

1. Risk Management in Trading

Stop-Loss Orders

- **Role:** A stop-loss order automatically exits a trade when the price moves against the trader beyond a predefined level.
- **Example:** If you buy a stock at \$100, you can set a stop-loss at \$95. If the price drops to \$95, the trade closes automatically, limiting your loss to \$5 per share.
- **Benefit:** Prevents large losses by cutting off trades that go against the prediction.

Position Sizing

- **Role:** Determines how much capital is allocated to a single trade to manage the total risk exposure.
- **Example:** If your total capital is \$10,000 and you limit risk to 2% per trade, you allocate \$200 per trade. For a stock priced at \$50, you buy only 4 shares.
- **Benefit:** Limits potential losses per trade and ensures no single trade significantly impacts the portfolio.

Portfolio Diversification

- **Role:** Spreads investment across various assets or markets to reduce dependency on a single trade.
- **Example:** Instead of investing all in tech stocks, allocate to tech, healthcare, and utilities.
- **Benefit:** Losses in one sector can be offset by gains in another, reducing overall portfolio risk.

2. Volatility and Its Role in Trading

Definition:

Volatility measures the rate and magnitude of price changes in a market. High volatility means larger price swings, while low volatility means stable prices.

Effect on Pairs Trading Strategy:

- **Example:** In pairs trading, if one stock moves erratically (high volatility), it can disrupt the relationship with its pair, leading to unpredictable outcomes.
- **Adjustment:** Avoid entering trades during periods of high volatility unless explicitly accounted for in the strategy.

Adjusting Entry and Exit Points:

- **Example:** If volatility spikes, widen the entry and exit thresholds to account for larger price swings.
 - **Entry:** Buy when the spread between the pair is wider than usual.
 - **Exit:** Close the trade once the spread normalizes, considering the increased range.

3. Variance Threshold for Feature Selection

Definition:

Variance thresholding removes features with low variability, assuming they carry little information for predictions.

Application in Trading:

- **Example:** If a feature (e.g., moving average of 1 week) shows almost constant values over time, it can be removed as it may not provide predictive insights.

Benefits:

- Reduces model complexity.
- Focuses on features that contribute most to predictions.

Drawbacks:

- May discard useful features that are only sporadically significant.
- Example: A low-variance feature like volume might still indicate critical moments.

4. Stop-Loss Orders and Their Effectiveness**Advantages:**

- **Automatic Risk Control:** Stops emotional trading.
- **Example:** In pairs trading, if a spread widens unexpectedly, the stop-loss exits to prevent further losses.

Disadvantages:

- **Market Conditions:** Sudden price gaps can bypass the stop-loss level.
- **Example:** If a stock closes at \$50 and gaps to \$40 overnight, a stop-loss set at \$45 won't trigger.

Ineffectiveness:

- During volatile markets with frequent price swings, a stop-loss may trigger prematurely, resulting in unnecessary exits.

5. Volatility Threshold Strategy**How It Works:**

- Sets specific volatility levels as criteria for entering or exiting trades.
- **Example:** If the volatility (e.g., measured by Bollinger Bands) exceeds a threshold, avoid entering the trade due to increased uncertainty.

Application with Kalman Filter:

- Kalman filters predict the relationship between pairs by smoothing price noise.

- **Example:** Use volatility thresholds to decide when to apply the Kalman filter predictions, avoiding erratic market periods.

Risks:

- Sole reliance on volatility thresholds may ignore other critical factors like trends or news events.
- **Example:** A low-volatility period may still involve unfavorable market conditions, leading to poor trade decisions.