

# NEMETON: LIQUIDITY SIGNALS FOR INTRADAY TRADING

**Empowering Intraday Traders** 

Unbiased Alpha GmbH

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# **1. Introduction**

The limit orderbook serves as the core matching engine that facilitates transparent trading and price discovery. However, its vast and intricate data can be challenging to interpret, particularly when extracting actionable trading signals. Recognizing the vital role of order flows as key drivers of price movements, we have developed a comprehensive suite of trading signals designed to harness the full predictive potential of this information—even when aggregated across lower frequencies.

Introducing **Nemeton**, our cutting-edge proprietary data API, tailored to meet the sophisticated demands of both retail and institutional investors. Nemeton empowers financial data scientists to unlock intraday insights, leveraging advanced market data to uncover profitable trading opportunities with precision and confidence.

# 2. Motivation

There is a substantial audience of traders spanning a wide spectrum, including institutional investors and trading firms, who concentrate on intraday timeframes. Their focus lies between the extremes of high-frequency trading, operating within time intervals ranging from 1 minute to a few hours. These investors normally lack proper trading signals and purely rely on candles and technical indicators, which perform poorly in most live trading strategies.

Order book data is inherently fast-paced, making high-frequency signals primarily advantageous for high-frequency trading (HFT) firms. Retail traders and non-specialized institutional investors often face significant barriers to entering the HFT space, primarily due to:

- 1. **Latency:** Building the ultra-fast infrastructure needed for effective HFT is beyond the reach of most companies and nearly all retail traders.
- 2. **Data Management:** High-frequency data demands sophisticated solutions for storage, cleaning, retrieval, and manipulation. Managing this data efficiently is far more complex than handling traditional candlestick or macroeconomic data.
- 3. **Cost:** Developing and maintaining low-latency algorithms, infrastructure, brokerage solutions, and scalable data systems requires significant financial investment, making it prohibitive for many.



Many intraday traders and investors struggle to find meaningful data that updates frequently enough (e.g., macroeconomic data) or offers sufficient predictive power (e.g., traditional candlestick patterns, which provide little actionable insight into future price movements). Algorithmic trading in this space often lacks a fundamental basis for making informed decisions, leading traders to rely on technical indicators. However, these indicators are primarily used because investors have no alternative to working with OHLCV data, forcing them to search for patterns and signals that frequently result in wasted time, effort, and poor performance.

Our solution bridges the gap between daily trading and high-frequency trading. By leveraging meaningful, real-time information directly from the markets — order book data and trades— our suite of intraday signals provides powerful insights. These signals are carefully aggregated and presented in a simplified, user-friendly format, enabling retail investors to make informed decisions with greater confidence. This approach allows traders to move beyond outdated methodologies and gain a competitive edge by integrating market microstructure data into their decision-making process.

By transforming and aggregating signals traditionally used in high-frequency trading (HFT) and making them relevant for larger timeframes, we offer predictive, actionable indicators for traders who seek fast, algorithmic strategies but lack the budget, infrastructure, or expertise to develop HFT systems. Our platform provides access to data-driven insights previously available only to institutional traders, allowing for more informed and systematic intraday trading strategies.

In the following sections, we will introduce three sample signals and toy strategies that illustrate how these goals are achieved. Additionally, we will demonstrate their relevance in the context of cryptocurrency futures, showcasing the potential of our approach in highly liquid and volatile markets.

# **3. Our Unique Value Proposition**

Our offering includes a diverse suite of advanced trading signals and statistics derived from the processing of order book and trade data. This data is gathered via WebSocket connections on the cloud, capturing market activity at a minimum interval of 1 minute. Depending on user requirements, our indicators are dynamically aggregated across intervals ranging from intraday to 1-day frequencies.

The proprietary logic driving our signals is exceptionally challenging to replicate without **robust infrastructure** for data storage, maintenance, and cleaning. Drawing from multiple sources —



including major cryptocurrency exchanges — our solution is designed to filter out market distortions, ensuring that our signals remain robust even in the presence of spoofing by high-frequency trading (HFT) firms, data outliers, and other irregularities. By analyzing **deep order book data** (e.g., 1000 levels), our approach mitigates the impact of manipulative tactics such as spoofing, which typically concentrate on top-of-book liquidity. Signals like order book slope capture structural liquidity imbalances across multiple price levels rather than reacting to ephemeral, deceptive orders placed near the best bid and ask. This ensures a more reliable and resilient representation of market dynamics, allowing traders to make informed decisions with confidence.

For retail traders, replicating these signals independently presents enormous challenges, particularly due to the need for technological expertise in cloud computing, API management, cross-API communication, and scalable database architecture. Even institutional players often struggle to manage such infrastructure and instead depend on expensive services like Bloomberg Terminal or Refinitiv Eikon.

By addressing these barriers, our platform empowers users with **actionable insights that were previously out of reach**, bridging the gap between the power of institutional-grade tools and the accessibility demanded by modern traders.

# 4. Signals Table

The current schema of the dataset follows, referring to any desired timeframe (from 1 minute to 1 day) and level (up to 1000 for both bids and asks):

Signal name	Signal Description	
Cumulative Depth	Total volume available on each side of the book (buy/sell).	
Depth Ratio	Ratio between available depth on the bid side and the total depth of the book.	
Dollar Value Imbalance	Defined as the difference in buyers and sellers' volume from the previous period over the total depth of the market at any point in time,	
Dynamic Order Flow	It summarizes the change in bid and ask	



Imbalance (DOFI)	volumes for each level compared to the		
	previous period.		
Includ Valatility	In a line descent of the second state of the s		
Implied Volatility	Implied expected move from the orderbook		
from Depth	VWAPs on the bid and ask side.		
	Rate between depth of the market and the		
Liquidity	width of the market (distance between best and		
Consumption Rate	worst bid or ask).		
Liquidity Imbalance	Imbalance between bid and ask sizes over the		
	total.		
Liquidity Sproad	Ratio between the worst spread and the best		
Donth	spread on the total book		
Deptii	spread on the total book.		
Mara Darath	Maximum available level on the bid and ask side		
Max Depth	simultaneously.		
Normalized Spread	Spread weighted by the total depth of the		
•	market.		
	Total pressure in terms of volume on the buy		
Orderbook Pressure	side compared to the total available depth of the		
	market.		
Arderbook Slope	Summary of the slope of normalized prices on		
order book slope	the total size available in the book.		
Drico Movement	Potential move in absolute terms given prices		
Price Movement	and sizes on the book		
Potential	and sizes on the book.		
	It signals how much the bid and ask sides are		
Quantity Inch - 1	getting updated in quantities and in what		
Quantity imbalance	direction, weighed by the distance from the best		
	bid and ask.		
Quote Asymmetry	It summarizes the asymmetry between bids or		



	asks given prices and sizes in the book.	
Quote Intensity	Number of updates in the bid and ask prices, signaling the frequency of quoting new orders.	
Quote Skewness	It defines the asymmetry of the distribution of quotes and levels in the orderbook.	
Spread	Distance between bid and ask at a specified level.	
Static Order Flow Imbalance	It represents the change in sizes, disregarding the direction of the change in prices, between bids and asks, weighed by the current price levels.	
Trade Imbalance	The imbalance between buyers and sellers in a specified timeframe.	
Weighted Mid	The mid price weighted by current sizes in the book.	

For more details on our signals, please look at the <u>Appendix</u>.

# **5. Application example I: Time series signals**

The concept of liquidity pertains to the availability of contracts in the orderbook, providing insight into the presence of buyers and sellers through bid and ask orders at any given moment. A significant imbalance in the orderbook can indicate the future direction of mid-price movements or prompt a rapid reversion due to supply and demand dynamics.

Trading signals can sometimes be designed to identify imbalances in the number of buyers and sellers that are available at a specific time for that asset. The power of Nemeton is to provide users with several potential solutions to their specific timeframe and traded asset.

In this example, we are going to observe the **Orderbook Pressure** for BTCUSDT. In particular, this indicator defines the disproportion between available buyers and sellers at a specific point in time.



A value of 0 would mean that there are only sellers in the market (positioned on the ask side, up to the 1000<sup>th</sup> level); a value of 1, instead would mean that there are only buyers (bid orders).

The expectation is that this signal would identify if there is any moment in the market where there is an unnatural imbalance towards buying or selling, which might anticipate market moves.

# **5.a. Numerical example**

For example, consider the price movement of BTCUSDT from July 2024 to early January 2025 (Fig. 1). While Bitcoin experienced an overall upward trend during this period, its price remained highly volatile, with significant movements occurring in short bursts.

Market liquidity conditions often serve as a leading indicator for sudden trend reversals and directional shifts. This is because traders adjust their positions based on their expectations of short-term market movements, leading to changes in liquidity that can precede sharp price swings.



**BTCUSDT Mid Price (hourly)** 

Fig.1: Mid-price of BTCUSDT (source: Binance).





BTCUSDT Orderbook Pressure rate of change, normalized over one month

Fig.2: Binance normalized rate of change for hourly Orderbook pressure of BTCUSDT.

Visually, there is evidence of significant spikes in order book pressure changes (Fig. 2). Interestingly, while one might expect to see large shifts on both the buy and sell sides, notable movements on the sell side are surprisingly rare over the specified period.

Instead, the most pronounced fluctuations occur on the buy side, where strong surges in buying pressure stand out. This suggests that liquidity imbalances tend to favor aggressive buying rather than heavy selling, potentially indicating market participants' confidence in upward price movements or a structural inefficiency in sell-side liquidity.

To illustrate how this information can be applied in trading, we will conduct a sample backtest. This backtest is designed to demonstrate the potential impact of extreme order book pressure changes on trading decisions.

While it does not factor in trading fees, the strategy itself is highly selective, executing trades infrequently. Specifically, it takes a short position only when the observed change in order book pressure exceeds 10 standard deviations compared to the past month of data—a level indicative of extreme market imbalance. In all other cases, the strategy remains in a long position, assuming that, in the absence of such extreme signals, upward momentum or market stability is more likely to persist.



KPI (annualized)	Strategy	BTCUSDT
Return	126.26%	50.34%
Volatility	52.97%	53.00%
Sharpe Ratio	-2.38	0.95
Maximum Drawdown	-17.96%	-28.64%

Table 1: Performance metrics of the indicator.

The results highlight how this straightforward concept can be translated into a practical and potentially effective trading strategy (Fig. 3). Despite its simplicity, the approach demonstrates that extreme shifts in order book pressure can serve as valuable signals for market positioning, offering actionable insights for traders looking to capitalize on short-term imbalances.

Although order book data remains largely underutilized in intraday trading, it holds significant potential for forecasting price movements. By analyzing liquidity dynamics and detecting unusual shifts in buying and selling pressure, traders can gain a deeper understanding of market sentiment and anticipate potential trend reversals. This makes order book analysis a powerful yet often overlooked tool for improving decision-making in cryptocurrency and other financial markets.





Fig.3: Performance of trading signal.

# 6. Application example II: Prevent Market Crashes

Trading signals derived from the order book can play a crucial role in anticipating market downturns before they fully materialize. Unlike traditional price-based indicators, which often react to past price movements, order book dynamics capture real-time shifts in supply and demand, making them a powerful leading indicator of market sentiment.

When significant news or macroeconomic events impact financial markets, order book liquidity tends to adjust almost instantly. Large traders and market makers, who often have access to superior information and faster execution, reposition their orders in response to these changes. A sudden withdrawal of buy-side liquidity, an overwhelming surge in aggressive sell orders, or an imbalance where sellers dominate buyers can all serve as early warning signs of an impending downturn. These shifts occur before prices fully reflect the new reality, giving attentive traders an opportunity to react ahead of the broader market.



By using an Order Book Pressure Indicator, traders can quantify these shifts and gain insights into how liquidity providers and institutional players are positioning themselves. This metric measures changes in the order book's depth and imbalance, highlighting moments when the market is at risk of a major move. If, for example, the indicator shows a rapid depletion of buy orders while sell-side pressure increases significantly, this could indicate that the market is on the verge of a sharp decline.

Recognizing and reacting to these order book signals can help traders manage risk more effectively. For instance, traders can reduce exposure, hedge positions, or even take advantage of short-selling opportunities when signs of an impending crash become evident. By continuing to refine and apply the Order Book Pressure Indicator, traders can enhance their ability to navigate volatile markets, staying ahead of major shifts before they unfold.

# 6.a. Numerical example

In this example, we analyze the hourly chart of XRP **Orderbook Pressure**, which has been normalized for better visualization, alongside the price movements of XRPUSDT perpetual contracts on Binance (Fig. 4). This provides a clear case study of how changes in liquidity conditions within the order book can serve as an early warning signal for impending market declines.





Fig.4: Illustration of the market crash during the FTX bankruptcy.

One particularly striking observation comes from **the period surrounding the FTX collapse**, one of the most significant black swan events in recent crypto market history. Leading up to the crisis, we can see that the green line, representing order book pressure, spikes sharply before the price reacts, indicating a shift in trader behavior before the broader market fully processes the event.

This spike reflects a surge in sell-side dominance and liquidity imbalance, meaning that market makers and large traders were either pulling liquidity from the buy-side or aggressively placing sell orders, anticipating a downturn. The order book essentially "warned" of the upcoming price drop by showing increased pressure well in advance of the actual price collapse.

Order book pressure acts as a leading indicator because it captures the underlying shifts in market sentiment before they become visible in price action. During major events like the FTX collapse:

Liquidity providers adjust their positioning: large traders may withdraw their bids or place aggressive sell orders, signaling fear and a lack of willingness to support the current price levels.
Market makers hedge against increased volatility: as uncertainty grows, market makers may widen spreads or reduce liquidity, exacerbating price fluctuations when panic selling begins.
Retail and institutional traders react at different speeds: well-informed traders who monitor



the order book may react first, while slower market participants (especially retail traders) tend to react after price declines are already underway.

By monitoring order book pressure, traders can potentially identify liquidation cascades before they occur. As illustrated in the XRPUSDT case, the initial spike in order book pressure provided a signal that strong downward price pressure was building up before the broader market collapse played out.

For traders, incorporating order book pressure into a broader risk management strategy can be highly beneficial. Some possible approaches include:

- Reducing exposure when sell-side pressure increases sharply
- Identifying potential shorting opportunities before major sell-offs
- Detecting signs of accumulation when order book pressure reverses after a crash

In summary, the order book can reveal critical market insights that price alone cannot provide. By analyzing liquidity dynamics during high-impact events, traders can develop more proactive trading strategies, helping them stay ahead of major market movements rather than simply reacting to them.

# 7. Conclusions

High-frequency data offers critical insights that no trader should overlook when analyzing the market. Unlike candlestick data, which falls short of delivering the depth and precision required for well-informed decisions, order book and trade data provide superior signals. These signals are not only highly actionable but can also be seamlessly integrated into intraday trading strategies, unlocking predictive power that directly translates into tangible success.

The evidence strongly supports the adoption of orderbook and trade data as essential tools for traders aiming to achieve a competitive edge and capitalize on market opportunities with confidence.



# Appendix

# Cumulative Depth (Bid & Ask)

#### What does it capture?

Cumulative depth quantifies the total available liquidity on the bid or ask side of the order book up to a given level. It measures the aggregate volume of limit orders, providing insight into the market's supply and demand dynamics at different price levels.

#### Why is it useful?

It serves as an indicator of market depth and order book resilience. Higher cumulative depth suggests greater liquidity, which can reduce execution costs, while lower depth may indicate a more fragmented or less stable order book.

#### How does it help traders?

Traders use cumulative depth to assess execution risk, estimate potential price impact, and refine execution strategies, particularly for large orders that could move the market. It also aids in detecting imbalances that may precede short-term price adjustments.



### **Depth Ratio**

#### What does it capture?

Depth Ratio measures the relative liquidity on the bid side of the order book compared to the total liquidity (bid + ask) within a specified depth level. A value close to 1 indicates strong bid-side liquidity, while a value near 0 suggests dominance of the ask side.

#### Why is it useful?

It provides a normalized view of liquidity balance, allowing traders to assess buying versus selling pressure. Unlike raw depth measures, it accounts for relative market conditions rather than absolute liquidity levels.

#### How does it help traders?

Traders use Depth Ratio to gauge market pressure and anticipate order book imbalances that could lead to price shifts. It assists in refining execution strategies, particularly in algorithmic trading and liquidity provisioning.

#### **Dynamic Order Flow Imbalance**

#### What does it capture?

Dynamic Order Flow Imbalance measures changes in bid and ask liquidity over time, incorporating both size and price movements at multiple levels of the order book. It captures whether market participants are adding or removing liquidity dynamically, indicating shifts in buying and selling pressure.

#### Why is it useful?

Unlike static imbalance measures, this metric accounts for liquidity evolution, detecting aggressive order placement or withdrawal. It helps in identifying hidden liquidity shifts that might not be visible from a single snapshot of the order book.

#### How does it help traders?



Traders use this signal to anticipate short-term price movements based on liquidity changes. A rising imbalance suggests increasing buying pressure, while a declining imbalance signals growing selling activity. This is particularly valuable in execution algorithms and market-making strategies.

#### **Dollar Value Imbalance**

#### What does it capture?

Dollar Value Imbalance measures the net shift in order book liquidity by tracking the change in bid and ask dollar volumes. It accounts for both price and size, reflecting how capital is allocated between buy and sell orders over time. This metric originated in high-frequency trading (HFT) as a way to detect microstructural imbalances but can also be valuable for intraday traders.

#### Why is it useful?

Unlike simple volume-based imbalance measures, Dollar Value Imbalance emphasizes the monetary weight behind order flow changes. This helps filter out noise from small orders and provides a clearer picture of capital movements. A rising imbalance suggests increased buying strength in dollar terms, whereas a falling imbalance indicates mounting selling pressure.

#### How does it help traders?

For intraday traders, this signal can highlight moments when capital is shifting in a particular direction, offering insight into liquidity dynamics before price moves materialize. It can help traders anticipate short-term momentum, time entries and exits more effectively, and gauge whether institutional flows are favoring the buy or sell side.

#### Implied Volatility from Depth

#### What does it capture?

Implied Volatility from Depth (IV Depth) estimates the effective price range implied by the order book's liquidity distribution. It measures how much bid and ask prices diverge, weighted by available liquidity, to infer an implicit volatility-like measure. While the concept of implied volatility is common in options markets, this metric applies a similar idea to order book depth to gauge short-term uncertainty in asset prices.

#### Why is it useful?



IV Depth provides a real-time, liquidity-sensitive measure of price uncertainty. Unlike standard volatility metrics based on historical price movements, this approach reflects current market conditions. A high IV Depth suggests wider bid-ask spreads and increased liquidity-driven uncertainty, while a lower IV Depth implies a more stable and efficient market.

#### How does it help traders?

For intraday traders, IV Depth serves as an early indicator of potential price swings or liquidity constraints. When liquidity is concentrated at extreme bid/ask levels, it signals higher risk and possible sharp moves. Traders can use this metric to adjust position sizing, fine-tune execution strategies, or anticipate periods of increased volatility without relying solely on past price movements.

# Liquidity Consumption Rate (LCR)

#### What does it capture?

The Liquidity Consumption Rate measures the extent to which liquidity is consumed at the bid and ask levels within the order book. It quantifies the relationship between the size of the available liquidity and the price distance between the highest bid and lowest ask. A higher rate signals faster depletion of liquidity at those levels.

#### Why is it useful?

The LCR helps traders identify potential liquidity imbalances and understand how quickly liquidity is being absorbed in the market. This can be a signal of increasing market volatility or a shift in market sentiment, often preceding significant price movements.

#### How does it help traders?

Traders can use the LCR to gauge market depth and anticipate price swings based on liquidity trends. By monitoring LCR, they can make more informed decisions about entry and exit points, especially when anticipating sudden moves or when liquidity is low.

#### **Liquidity Imbalance**

#### What does it capture?



Liquidity Imbalance quantifies the relative difference between the size of the bid and ask sides of the order book. It measures whether the available liquidity is skewed toward buyers or sellers, providing insight into potential market pressure. A positive value indicates more liquidity on the bid side (buying pressure), while a negative value signals more liquidity on the ask side (selling pressure).

# Why is it useful?

This metric is useful for detecting shifts in market sentiment and understanding the supply and demand dynamics at any given time. A large imbalance often signals potential price moves, as the market may move toward the side with less liquidity, indicating where the market is more likely to be impacted by smaller trades.

#### How does it help traders?

Traders can use liquidity imbalance to identify potential market turning points or trends. If there's a strong imbalance in favor of the bids, it could signal upward pressure, suggesting an opportunity for long trades. Conversely, an imbalance in favor of the asks may indicate a bearish sentiment, suggesting short opportunities or the need for caution when entering long positions.

# **Liquidity Spread Depth**

# What does it capture?

Liquidity Spread Depth measures the relative change in the spread (the difference between the best bid and ask prices) at a specific level of depth within the order book. It compares the spread at a given depth (usually determined by the number of order book levels) with the spread at the top of the book. This gives traders a sense of how liquidity is distributed beyond the best prices and how it might impact the price movement as orders move further from the market.

# Why is it useful?

This metric helps assess market depth by examining how liquidity changes beyond the first few levels of the order book. A large spread at deeper levels compared to the top of the book suggests that liquidity becomes thinner as traders move away from the best prices, which could signal higher slippage risks. Conversely, a consistent spread across different levels implies deeper market liquidity.

#### How does it help traders?



Traders can use Liquidity Spread Depth to gauge the strength of price support or resistance deeper into the order book. If the spread at deeper levels is large relative to the top, it could suggest a lack of liquidity, increasing the likelihood of price slippage when executing large orders. Conversely, a consistent spread at different levels indicates a more stable market environment for executing trades with minimal slippage.

# Maximum Depth

#### What does it capture?

Maximum Depth refers to the total number of price levels available on the bid and ask side of the order book. It measures the extent of market liquidity available for both buying and selling at different price points beyond the best bid and ask prices.

# Why is it useful?

This metric indicates the depth of the market on both sides (bid and ask). A higher maximum depth implies greater liquidity, as more levels of orders are visible at varying price points. Conversely, a low maximum depth suggests a thinner order book, which may lead to higher slippage when executing large trades.

#### How does it help traders?

Traders can use Maximum Depth to evaluate how much liquidity is available at different price levels. In intraday trading, if the maximum depth is large, it means that the market can absorb large trades without drastically moving the price. If the maximum depth is small, traders might anticipate higher price volatility when placing larger orders, which is crucial for managing risks in fast-moving markets.

#### **Mid Price**

#### What does it capture?

The Mid Price is calculated as the average of the highest bid price and the lowest ask price at the selected depth level. This price represents the central point between the available buy and sell prices, offering a useful reference for market valuation at a given moment.

#### Why is it useful?



It provides a proxy for the fair market price at any given point in time. The Mid Price is especially useful for determining the relative value of an asset in relation to the current supply and demand dynamics.

#### How does it help traders?

Traders use the Mid Price to assess the market equilibrium between buying and selling pressure. A sharp deviation from the Mid Price may indicate a potential price imbalance or impending volatility. Intraday traders can use this as a benchmark to decide on entry or exit points, aiming for a price close to the Mid Price or a strategy that anticipates movement toward it.

#### **Normalized Spread**

#### What does it capture?

The Normalized Spread measures the relative cost of executing a trade in terms of the market depth. It calculates the price difference between the best bid and best ask and normalizes it by the total liquidity available at those prices. In other words, it reflects how wide the spread is relative to the market's depth, taking into account the available quantities at the bid and ask prices.

#### Why is it useful?

The Normalized Spread provides insights into the market's liquidity and potential transaction costs. A higher normalized spread indicates that the spread is large in relation to the available liquidity, suggesting higher costs for execution and potentially more slippage. A lower normalized spread means that the market is relatively deeper, with more liquidity available at the best prices, which can result in lower transaction costs and less slippage risk.

#### How does it help traders?

For intraday traders, the Normalized Spread helps evaluate the efficiency of execution. A high normalized spread suggests that price moves might be costly, especially when executing large orders, as there is less liquidity available in proportion to the spread. Conversely, a low normalized spread indicates that the market is more liquid, offering better execution conditions and a lower risk of price distortion. Traders can use the Normalized Spread to gauge the market's depth throughout the day and adjust their strategies accordingly to minimize slippage and improve trade execution.

#### **Orderbook Pressure**



#### What does it capture?

Orderbook Pressure measures the relative dominance of bids versus asks in the order book. It quantifies the pressure exerted by the current orders on each side of the book by calculating the sum of the bid and ask prices weighted by their respective sizes. The ratio of the weighted bid pressure to the total weighted pressure (sum of bid and ask pressures) indicates whether there is more buying or selling pressure in the market at a given point in time.

#### Why is it useful?

Orderbook Pressure is a valuable metric for assessing the market's imbalance between buyers and sellers. A high Orderbook Pressure (closer to 1) indicates that the buying side is exerting more pressure on the market, suggesting that the price might rise due to stronger demand. Conversely, a low Orderbook Pressure (closer to 0) suggests that selling pressure is dominating, and prices may be more likely to fall.

#### How does it help traders?

For intraday traders, Orderbook Pressure helps gauge the current market sentiment and potential short-term price movement. By monitoring this metric, traders can better understand whether the market is leaning towards buying or selling pressure. High pressure from either side can influence decision-making, such as whether to enter or exit a position. Additionally, it can help traders anticipate potential price reversals or continuation based on the dominance of the order book on either side.

#### **Orderbook Slope**

#### What does it capture?

Orderbook Slope measures the slope or steepness of the bid and ask sides of the order book. It calculates how the price changes relative to the cumulative order sizes across the levels of the book. By comparing the highest and lowest prices within a given level and dividing by the total order size at those levels, it provides insight into the "steepness" of the book's price structure on both the bid and ask sides.

#### Why is it useful?

Orderbook Slope helps traders understand how price movement is distributed across different order book levels. A steeper slope indicates a sharper price gradient, which may signify potential



price volatility or quick movements if liquidity is consumed at those levels. A flatter slope suggests that price movements are more gradual, with less risk of sudden price shifts. This metric highlights the concentration of liquidity and the level of resistance or support in the market.

### How does it help traders?

For intraday traders, Orderbook Slope offers a glimpse into the market's price sensitivity. A steep slope can indicate a market that could move quickly if a large order is executed, while a flatter slope suggests that price movement will require more liquidity or a larger order to trigger a significant price shift. Traders can use this information to better time their entries and exits, manage slippage, and predict potential price movement, especially when monitoring the order book at different levels throughout the day.

# **Price Movement Potential (PMP)**

# What does it capture?

Price Movement Potential (PMP) evaluates the likelihood of price movement based on the pressure exerted by the buy (bid) and sell (ask) orders within a given depth level of the order book. It calculates the ratio of the total ask pressure (the sum of ask prices multiplied by their respective quantities) to the total bid pressure (the sum of bid prices multiplied by their respective quantities) within the specified depth level.

#### Why is it useful?

PMP is useful because it gives traders an indication of the relative buying versus selling pressure within the market. A high PMP suggests that there is more pressure from sellers, which may lead to downward price movement, while a low PMP indicates more buying pressure, potentially driving prices upwards. This can help traders assess the direction of price movement and make decisions accordingly.

#### How does it help traders?

For traders, PMP helps to gauge the risk of price movement in either direction. By understanding the balance between bid and ask pressure, traders can predict potential price volatility and adjust their trading strategies. If PMP is high, indicating strong sell-side pressure, traders might anticipate a potential price drop and may look to enter short positions. Conversely, a low PMP might signal a more stable or upward-moving market, favoring long positions.



# Quantity Imbalance (QI)

#### What does it capture?

Quantity Imbalance (QI) measures the change in order book quantities (bids and asks) over time, comparing the current quantities with the previous ones. It calculates the difference in the quantity of bids and asks, adjusted for price movements, within a specified depth level of the order book.

#### Why is it useful?

QI provides insights into the shifts in supply and demand within the order book. A high QI indicates that there has been a significant change in either the bid or ask side, reflecting an imbalance in market sentiment or the potential for price movement. This can signal a market event or large orders that could impact prices. On the other hand, a low QI suggests that the market is relatively stable, and liquidity is balanced.

#### How does it help traders?

For traders, QI helps identify potential opportunities or risks due to significant shifts in the order book. If the QI is high, it may indicate an impending price movement, and traders might adjust their strategies accordingly to either capitalize on or mitigate risks from these movements. By tracking QI, traders can make more informed decisions about entering or exiting positions based on realtime changes in market depth.

#### **Quote Asymmetry**

#### What does it capture?

Quote Asymmetry measures the imbalance in the pricing and weighted liquidity between bids (buy orders) and asks (sell orders) at different levels of the order book. It assesses how the bid and ask sides are asymmetrically distributed, factoring in the proximity of prices to the market midpoint. The metric is calculated by weighting the liquidity at each level, with adjustments based on the deviation of each price from the market midpoint. The result quantifies the relative imbalance between the bid and ask sides in terms of their liquidity and price positioning.

#### Why is it useful?

Quote Asymmetry provides traders with a deeper understanding of order book dynamics, specifically the relative pressure from buyers and sellers at various price levels. A higher value



indicates that the order book is more biased towards one side (either bid or ask), which can signal potential price movement in the direction of the heavier side. A lower value suggests a more balanced market, with liquidity distributed evenly between the bid and ask sides.

#### How does it help traders?

For traders, Quote Asymmetry is useful in identifying when the market might be skewed towards one side, either due to a larger concentration of orders or more aggressive pricing. A higher Quote Asymmetry (especially if it leans towards the ask side) could indicate potential downward price pressure, while a higher value on the bid side may suggest upward movement. This information can help traders anticipate market behavior and refine their strategies, especially in fast-moving or volatile markets.

# **Quote Concentration**

# What does it capture?

Quote Concentration measures the relative distribution of liquidity across bids and asks in the order book, weighted by their proximity to the market midpoint. This metric calculates how concentrated the liquidity is at the best bid and best ask prices, considering the size of orders at each level. The concentration is influenced by the deviation of the prices from the midpoint, providing insight into how the market liquidity is distributed relative to the current price.

#### Why is it useful?

Quote Concentration helps traders understand the level of liquidity available in the market and its proximity to the current market price. A high Quote Concentration suggests that a significant amount of liquidity is concentrated around the best bid and ask prices, indicating a more competitive and tight market. A low concentration could imply a less liquid market where orders are spread out further from the midpoint, leading to potential price instability.

#### How does it help traders?

For traders, Quote Concentration can serve as a gauge of market liquidity and depth. A higher concentration suggests that liquidity is tightly concentrated near the current price levels, offering less slippage risk when executing orders. A lower concentration might signal that liquidity is spread out, increasing the likelihood of price slippage and less favorable execution. Traders can use this



information to assess how easily they can execute trades without significantly affecting the price, and adjust their strategies accordingly.

# **Quote Intensity**

#### What does it capture?

Quote Intensity measures the frequency and volume of changes in the order book at specific price levels, particularly focusing on the best bid and ask prices. This metric tracks how much the liquidity at each level is changing between two consecutive timestamps, reflecting the activity and volatility of the order book.

#### Why is it useful?

Quote Intensity provides insight into the dynamic nature of the market. A high Quote Intensity suggests frequent updates or changes in bid and ask sizes, indicating higher market activity, potential volatility, or shifts in market sentiment. On the other hand, a low Quote Intensity indicates a more stable or passive market, with fewer changes in liquidity at the best price levels.

#### How does it help traders?

Traders can use Quote Intensity to assess the stability and liquidity of the market. High intensity can indicate a rapidly changing market where price movements may be more volatile, which may require adaptive strategies for execution, such as using limit orders or hedging against potential slippage. A lower intensity suggests less market activity, providing traders with more certainty in the order book's stability and liquidity.

#### **Quote Skewness**

#### What does it capture?

Quote Skewness measures the asymmetry or imbalance in the distribution of liquidity (the sizes of bids and asks) around the mid-price of the order book. It quantifies whether the liquidity is more concentrated on the bid or ask side, and whether price levels are more spread out in one direction. A skewness value indicates if there's a greater amount of liquidity on one side, which could lead to price pressure.

#### Why is it useful?



Quote Skewness provides insight into the market's order book structure and the potential for price movement. A positive skewness suggests the ask side is more liquid or compressed, potentially indicating downward price pressure, while a negative skewness indicates that the bid side may be more liquid or compressed, potentially leading to upward price movement. It helps in understanding the market sentiment and order book pressure.

# How does it help traders?

Traders can use Quote Skewness to gauge potential price movement directions and market pressure. A highly skewed order book could indicate that the market is more likely to move in a certain direction. Traders may adjust their strategies accordingly, such as being more cautious in a market with extreme skewness or exploiting the imbalance by adjusting their order sizes. It can also provide a signal of potential market reversals or trends based on liquidity distribution.

#### Static Order Flow Imbalance

# What does it capture?

The Static Order Flow Imbalance (Dynamic in the provided code) measures the difference between the inflow of bids and asks over time. This metric evaluates how orders on both sides of the book have changed, helping to capture the relative strength or weakness of each side in the market (bids vs. asks).

# Why is it useful?

The Static Order Flow Imbalance gives an indication of whether there is more buying or selling pressure in the market. A positive imbalance indicates that the market may be skewing toward buying pressure (bids), while a negative imbalance suggests selling pressure (asks). This helps traders assess the market's supply and demand balance.

#### How does it help traders?

Traders can use this metric to identify market trends based on order flow. If the imbalance is large and positive, there might be an opportunity to enter a long position. Conversely, if the imbalance is negative, it might suggest a shorting opportunity. The use of the logarithmic transformation could provide a more nuanced view of smaller fluctuations in order sizes, helping traders make more informed decisions.

#### **Spread**



#### What does it capture?

The Spread measures the difference between the highest bid and the lowest ask in the order book up to the specified level. It captures the cost to transact between buying and selling at the most favorable prices across all levels of liquidity. A smaller spread generally indicates better market liquidity, while a larger spread suggests lower liquidity or more significant price disparity between buyers and sellers.

#### Why is it useful?

The Spread provides insights into the liquidity of a market. A tight spread suggests a more efficient market with lower transaction costs, while a wide spread can indicate higher volatility or uncertainty. It is a crucial indicator for assessing market depth and the cost of execution.

#### How does it help traders?

Traders use the Spread to gauge transaction costs and liquidity conditions. A narrower spread can suggest favorable conditions for executing trades with minimal slippage, while a wider spread may signal caution due to potential price fluctuations or less liquidity. Traders can adjust their strategies accordingly to minimize execution costs or take advantage of price discrepancies.

#### Trade Imbalance

#### What does it capture?

Trade Imbalance quantifies the relative weight of buy and sell trades in the market, reflecting the balance or imbalance between the buying and selling activity. It compares the total notional value of buy trades to the combined notional value of buy and sell trades.

#### Why is it useful?

Trade Imbalance highlights the relative strength of market participants, helping to understand whether there is more buying or selling pressure. A higher value indicates stronger buying pressure, while a lower value indicates stronger selling pressure, which can inform price movement expectations.

#### How does it help traders?



Traders use Trade Imbalance to gauge market sentiment and potential price direction. An imbalance could signal potential upward or downward movement, allowing traders to align their strategies accordingly—either by joining the prevailing trend or anticipating a reversal.

# Weighted Mid

# What does it capture?

Weighted Mid calculates the average price between the bid and ask sides of the order book, weighted by the size of orders at each level. It provides a more accurate mid-price by considering the depth and liquidity at various levels of the order book, rather than just the best bid and ask.

# Why is it useful?

Weighted Mid offers a refined estimate of the true market price by factoring in liquidity across multiple levels. This helps to better represent the market equilibrium and avoid the bias that may arise from relying solely on the best bid and ask.

# How does it help traders?

Traders can use the Weighted Mid as a more stable reference price for executing trades, especially in markets with large order books. It helps them to assess market conditions and make more informed decisions, reducing the risk of slippage or price distortions.