Trade Performance Analysis Report

1. Objective

The objective of this analysis is to evaluate the trading performance of various accounts using historical trade data from Binance. The key focus areas include calculating financial metrics such as Total PnL, ROI, Sharpe Ratio, Max Drawdown, Win Rate, and overall account ranking. The final goal is to identify the top 20 performing accounts based on a weighted scoring system.

2. Methodology

2.1 Data Preprocessing

- Mounted Google Drive (since we used Google Colab).
- Loaded the dataset into a Pandas DataFrame.
- Reads the CSV file into `df`.
- The dataset contains multiple trade records per account stored in a structured JSON format under the "Trade_History" column.
- We converted this column from a string representation to a list of dictionaries using ast.literal_eval().
- If `Trade_History` is missing (`NaN`), it is replaced with an **empty list** (`"[]"`).
- This prevents errors when applying `ast.literal_eval`
- `Ensures that rows where Trade_History is still NaN (if any) are removed.`
- The data was then exploded, breaking down multiple trades per account into individual rows for detailed analysis.
- `apply(pd.Series)`: Converts the **dictionary inside `Trade_History` into multiple columns**.

2.2 Calculated Metrics

We computed the following financial metrics:

1. **Total PnL (Profit and Loss):**
    - Summed up all realized profits per account.
    - **Formula: Total PnL=∑realizedProfit**
2. **Total Investment:**
    - Summed up all the BUY quantities per account.
    - `trades_df[trades_df["side"] == "BUY"]` → Filters only **BUY** trades (investment amounts).
    - `.groupby("Port_IDs")["quantity"].sum()` →Groups by **Port ID** (each trader).
    - Sums up the `quantity` (total amount invested).
    - `.reset_index()` → Converts the grouped data into a DataFrame.
3. **Return on Investment (ROI):**
    - Measures profitability relative to the total investment.
    - **Formula: ROI=(Total Investment / Total PnL) x 100**
4. **Sharpe Ratio:**
    - Measures risk-adjusted return using the mean and standard deviation of PnL.
    - **Formula: Sharpe Ratio = Mean PnL / Standard Deviation of PnL**
    - Handled cases where Std_PnL = 0 by replacing it with a small value to avoid division errors.
5. **Maximum Drawdown (MDD):**
    - Represents the worst peak-to-trough decline in cumulative returns.
    - **Formula: Max Drawdown = Mean PnL / Standard Deviation of PnL**
6. **Win Rate:**
    - Percentage of trades with positive realized profit.
    - **Formula: Win Rate = (Winning Positions / Total Positions) x 100**

2.3 Scoring & Ranking

- We assigned weights to different metrics to rank accounts:
    - ROI (40%)

    - Sharpe Ratio (30%)
    - Max Drawdown (-20%) (penalized for risk)
    - Win Rate (10%)
- Final score calculated as:

  Score = (ROI x 0.4) + (SharpeRatio x 0.3) + (MaxDrawdown x −0.2) +(WinRate x 0.1)

- Sorted accounts in descending order of score to get the Top 20 Accounts.

3. Findings & Insights

- Some accounts had high PnL but poor risk management, leading to low Sharpe Ratios.
- A few accounts had negative ROI due to large losses compared to their investments.
- The top 20 accounts demonstrated a balance between profitability and risk management, with high Sharpe Ratios and moderate drawdowns.

4. Challenges & Assumptions

- Some accounts had missing trade history (`NaN` values), which we replaced with an empty list.
- Accounts with zero investments were assigned ROI = 0 to avoid division errors.
- Inf & NaN values in Sharpe Ratios were replaced with 0 for meaningful comparison.

5. Conclusion

This analysis successfully ranked Binance accounts based on multiple financial metrics. The Top_20_Accounts.csv highlights the best-performing accounts based on risk-adjusted returns. This can help in identifying profitable trading strategies.