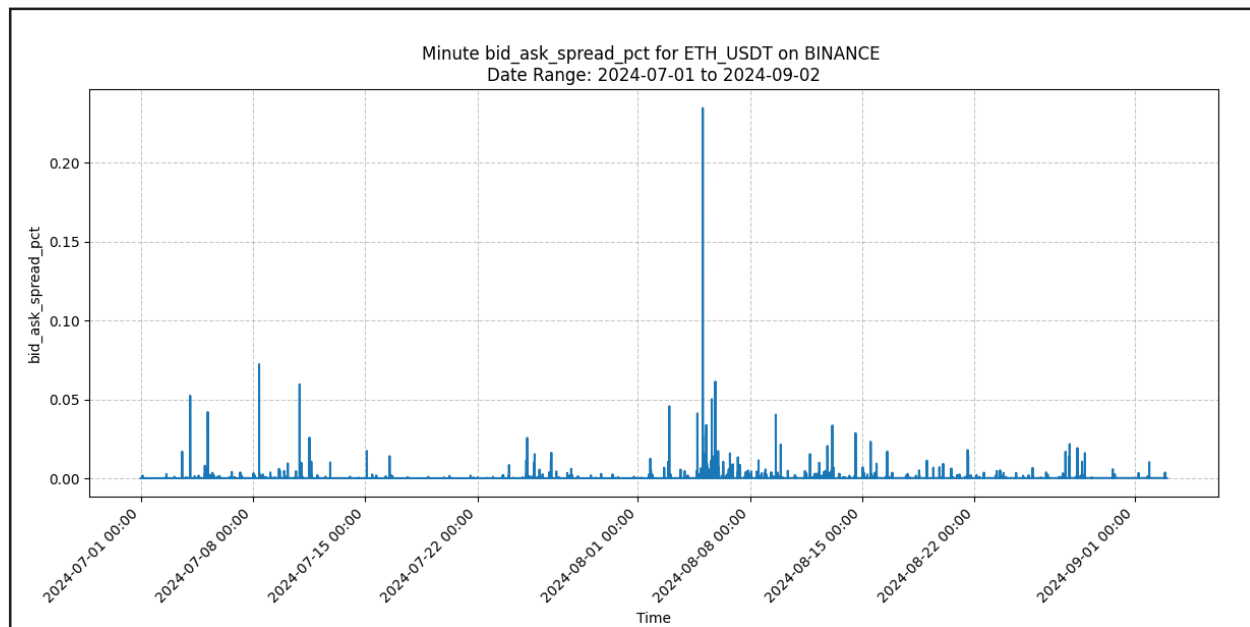
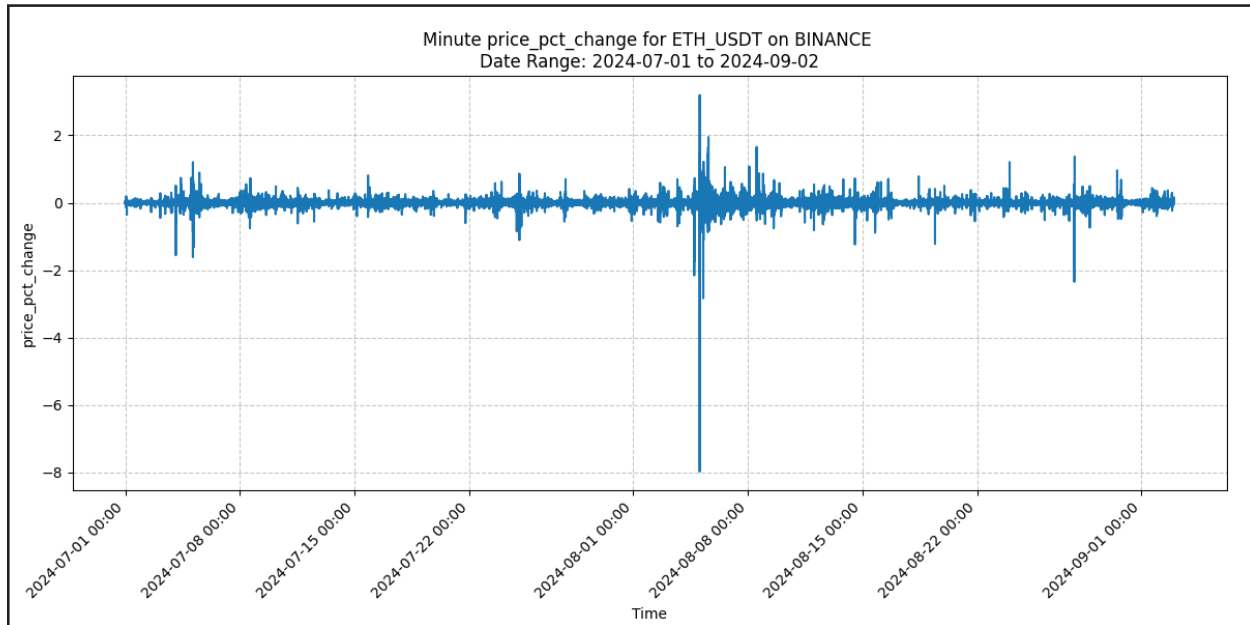


Trade count tracks the number of individual trades executed over a specific period and can provide valuable insight into market dynamics, especially during volatile phases. When trade count spikes, particularly with smaller orders, it often indicates increased bot or algorithmic trading. Bots are frequently triggered by technical indicators, such as moving average crossovers, and can flood the market with small, frequent trades.

During the recent volatility, trade count surged to 7 million trades per minute compared to the usual 1.5 million. This sharp increase, dominated by smaller orders, suggests that bots were highly active, responding to technical setups or momentum shifts. Even though these trades are smaller, the high frequency can cause significant price movements, especially if the order book is thin and liquidity is limited.

Algo-driven trading can have a strong impact on price, as these bots quickly process and execute orders, sometimes overwhelming the market. This creates volatility, as rapid-fire trades hit both buy and sell sides of the order book. In the days following these spikes, trade count often drops sharply, signalling a reduction in bot activity and a return to more stable market conditions.

Bid-Ask Spread and Volatility

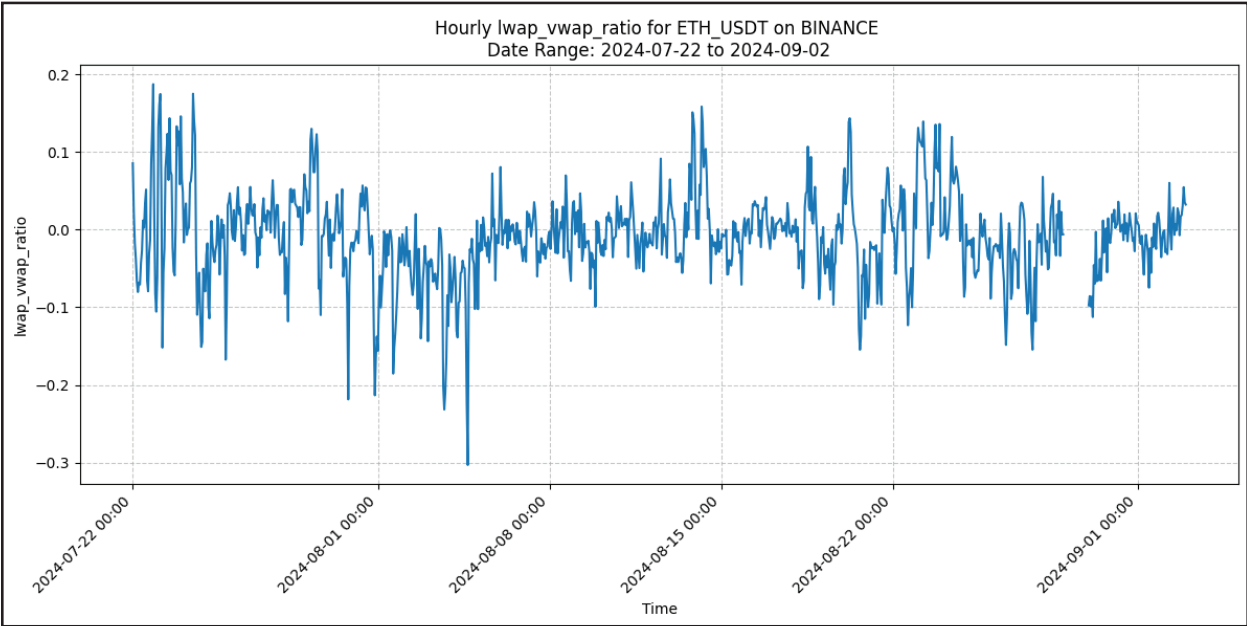


During periods of heightened volatility, like the recent price drop, we observe price volatility clustering, where sharp price changes persist over time. This coincides with a significant widening of the bid-ask spread, which jumped to over 0.2% during the drop and remained elevated for several days afterward. This persistent spread widening indicates increased execution costs as market participants pull liquidity and become more risk-averse.

This spread expansion poses challenges for trading strategies, particularly those reliant on tight execution. The larger the spread, the more traders must pay to enter or exit positions, increasing slippage and reducing profitability. For high-frequency and algorithmic traders, the costs associated with this spread widening can significantly impact performance, forcing them to adjust strategies in response to the new conditions.

By comparing the average volatility and bid-ask spreads before and after the event, we can clearly see the stress levels in the market. The sustained elevated spreads after the price drop reflect the ongoing difficulty in executing trades efficiently, with increased costs persisting even as the market begins to consolidate. Traders need to account for these higher execution costs following large events, as spreads may take time to normalize.

Liquidity-Weighted Price vs. Volume-Weighted Price



LWAP (Liquidity-Weighted Average Price) and VWAP (Volume-Weighted Average Price) are important metrics that offer insights into market conditions. LWAP is derived from the order book, focusing on the price based on liquidity at various price levels, while VWAP comes from the trade book, representing the average price based on the volume of executed trades over time.

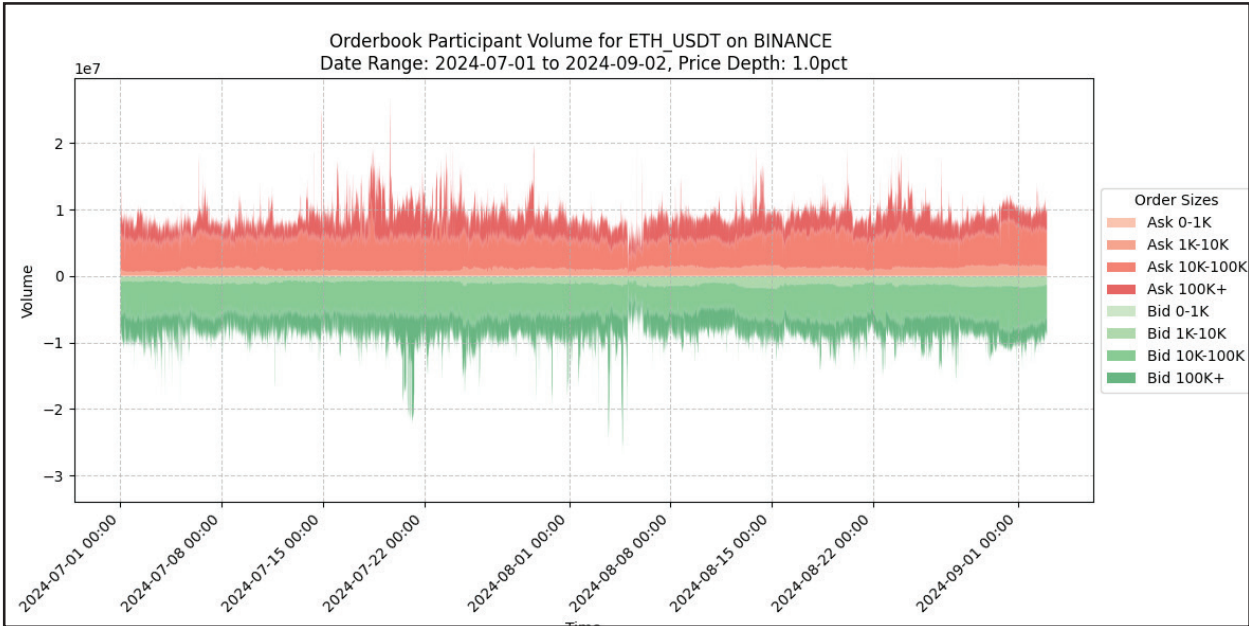
The difference between LWAP and VWAP helps reveal market sentiment. If LWAP is lower than VWAP, it suggests that liquidity is concentrated on the sell side, meaning sellers may be dominating and creating potential downward pressure. Conversely, when LWAP is higher than VWAP, it indicates stronger buy-side liquidity, signalling bullish sentiment.

Before the August 5th drop, the difference between LWAP and VWAP dropped sharply to -0.3, indicating significant sell-side pressure. This suggested that while trade volumes remained steady, there was a growing imbalance in the order book, with sell-side liquidity outweighing buy-side liquidity. This shift was a potential early warning sign of the coming market decline, as the negative difference indicated weakening market conditions.

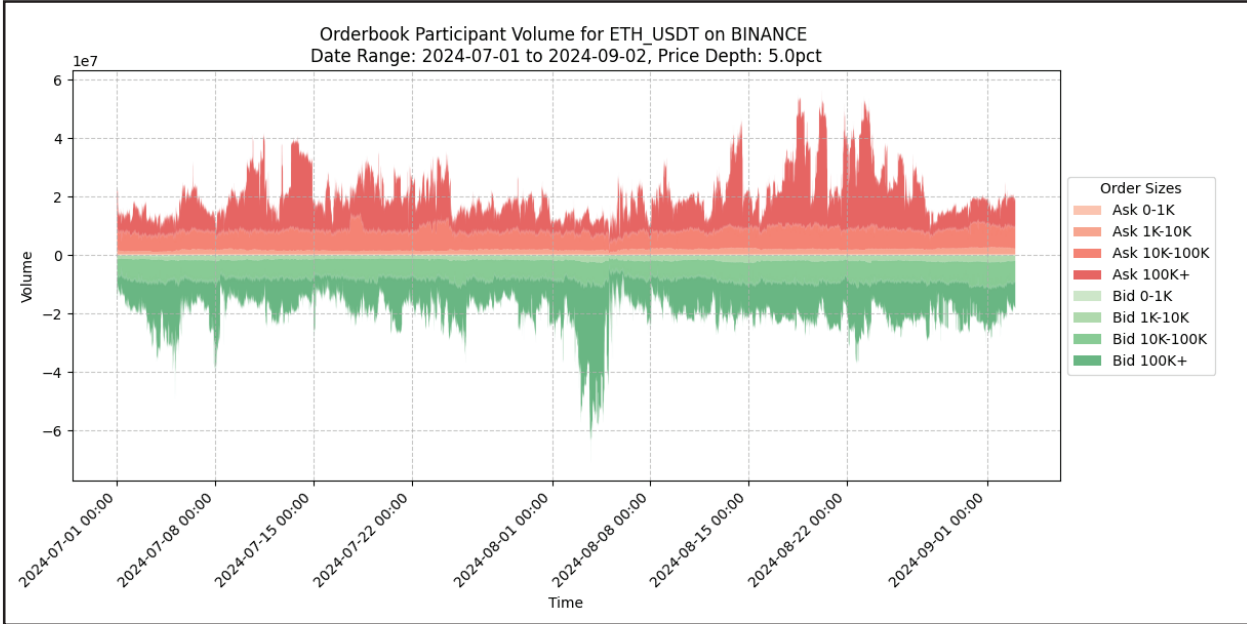
Tracking the trend of LWAP vs. VWAP over time can help traders identify potential market turns. Large drops in this difference, especially to negative values, can indicate building sell pressure, signalling a possible downturn. By monitoring this relationship, traders can better anticipate shifts in market sentiment and prepare for major price moves.

Volume of the Order Book at 1% and 5% Depth

The 1% and 5% depth profiles provide key insights into the structure of the order book and the available liquidity at different price levels. By examining how much buy and sell liquidity exists within 1% and 5% of the current market price, traders can understand how liquidity is distributed and how this affects market behavior during volatile events.



The 1% depth chart focuses on liquidity closer to the market price, often showing how tightly liquidity is concentrated. For example, around recent market drops, the 1% depth profile revealed significant changes in liquidity, with a noticeable tightening as liquidity thinned by 20-30% following the event. This reduction in near-market liquidity made executing trades more expensive and difficult, contributing to short-term volatility as prices became more sensitive to smaller orders.

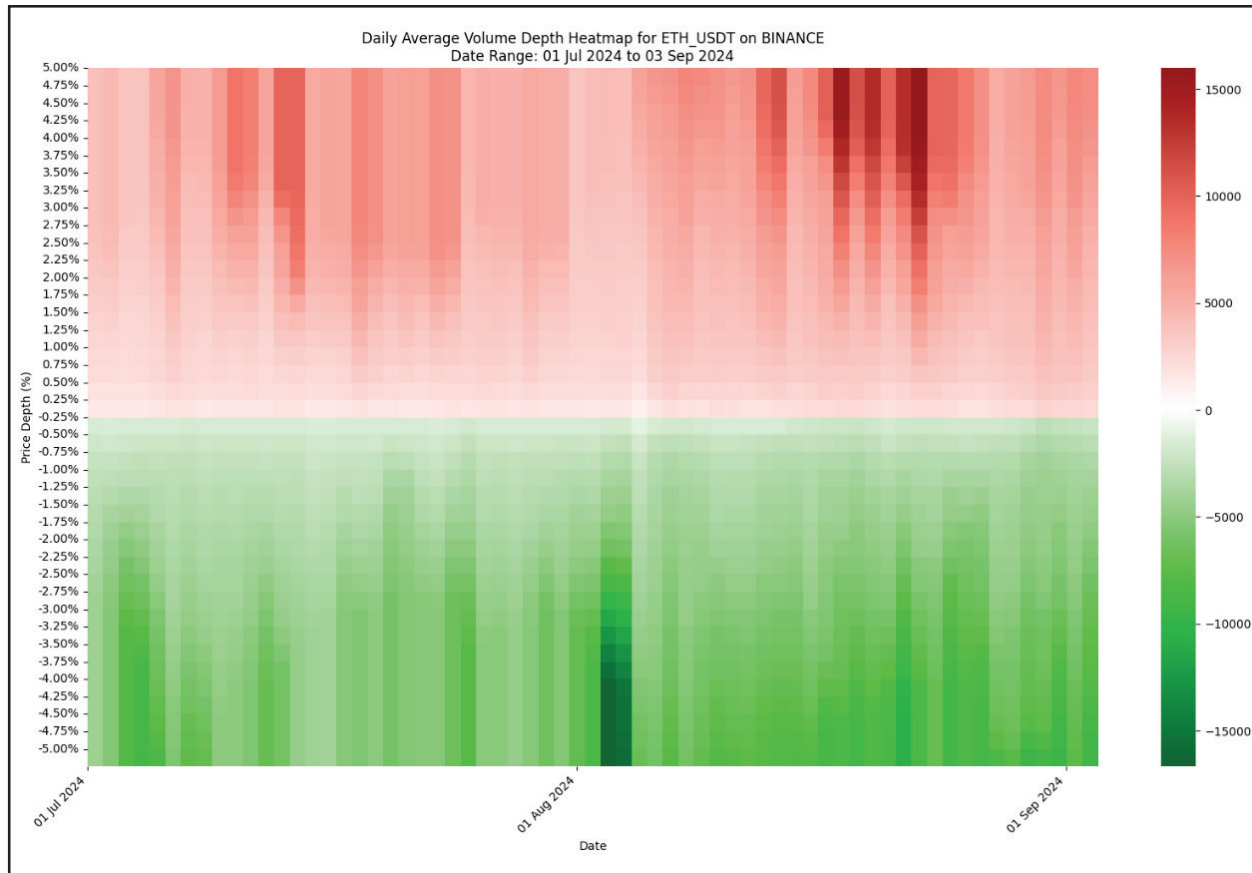


In contrast, the 5% depth chart provides a broader view of the order book. During the market drop, this deeper level showed a spike in bid volume, indicating strong buying interest below the market price. This suggests that some traders anticipated a potential bounce or saw lower prices as attractive entry points. The increased liquidity at the 5% depth helped stabilise the market after the initial drop, showing that while near-market liquidity thinned, there was strong interest at lower levels.

The comparison between 1% and 5% depths highlights the importance of examining liquidity at multiple levels. While the 1% depth shows near-term price sensitivity and immediate market reactions, the 5% depth reveals longer-term support and the willingness of participants to place orders at deeper price levels. This divergence in liquidity distribution reflects varying trader expectations and risk appetites, with some seeking short-term opportunities and others positioning for potential reversals.

Monitoring both the 1% and 5% depth profiles provides a comprehensive view of market structure. It helps traders anticipate liquidity-driven price swings, understand the likelihood of support or resistance at different levels, and adjust their strategies accordingly during periods of high volatility.

Liquidity Fragmentation Profile at 0.25% Depths



The liquidity fragmentation profile at 0.25% depths measures how liquidity is distributed across narrow price levels within the order book, offering insight into market structure and sentiment. This profile tracks how much buy and sell liquidity exists within 0.25% of the current market price, providing a detailed view of how liquidity is concentrated or fragmented around key price points.

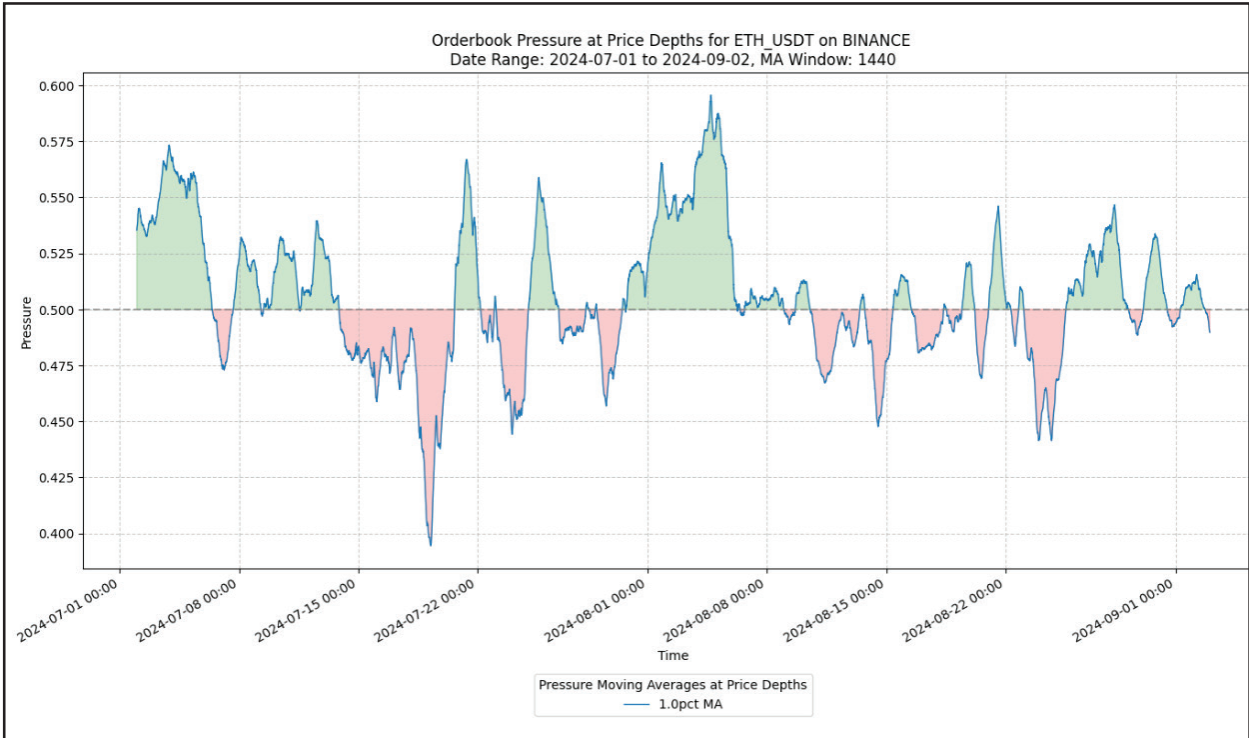
Using a heatmap, this metric visually represents changes in the order book over time by normalizing the percentage differences from the mid-point. The heatmap allows traders to track how liquidity evolves, showing periods of increased or decreased liquidity at specific price levels. For example, in early August, a dark band on the heatmap indicated a significant increase in liquidity close to the mid-point, suggesting that participants were actively placing orders around key price levels as prices shifted. These periods of deep liquidity often point to important support or resistance zones in the market.

While depth charts give snapshots of liquidity at fixed price ranges like 1% or 5%, the liquidity fragmentation profile offers a more granular, real-time view of how liquidity is spread across smaller intervals. This helps traders understand the broader picture of how market sentiment is shifting and which price levels are being tested by large amounts of liquidity.

Analyzing this profile provides insights into potential price support and resistance levels. When liquidity is heavily concentrated at certain depths, it can act as a barrier to price movement. On the other hand, fragmented liquidity may indicate weaker support or resistance, increasing the likelihood of price swings. By tracking the changes in liquidity over time, traders can anticipate potential market movements and identify critical levels where sentiment may shift.

Pay close attention to periods where deep liquidity is tested or fragmented, as these often align with significant market events. This can help better time entries and exits and understand where price might find support or face resistance.

Order Book Pressure



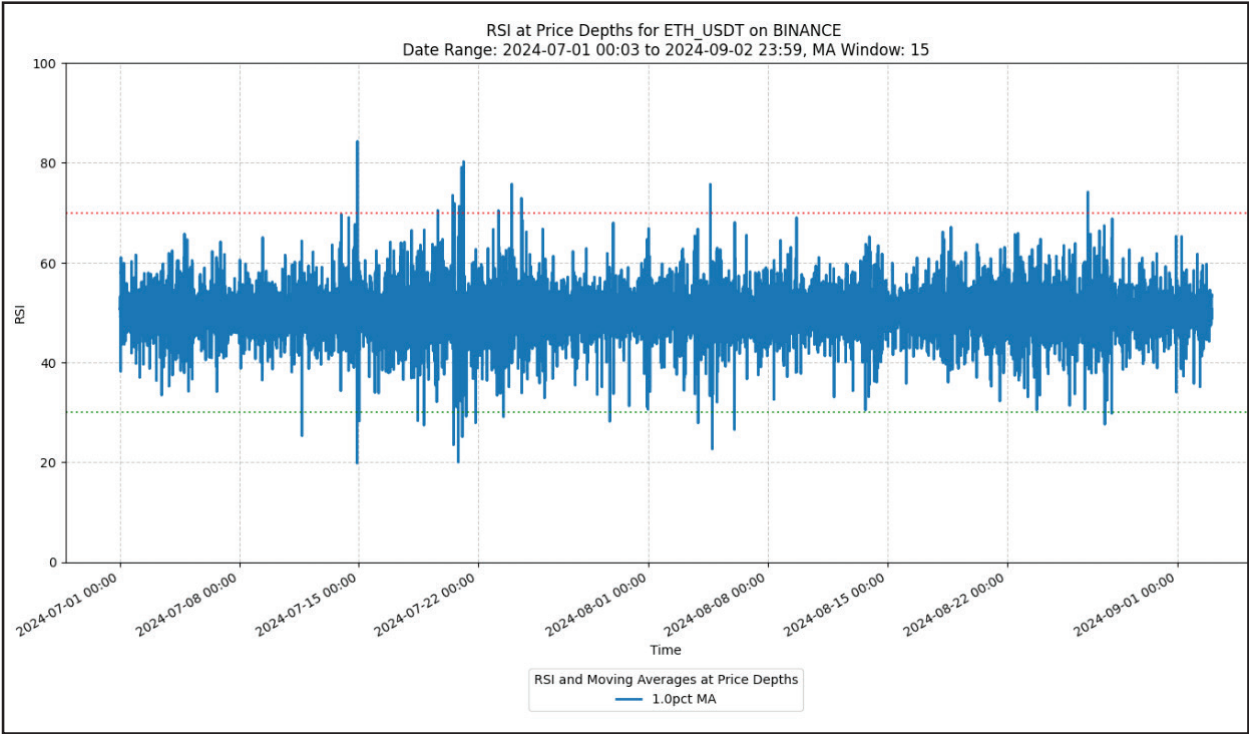
Order book pressure, calculated as $(\text{bid volume} - \text{sell volume}) / \text{total volume}$, is a key indicator of the balance between buy and sell orders in the market. It reveals shifts in market sentiment and can help identify critical points during volatile moves. This metric is particularly useful for spotting when a bottom might be forming after a significant price drop, as it reflects how aggressive buyers or sellers are at any given moment.

During periods of high selling pressure, rising order book pressure can signal that the market is nearing a bottom. For example, when order book pressure hits levels around 0.55-0.6, it often indicates that buying demand is starting to outweigh selling volume, suggesting that the selling momentum is weakening. This level typically coincides with the market absorbing sell-side liquidity and potentially reversing direction.

The 1% price depth is a crucial area to monitor for shifts in order book pressure. If the bid volume significantly increases at this depth while sell volume decreases, it may signal that buyers are stepping in to support the market. This can be an early sign of a bottom forming, especially when combined with other indicators like price stabilization or a spike in total traded volume.

However, order book pressure alone may not be enough to confirm a reversal. It's essential to use it alongside other metrics, such as volume spikes or price action, to get a fuller picture of market conditions. This way, traders can avoid relying solely on a single indicator and improve the accuracy of their entry and exit points during volatile moves.

Order Book RSI (Relative Strength Index)



Order Book RSI measures the momentum of changes in buy and sell orders within the order book, helping traders gauge market pressure and identify potential turning points. It tracks how the volume of bid orders (buy-side) compares to sell orders (sell-side) over time, offering insight into whether the market is overbought or oversold based on order flow dynamics.

The RSI is calculated by comparing the relative strength of buy and sell volume within the order book, usually focusing on price levels close to the current market price (typically within 1% of it). When the bid volume (buying activity) increases more rapidly than sell volume, the RSI rises, signaling growing buy-side pressure. Conversely, when sell volume (selling activity) increases faster than bids, the RSI falls, indicating stronger sell-side dominance.

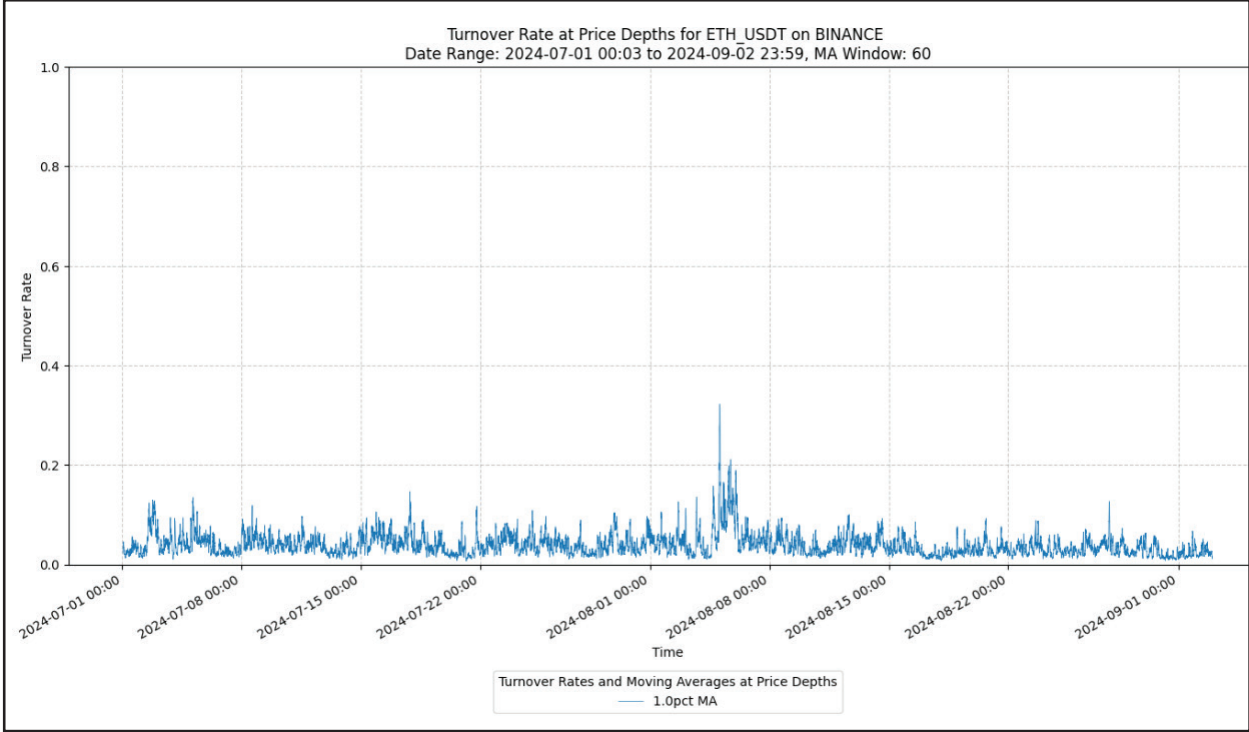
Key levels for Order Book RSI:

- **Above 70:** This indicates strong buy-side momentum, suggesting that the market is overbought. Buyers may soon exhaust their activity, and a price pullback could follow.
- **Below 30:** This signals heavy sell-side pressure and an oversold market. It often suggests that sellers are nearing exhaustion, which could lead to a price rebound.

For example, during the recent market volatility surrounding the acceleration of the Yen's appreciation and the Nikkei drop, Order Book RSI breached both the 70 and 30 levels. These spikes reflected intense shifts in order flow, highlighting key moments of market stress and signaling potential price reversals.

Order Book RSI is valuable because it captures the intensity and speed of order flow changes in real time, offering traders early clues to upcoming large market swings. However, it should be used in combination with other metrics like volume and order book pressure to confirm these signals and avoid false alarms.

Order Book Turnover Rate



Order book turnover rate measures how frequently orders are added, modified, or cancelled within the order book, giving a clear sense of the market’s activity and responsiveness. It tracks how dynamic the market is by counting the number of changes to the order book over a given period.

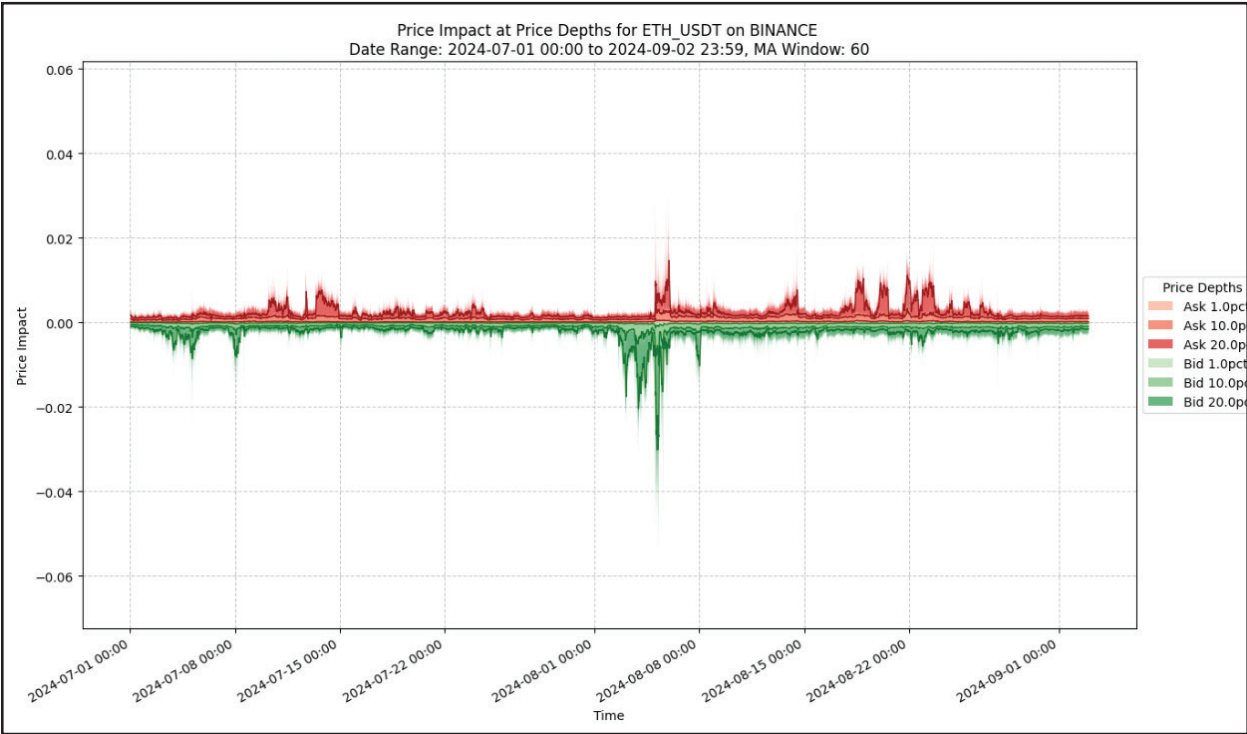
This rate is calculated by averaging the total number of order changes, including new orders, cancellations, and modifications, over a 60-minute window. Each minute, the total number of updates to the order book is recorded, and these changes are averaged to get the turnover rate.

A high turnover rate reflects an active and liquid market, where participants are rapidly adjusting their positions. This is usually seen during periods of volatility, when traders respond quickly to price fluctuations. A low turnover rate, on the other hand, signals a more stagnant market, with fewer updates to the order book, indicating reduced activity and liquidity.

During the recent Nikkei drop, the order book turnover rate spiked to 0.35, signalling intense activity as traders quickly placed and cancelled orders in response to the sudden volatility. This elevated turnover showed how quickly participants were adjusting their positions in real-time. In the days following, the turnover rate slowed, reflecting a stabilization of market activity as volatility decreased and traders became less reactive.

Order book turnover rate is a key metric for assessing market health. A higher rate points to active participation and strong liquidity, while a lower rate can indicate a slower, less dynamic market. This metric works well when combined with other indicators like order book pressure and the bid-ask spread, helping traders gain a fuller understanding of market conditions during volatile periods.

Price Impact / Slippage



Price impact, also known as slippage, measures the difference between the expected price of an order (based on the mid-point) and the actual price at which it gets executed. This difference widens significantly during periods of volatility, when liquidity becomes more fragmented and the bid-ask spread increases. Price impact is particularly important for large orders, as they tend to push through multiple price levels in the order book.

Price impact is typically analyzed by looking at how much a 1%, 10%, or 20% trade (relative to current order book volume) moves the market. The percentage difference is calculated from the mid-point price, providing a clear view of how large trades affect market prices.

During recent volatile periods, slippage exceeded 2% at times, including the spread. Specifically, after the Nikkei drop, price impact on the bid side widened significantly to around 0.04%, showing how liquidity became sparse on the buy side as participants were hesitant to place large bids. In contrast, the ask-side slippage saw multiple spikes, with slippage reaching around 0.01%, as sellers became more active, especially in the hours following the event.

This slippage reflects the true cost of executing trades during periods of high volatility, as the market's ability to absorb large orders diminishes. Traders must account for price impact when making large trades, as slippage can drastically reduce profitability or increase costs. Monitoring these slippage percentages across different volumes (1%, 10%, 20% of the order book) offers a deeper understanding of how liquidity is distributed and how much market impact a trade will have.

Price impact analysis is crucial for risk management, especially when trading larger positions. It shows how much the market can be moved by a single order, and during volatile periods, these costs can spike, as seen with the post-Nikkei drop slippage. Being aware of the potential slippage helps traders make more informed decisions, especially in thin markets.

Conclusion

The yen carry trade unwinding and its ripple effects on the crypto market emphasize the deepening ties between traditional finance and digital assets. By analyzing a range of metrics—total traded volume, net trading pressure, and order book dynamics—we uncover hidden market dynamics that, while seemingly chaotic, often follow identifiable patterns during periods of volatility.

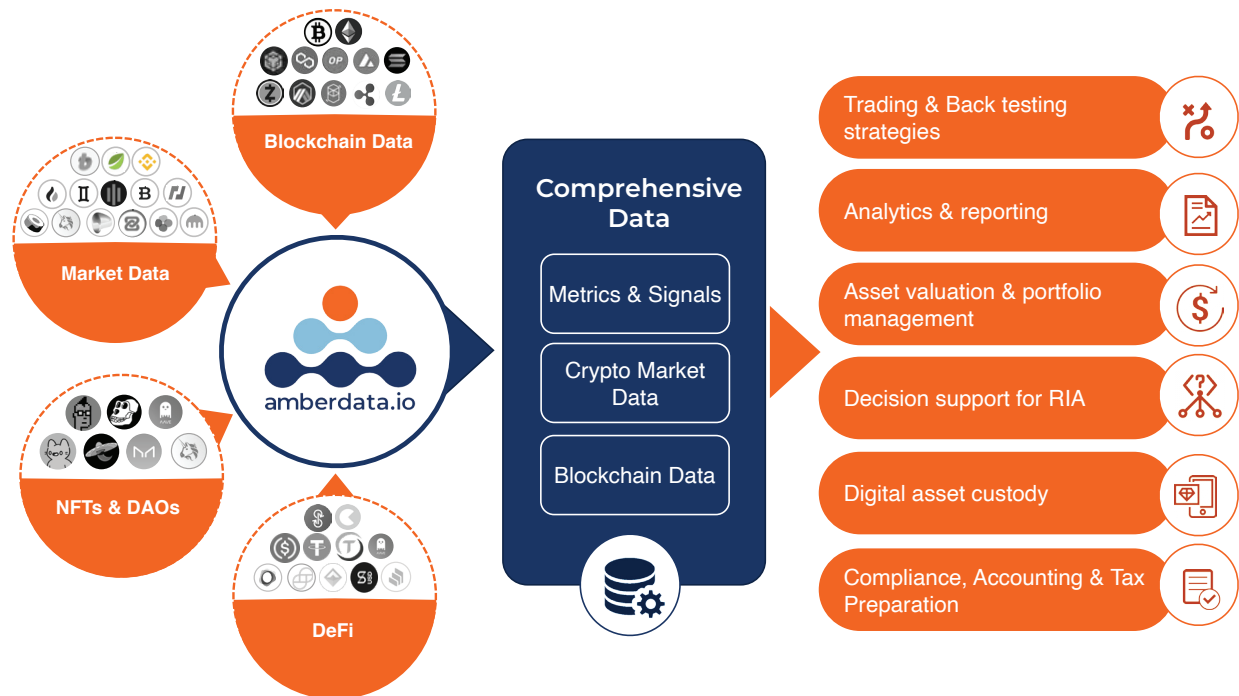
One key insight from our findings is that small traders and algorithmic trading systems can have an outsized impact when markets are turbulent. Rapid-fire trades and automated strategies can significantly move prices, even with lower trade volumes, especially when liquidity is thin.

Order book metrics, such as order book pressure and RSI momentum, consistently signal market turns before price action, offering early clues for traders to act before major price shifts occur. Monitoring the turnover rate of the order book also reveals how actively market participants are adjusting their orders, which is especially valuable during high-stress periods.

Furthermore, the post-drop periods, while they present opportunities for trading, also come with heightened risks. Metrics like bid-ask spreads and price impact/slippage widen considerably after major market events, increasing execution costs and making precise trade timing more challenging. Traders need to be particularly vigilant in these moments, as misjudging liquidity conditions can erode profitability.

In summary, understanding and utilizing these market indicators provides traders with a holistic view of market behavior, offering tools to spot opportunities, mitigate risks, and refine strategies. What may initially appear as chaos during market drops is often governed by repeatable patterns, and those who pay attention to order book signals and liquidity conditions can gain a significant edge in both traditional and crypto markets.

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