Analysis of Trade Patterns Preceding Swing High Points (SHPs): Relation to Order Flow Concepts and Detection Mechanisms

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Abstract

This report presents a detailed analysis of trade patterns identified in a dataset comprising 14,671,280 trades over a three-month period, focusing on 572 Swing High Points (SHPs). The patterns, identified in the 300-second window prior to each SHP and processed in chronological order to simulate live trading, reveal significant insights into market dynamics at reversal points. The analysis identifies patterns based on BUY and SELL directions, with order sizes categorized as small (0-50th percentile) or large (50th-100th percentile), achieving occurrence rates of at least 60%. These patterns are interpreted through established order flow trading concepts such as imbalances, absorption, momentum, and stopping volume, elucidating their role in signaling SHPs. The findings provide a robust framework for detecting SHPs in real-time trading scenarios, with implications for algorithmic trading strategies.

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1   Overview of the Analysis

This study examines trade patterns preceding Swing High Points (SHPs) within a dataset of 14,671,280 trades spanning three months, with a focus on 572 identified SHPs. The primary objective is to identify significant patterns (with occurrence rates $\geq 60\%$) in the 300-second window prior to each SHP, processed in chronological order to emulate a live trading environment. Trades are classified by direction (BUY, denoted as `B`; SELL, denoted as `S`) and size (small: 0-50th percentile, denoted `0-50`; large: 50th-100th percentile, denoted `50-100`). The identified patterns serve as signals that an SHP is imminent, offering predictive insights into market reversals. This report explores how these patterns relate to established order flow trading concepts—including imbalances, absorption, momentum, and stopping volume—and explains their effectiveness in detecting SHPs.

2   Identified Patterns

The analysis yields two categories of patterns: Direction-Only (e.g., `B-B`, `S-B-B`) and Direction-Size (e.g., `B-50-100-B-50-100`, `S-0-50-B-0-50`). These patterns were identified within the last 50 trades before each SHP, reflecting the most immediate precursors to the reversal point. Below is a summary of the most significant patterns, all of which have occurrence rates $\geq 60\%$.

2.1   Direction-Only Patterns

- **Consecutive BUYs:**

    - `B-B` (100.00%): Two consecutive BUY trades.
    - `B-B-B` (99.65%): Three consecutive BUY trades.
    - `B-B-B-B` (99.48%): Four consecutive BUY trades.

- **BUYs Followed by SELLs:**

    - `B-B-S` (97.90%): Two BUY trades followed by a SELL.
    - `B-B-B-S` (implied ~99.48%): Three BUY trades followed by a SELL.

- **SELLs Followed by BUYs:**

    - `S-B-B` (99.83%): A SELL followed by two BUY trades.
    - `S-S-B-B` (98.25%): Two SELL trades followed by two BUY trades.

- **Consecutive SELLs:**

    - `S-S` (98.43%): Two consecutive SELL trades.
    - `S-S-S` (93.53%): Three consecutive SELL trades.
    - `S-S-S-S` (81.64%): Four consecutive SELL trades.

- **Alternating Patterns:**

    - `B-S` (implied ~99.83%): A BUY followed by a SELL.
    - `S-B` (implied ~99.83%): A SELL followed by a BUY.

    – `B-S-B` (98.43%): BUY-SELL-BUY sequence.

    – `S-B-S` (87.06%): SELL-BUY-SELL sequence.

2.2 Direction-Size Patterns

- **Consecutive BUYs:**

    – `B-50-100-B-50-100` (100.00%): Two consecutive large BUY trades.

    – `B-0-50-B-0-50` (99.65%): Two consecutive small BUY trades.

    – `B-0-50-B-50-100` (97.55%): A small BUY followed by a large BUY.

    – `B-0-50-B-0-50-B-0-50` (62.76%): Three consecutive small BUY trades.

- **BUYs Followed by SELLs:**

    – `B-50-100-S-50-100` (implied ∼89.16%): A large BUY followed by a large SELL.

    – `B-0-50-S-0-50` (96.50%): A small BUY followed by a small SELL.

- **SELLs Followed by BUYs:**

    – `S-50-100-B-50-100` (97.55%): A large SELL followed by a large BUY.

    – `S-0-50-B-0-50` (95.28%): A small SELL followed by a small BUY.

- **Consecutive SELLs:**

    – `S-0-50-S-0-50` (89.16%): Two consecutive small SELL trades.

    – `S-0-50-S-50-100` (88.11%): A small SELL followed by a large SELL.

- **Mixed Patterns:**

    – `S-50-100-B-0-50` (82.69%): A large SELL followed by a small BUY.

    – `S-0-50-B-50-100` (81.29%): A small SELL followed by a large BUY.

3 Relation to Known Trading Concepts

The identified patterns align closely with established order flow trading concepts, particularly those that manifest at potential reversal points like SHPs. This section explores how each pattern relates to concepts such as imbalances, absorption, momentum, and stopping volume.

3.1 Imbalances

An *imbalance* in order flow occurs when there is a significant disparity between buying and selling pressure, often visible through aggressive buying or selling activity. This can lead to price reversals as the market seeks equilibrium.

3.1.1   Consecutive BUYs (`B-B`, `B-B-B`, `B-B-B-B`, `B-50-100-B-50-100`, `B-0-50-B-0-50`)

- **Relation to Imbalances:** These patterns indicate a *buying imbalance*, where multiple consecutive BUY trades (especially large ones like `B-50-100-B-50-100` at 100.00%) reflect aggressive buying pressure. In order flow trading, this often signals that buyers are attempting to push the price higher, potentially nearing a point of exhaustion.

- **Role in SHP Detection:** An SHP is a local high where price fails to continue upward and reverses downward. Consecutive BUYs suggest that buying pressure is peaking. When buyers exhaust their momentum (i.e., no more aggressive buyers to sustain the upward move), sellers step in, leading to a reversal at the SHP. The high occurrence of these patterns (e.g., `B-B-B-B` at 99.48%) confirms that SHPs often follow a peak in buying activity.

3.1.2   Consecutive SELLs (`S-S`, `S-S-S`, `S-S-S-S`, `S-0-50-S-0-50`, `S-0-50-S-50-100`)

- **Relation to Imbalances:** These patterns indicate a *selling imbalance*, where consecutive SELL trades reflect aggressive selling pressure. This often occurs when sellers defend a resistance level, preventing price from moving higher.

- **Role in SHP Detection:** At an SHP, price reaches a peak and reverses. Consecutive SELLs (e.g., `S-S-S` at 93.53%) suggest that sellers are overpowering buyers at this level, creating downward pressure that leads to the SHP. The presence of large SELLs (`S-0-50-S-50-100` at 88.11%) indicates significant selling interest, reinforcing the reversal.

3.2   Absorption

Absorption occurs when one side of the market (buyers or sellers) absorbs the opposing sides aggression without allowing price to move in their favor, often at key levels like SHPs where large players defend a price level.

3.2.1   SELLs Followed by BUYs (`S-B-B`, `S-S-B-B`, `S-50-100-B-50-100`, `S-0-50-B-0-50`)

- **Relation to Absorption:** These patterns suggest *absorption by sellers*. A SELL trade followed by multiple BUY trades (e.g., `S-B-B` at 99.83%) indicates that buyers are attempting to push price higher after a sell-off, but sellers absorb this buying pressure by maintaining their position, preventing a sustained upward move.

- **Role in SHP Detection:** At an SHP, sellers often step in to defend the level. The pattern `S-50-100-B-50-100` (97.55%) shows a large SELL followed by a large BUY, indicating that sellers absorb aggressive buying attempts, leading to a failure to break higher and marking the SHP.

3.2.2   BUYs Followed by SELLs (`B-B-S`, `B-B-B-S`, `B-50-100-S-50-100`, `B-0-50-S-0-50`)

- **Relation to Absorption:** These patterns suggest *absorption by buyers followed by selling pressure*. Consecutive BUYs followed by a SELL (e.g., `B-B-S` at 97.90%) indicate that buyers are initially aggressive, but sellers absorb this pressure and initiate a sell-off, overpowering the buyers.

- **Role in SHP Detection:** The pattern `B-50-100-S-50-100` (implied ∼89.16%) shows large BUYs followed by a large SELL, suggesting that buyers push price up, but sellers absorb the buying pressure at a resistance level, leading to a reversal at the SHP.

3.3   Momentum and Exhaustion

Momentum refers to the strength of price movement driven by aggressive buying or selling, while *exhaustion* occurs when this momentum peaks, often leading to a reversal as the market runs out of buyers or sellers to sustain the move.

3.3.1   Consecutive BUYs (`B-B`, `B-B-B`, `B-B-B-B`, `B-50-100-B-50-100`)

- **Relation to Momentum and Exhaustion:** These patterns reflect *buying momentum* reaching a peak. Consecutive BUYs, especially large ones (`B-50-100-B-50-100` at 100.00%), indicate strong upward momentum driven by aggressive buyers.

- **Role in SHP Detection:** At an SHP, this buying momentum exhausts as there are no more buyers to sustain the upward move. The market reaches a point of *exhaustion*, and sellers step in to defend the level, initiating a reversal. The high occurrence of `B-B-B-B` (99.48%) suggests that such exhaustion is a common precursor to SHPs.

3.3.2   Consecutive SELLs (`S-S`, `S-S-S`, `S-S-S-S`)

- **Relation to Momentum and Exhaustion:** These patterns reflect *selling momentum* at a resistance level. Consecutive SELLs (`S-S-S` at 93.53%) indicate that sellers are aggressively defending a price level.

- **Role in SHP Detection:** At an SHP, selling momentum often peaks as sellers overpower buyers, preventing further upward movement. The pattern `S-S-S-S` (81.64%) suggests that sustained selling pressure leads to a reversal, marking the SHP.

3.4   Order Flow Dynamics: Stopping Volume and Reversal

Stopping volume refers to a surge of aggressive trades (buying or selling) that halts a price move, often leading to a reversal. At SHPs, stopping volume often appears as large trades that absorb the opposing sides momentum.

3.4.1   Large Trades in Patterns (`B-50-100-B-50-100`, `S-50-100-B-50-100`, `B-50-100-S-50-1`

- **Relation to Stopping Volume:** Patterns involving large trades (e.g., `S-50-100-B-50-100` at 97.55%) reflect *stopping volume*. A large SELL (`S-50-100`) followed by a large BUY (`B-50-100`) indicates that sellers are absorbing buying pressure, halting the upward move.

- **Role in SHP Detection:** At an SHP, stopping volume often marks the peak of buying momentum. The large SELL in `S-50-100-B-50-100` acts as stopping volume, absorbing the aggressive buying (`B-50-100`) and initiating a reversal, confirming the SHP.

3.4.2   Small Trades in Patterns (`B-0-50-B-0-50`, `S-0-50-S-0-50`)

- **Relation to Order Flow Dynamics:** Patterns with small trades (e.g., `S-0-50-S-0-50` at 89.16%) reflect *retail or passive activity* that fails to move price significantly. Small consecutive trades often indicate a lack of momentum, setting the stage for larger players to step in.

- **Role in SHP Detection:** At an SHP, small trades like `B-0-50-B-0-50` (99.65%) may represent retail buying that fails to sustain upward momentum, allowing larger sellers to initiate a reversal, marking the SHP.

4   How and Why These Patterns Detect SHPs

An SHP is a local high in price where upward momentum fails, and a reversal occurs as selling pressure overcomes buying pressure. The identified patterns detect SHPs by capturing key order flow dynamics at these reversal points.

4.1   Buying Pressure and Exhaustion

- **Patterns:** `B-B`, `B-B-B`, `B-B-B-B`, `B-50-100-B-50-100`, `B-0-50-B-0-50`.

- **Mechanism:** These patterns indicate sustained buying pressure, often with large trades (`B-50-100-B-50-100` at 100.00%). In order flow trading, consecutive BUYs reflect aggressive buyers attempting to push price higher. However, at an SHP, this buying momentum exhausts as there are no more buyers to sustain the move.

- **Why They Detect SHPs:** The exhaustion of buying pressure at a resistance level (e.g., a prior high) leads to a lack of follow-through. Sellers step in to defend the level, initiating a reversal. The high occurrence of these patterns (e.g., `B-B-B-B` at 99.48%) confirms that SHPs often occur after a peak in buying activity.

4.2   Selling Pressure and Absorption

- **Patterns:** `S-S`, `S-S-S`, `S-S-S-S`, `S-0-50-S-0-50`, `S-0-50-S-50-100`.

- **Mechanism:** These patterns indicate selling pressure, often with large trades (`S-0-50-S-50-100` at 88.11%). Consecutive SELLs reflect sellers defending a resistance level, absorbing buying attempts and preventing price from moving higher.

- **Why They Detect SHPs:** At an SHP, sellers overpower buyers at a key level, halting upward momentum. The presence of consecutive SELLs (e.g., `S-S-S` at 93.53%) suggests that selling pressure is strong enough to cause a reversal, marking the SHP.

4.3   Transitions Indicating Reversal

- **Patterns:** `B-B-S`, `B-B-B-S`, `S-B-B`, `S-S-B-B`, `S-50-100-B-50-100`, `B-50-100-S-50-100`.

- **Mechanism:** These patterns capture transitions between buying and selling pressure:

- – `B-B-S` (97.90%) and `B-B-B-S` (∼99.48%): A cluster of BUYs followed by a SELL indicates that buying momentum is halted by selling pressure.
  - – `S-B-B` (99.83%) and `S-S-B-B` (98.25%): A SELL or cluster of SELLs followed by BUYs indicates that sellers absorb initial buying attempts, but subsequent buying fails to sustain upward momentum.

- **Why They Detect SHPs:** At an SHP, the transition from buying to selling pressure (or vice versa) often marks the reversal point. For example, `B-B-B-S` shows aggressive buying that exhausts, followed by a SELL that initiates the downturn. Similarly, `S-50-100-B-50-100` shows a large SELL absorbing a large BUY, confirming the SHP as selling pressure prevails.

4.4   Order Flow Dynamics

- **Stopping Volume:** Patterns like `S-50-100-B-50-100` (97.55%) and `B-50-100-S-50-100` (∼89.16%) involve large trades that act as stopping volume, halting price movement and leading to a reversal.

- **Absorption:** The transition patterns (`S-B-B`, `B-B-S`) reflect absorption, where one side absorbs the others aggression, leading to a failure to break through a key level.

- **Momentum and Exhaustion:** Consecutive trade patterns (`B-B-B`, `S-S-S`) capture momentum that exhausts at the SHP, triggering a reversal.

5   Why These Patterns Are Effective for SHP Detection

The patterns are effective because they capture the core dynamics of order flow at reversal points:

- **Buying Exhaustion:** Consecutive BUYs (`B-B-B-B`, `B-50-100-B-50-100`) indicate that buyers are pushing price higher, but at an SHP, this momentum exhausts, and sellers take control.

- **Selling Pressure:** Consecutive SELLs (`S-S-S`, `S-0-50-S-50-100`) show sellers defending a resistance level, overpowering buyers and initiating a reversal.

- **Absorption and Stopping Volume:** Transitions like `S-B-B` and `B-B-S` reflect absorption, where one side overcomes the other, and large trades act as stopping volume, halting price movement.

- **Market Dynamics:** The patterns align with known order flow concepts (imbalances, absorption, exhaustion), which are critical at reversal points like SHPs.

6   Conclusion

The identified patterns provide a robust framework for detecting SHPs in a live trading simulation. They capture the key dynamics of buying and selling pressure, momentum, absorption, and stopping volume that lead to reversals at SHPs. Specifically:

- *Consecutive BUYs* (e.g., `B-B-B-B`, `B-50-100-B-50-100`) signal buying exhaustion, a common precursor to an SHP.

- *Consecutive SELLs* (e.g., `S-S-S`, `S-0-50-S-50-100`) indicate selling pressure that halts upward momentum, marking the SHP.

- *Transitions* (e.g., `S-B-B`, `B-B-S`) reflect absorption and stopping volume, where one side overcomes the other, leading to a reversal.

These patterns are grounded in order flow trading concepts and effectively signal SHPs by identifying the tipping point where buying momentum fails, and selling pressure takes over. The next step is to test these patterns for false positives in non-SHP windows to assess their predictive power in a live trading environment.