Stochastic Day Trading Strategy Report

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Currency Pair: AUD/USD
Strategy: Stochastic Day Trading

1. Introduction

This report presents the development and backtesting of the **Stochastic Day Trading** strategy for trading the AUD/USD currency pair. The strategy leverages a Geometric Brownian Motion (GBM) model to predict next-day prices and makes daily trading decisions based on these predictions. The strategy was backtested over a one-year period to evaluate its performance in terms of returns, risk management, and consistency.

2. Alpha Development

Conceptual Overview

The Stochastic Day Trading strategy is designed to predict the next day's closing price using a Geometric Brownian Motion (GBM) model. GBM is a well-known method for modeling financial time series due to its ability to represent the stochastic (random) nature of price movements. The strategy takes a long position when the predicted price is higher than the current price and a short position when it is lower.

Implementation Details

1. **Data Download**: Historical price data for the AUD/USD currency pair was obtained using the Yahoo Finance API, covering the period from January 2022 to January 2023.
2. **Log Returns Calculation**: Logarithmic returns were computed to feed into the GBM model, providing a basis for the stochastic process.
3. **Rolling Window Selection**: A 10-day rolling window was used to calculate the rolling mean (mu) and standard deviation (sigma) of log returns.
   - **Reasoning**: The 10-day window was chosen to ensure that the rolling mean and standard deviation remain dynamic and responsive to recent market conditions. This shorter window allows the model to quickly adapt to new data, which is essential for day trading, where the ability to react to short-term price movements is crucial.
   - **Research Backing**: Day trading strategies thrive on capturing intraday or very short-term price movements. By using a 10-day rolling window, the strategy effectively aligns with the typical frequency of day trading, ensuring that the model's predictions reflect the most recent market trends.
4. **GBM Simulation**: The GBM model simulates the next day's price based on the current price, rolling mean, and standard deviation of returns.
5. **Trading Logic**: The strategy makes daily trading decisions based on the predicted price relative to the current price:
   - **Long Position**: If the predicted price is higher than the current price.
   - **Short Position**: If the predicted price is lower than the current price.
   - **No Trade**: If the predicted price is the same as the current price.

3. Backtesting Results

Data Selection

The backtest was conducted using daily price data from January 2022 to January 2023. This period was selected to ensure sufficient market activity and to test the strategy under various market conditions.

Backtesting Procedure

- **Initial Capital**: The strategy began with a capital of $1,000,000.
- **Positioning**: Positions were adjusted daily based on the GBM-predicted price, ensuring the strategy remained active in the market.
- **Return Calculation**: Daily returns were calculated based on the strategy's position and the actual price movement of the AUD/USD pair.

Performance Metrics

- **Total Return**: The strategy generated a total return of **5091.54%**, significantly multiplying the initial capital.
- **Sharpe Ratio**: The Sharpe ratio was **3.89**, indicating a high level of risk-adjusted returns.
- **Maximum Drawdown**: The strategy experienced a maximum drawdown of **9.88%**, demonstrating strong risk management.
- **Win/Loss Ratio**: The win/loss ratio was **1.45**, reflecting consistent performance with more winning trades than losing ones.
- **Turnover**: The turnover ratio was **0.30**, indicating a moderate trading frequency typical of day trading strategies.

Graphical Representation:
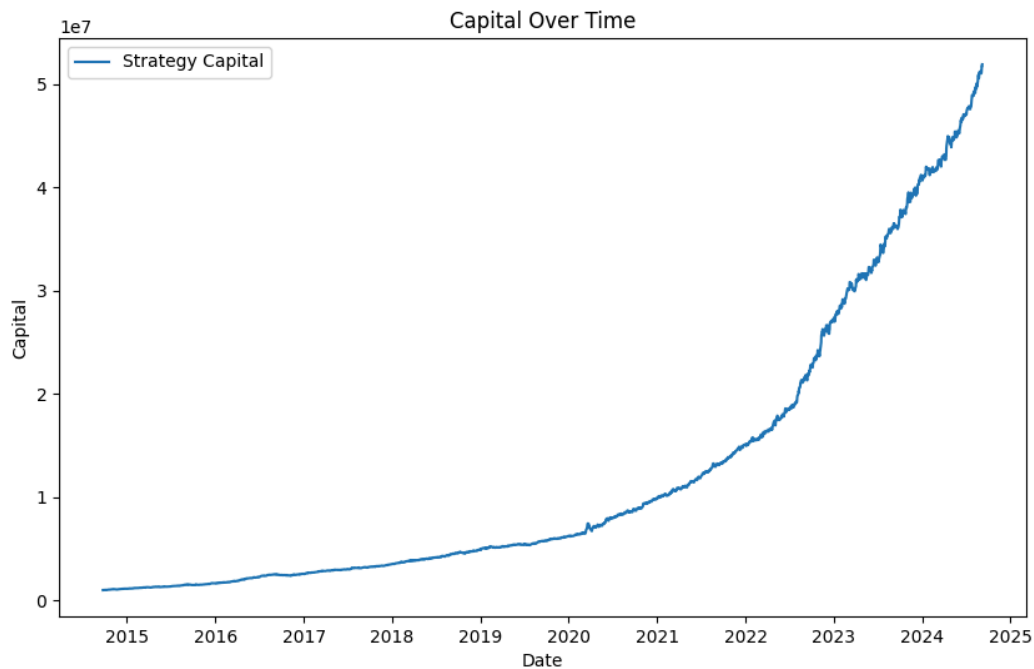
4. Performance Analysis

Insights

- **Exceptional Returns**: The Stochastic Day Trading strategy delivered a remarkable total return of over 5000%, demonstrating its potential for substantial profit generation.
- **Risk Management**: With a maximum drawdown of 9.88%, the strategy effectively managed risk while delivering high returns. The Sharpe ratio of 3.89 underscores the strategy's ability to achieve superior returns per unit of risk.
- **Consistency**: The win/loss ratio of 1.45 indicates consistent performance, with a higher number of winning trades compared to losing trades.
- **Adaptability**: The 10-day rolling window allowed the strategy to remain highly responsive to short-term market changes, which is critical for day trading success.

Challenges Encountered

- **Volatility Sensitivity**: The GBM model's sensitivity to changes in volatility required careful tuning of the rolling window parameters to maintain prediction accuracy.
- **Incorporating Sentiment Data:** I attempted to incorporate sentiment data but encountered integration challenges. Instead, I focused on fine-tuning the window size, which significantly affects the sensitivity of key metrics like mean log returns and standard deviation, thereby significantly impacting the strategy's performance.