

**OPTION TRADING USING MACHINE
LEARNING
USER GUIDE**

INTRODUCTION

This document serves as a comprehensive user guide for executing a Python-based script that analyzes the relationship between Bank Nifty and the Dual Momentum Tracker (DMT) for selected banks (HDFC and ICICI). The program is designed to fetch historical data, compute the DMT, and visualize key trends, including significant maxima and minima. The DMT is calculated based on the daily returns of the selected banks, while the Bank Nifty represents the overall index performance. The analysis is designed to provide insights into shifts in the market's momentum, allowing users to identify key points in time where significant changes occur.

This guide covers each stage of the process, from importing the necessary libraries to generating insightful visualizations, ensuring that users can follow along and understand each aspect of the execution.

PREREQUISITES

Before executing the script, ensure that your Python environment is correctly set up. The following Python packages are essential for the smooth running of the code:

- **yfinance**: Used for downloading financial data from Yahoo Finance.
- **numpy**: Required for numerical computations.
- **pandas**: Provides tools for data manipulation and analysis.
- **matplotlib**: Used for creating static, interactive, and animated visualizations.
- **scipy**: Specifically, the `scipy.signal` module is used for calculating local maxima and minima.

INSTALLATION OF DEPENDENCIES

Step 1: Import Libraries

The first step of the process involves importing all the necessary Python libraries that will be used throughout the script. These libraries allow the program to handle data, perform calculations, and generate visualizations.

Each library has its specific function in the script:

- **yfinance**: Fetches historical stock data, such as the closing prices of Bank Nifty and the selected banks.
- **numpy** and **pandas**: Handle data manipulations, including calculating daily returns and managing time series data.
- **matplotlib**: Facilitates the creation of visualizations, particularly dual-axis plots that compare Bank Nifty and the DMT.
- **scipy**: Identifies key turning points in the data by calculating local maxima and minima using signal processing techniques.

Step 2: Download Historical Data

The script is designed to download historical stock data for both Bank Nifty and the selected banks (HDFC and ICICI). This data includes daily closing prices from January 1, 2023, to August 1, 2024. The data is sourced from Yahoo Finance via the `yfinance` library, which provides an efficient interface for retrieving financial data programmatically.

Bank Nifty Index

Bank Nifty represents the performance of banking sector stocks listed on the National Stock Exchange (NSE) of India. By downloading its historical closing prices, the script can compare the general performance of the banking sector with that of individual banks.

Selected Banks

The selected banks in this analysis are HDFC Bank and ICICI Bank, two major players in India's financial sector. The script downloads their closing price data for the specified period. This data is critical for calculating the DMT, which tracks the momentum of these banks.

Step 3: Calculate the DMT Indicator

The Dual Momentum Tracker (DMT) is the main indicator used in this analysis. It is calculated by first computing the **daily returns** for each selected bank. Daily returns measure the percentage change in the closing price from one day to the next, providing a sense of how each stock is moving.

Daily Returns Calculation

For each of the selected banks (HDFC and ICICI), daily returns are calculated. This is done using the `pct_change()` function in pandas, which calculates the percentage change between the closing prices of consecutive days.

Average of Returns

After obtaining the daily returns for both banks, the DMT is calculated as the average of the daily returns of the selected banks. By taking the mean return of these two banks, the DMT provides a composite measure of momentum for the selected financial stocks.

Step 4: Smooth the DMT Using Moving Average

The DMT values can sometimes exhibit high variability due to daily market fluctuations. To make the trends clearer and reduce noise, a **moving average** is applied to the DMT.

Moving Average

A 14-period moving average is used to smooth the DMT. The moving average is a technique often used in time-series analysis to reduce short-term fluctuations and highlight longer-term trends or cycles. By applying this filter, we create a smoothed version of the DMT that can be used to better understand overall market movements, minimizing the impact of day-to-day volatility.

Step 5: Calculate Local Maxima and Minima

After smoothing the DMT, the next step is to identify potential **turning points**—specifically, local maxima (peaks) and minima (troughs). These points represent moments when the momentum of the selected banks shifts, indicating possible trend reversals.

Local Maxima and Minima

Local maxima represent the highest points (peaks) in the DMT smoothed values, while local minima represent the lowest points (troughs). The rolling window technique is used to examine each segment of the smoothed DMT, calculating where the highest and lowest values are located within a defined range.

Significance of Peaks and Troughs

Identifying these points helps traders and analysts understand when the market might be entering a period of momentum change. For example, local maxima may indicate a period where the momentum of the selected banks is peaking, potentially leading to a downturn, while local minima might suggest that momentum is bottoming out and ready to rise.

Step 6: Define Threshold and Filter Significant Points

While local maxima and minima can provide insights into trend reversals, not all turning points are significant. To filter out less important changes, a **threshold** is introduced. This threshold is based on the **standard deviation** of the smoothed DMT values and helps distinguish between minor fluctuations and more significant shifts.

Threshold Definition

The threshold is set at 2% of the standard deviation of the smoothed DMT values. By using this criterion, the script only flags turning points that represent a significant deviation from the average DMT value. This ensures that the analysis focuses on meaningful changes in market momentum, ignoring noise and minor fluctuations.

Filtering Maxima and Minima

Once the threshold is defined, the script filters the local maxima and minima, leaving only those that exceed this threshold. These points are considered significant and are highlighted in the final visualization.

Step 7: Plot the Data

The final step of the script involves plotting the **Bank Nifty closing prices** and the **smoothed DMT values** on a dual-axis graph. This allows users to visualize the relationship between the broader banking index and the momentum of the selected banks.

Dual-Axis Plot

- **Left Y-Axis (Bank Nifty):** The left y-axis represents the Bank Nifty closing prices, plotted in a dark blue line.
- **Right Y-Axis (DMT Smoothed):** The right y-axis represents the smoothed DMT values, plotted in a grey line.

This dual-axis plot allows for a direct comparison between the Bank Nifty's overall performance and the DMT, making it easy to see how the momentum of the selected banks relates to the broader market.

Significant Points

Significant maxima and minima (identified using the threshold) are highlighted in the plot. Maxima are represented by **green triangles (upward-facing)**, indicating peaks, while minima are represented by **red triangles (downward-facing)**, indicating troughs.

Conclusion

This provides a robust method for analyzing the relationship between Bank Nifty and the Dual Momentum Tracker for selected banks (HDFC and ICICI). By following the steps outlined in this guide, you will be able to:

- Download historical data for Bank Nifty and selected banks.
- Calculate the Dual Momentum Tracker based on the daily returns of the banks.
- Smooth the DMT to reduce noise and highlight trends.
- Identify and filter significant turning points using local maxima and minima.
- Generate a clear, dual-axis visualization that compares Bank Nifty performance with the DMT.