Forex Data Analysis & Trading Strategy Development

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1. Introduction
The Forex (foreign exchange) market is one of the most liquid and volatile financial markets in the world. This project analyzes historical Forex data to uncover trends, detect outliers, measure volatility, and develop trading strategies such as Moving Average Crossover and Bollinger Bands using Python.

2. Dataset Overview
The dataset includes EUR/USD daily Forex prices from [start date] to [end date].

- Source: Alpha Vantage API
- Variables: Date, Open, High, Low, Close
- Format: Time series with no missing values and cleaned for analysis.

3. Data Cleaning & Preprocessing
Steps taken:
- Converted 'Date' to datetime format
- Set 'Date' as index
- Verified numerical columns (Open, High, Low, Close)
- Sorted data in chronological order.

4. Exploratory Data Analysis (EDA)
Visualized closing prices over time and calculated simple moving averages (SMA) to observe trends. Used 10-day and 50-day SMAs to highlight potential trend shifts.

5. Outlier Detection

Outliers were detected using the Interquartile Range (IQR) method. Boxplots showed that extreme values corresponded with significant market activity, especially in the High and Low price columns.

6. Volatility Analysis

Volatility was measured using the daily price range (High - Low). Peaks in volatility often coincided with macroeconomic news. Standard deviation of closing prices was also computed to assess overall fluctuation.

7. High-Volatility Event Analysis

Notable events:

- Nov 6, 2024: U.S. elections and Fed rate cut led to a sharp USD appreciation.
- Mar 5, 2025: Trade war announcements led to market uncertainty and EUR/USD volatility.

8. Trading Strategy Development

Two technical strategies were implemented:

1. Moving Average Crossover:
- Buy: SMA_10 crosses above SMA_50
- Sell: SMA_10 crosses below SMA_50

2. Bollinger Bands:
- Buy: Price touches lower band
- Sell: Price touches upper band

9. Backtesting & Evaluation

Backtested both strategies:
- Calculated signal-based returns
- Visualized cumulative performance
- Moving Average performed well in trends; Bollinger Bands in range-bound markets.

10. Conclusion & Recommendations

This analysis confirms the effectiveness of data-driven strategies in Forex trading. Key takeaways:
- Strategies must match market conditions (trend vs range)
- Events significantly affect volatility

Recommendations:
- Add RSI/MACD for better signals
- Automate strategy logic
- Explore machine learning forecasting
- Extend analysis to more currency pairs.

11. References

- Alpha Vantage API: https://www.alphavantage.co
- Bollinger, J. (2001). Bollinger on Bollinger Bands.
- Tukey, J. W. (1977). Exploratory Data Analysis.