Project Report

Time Series Analysis
Of ITC stock

Project – 2

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The presented R code delves deeply into the time series characteristics of **ITC** stock prices, offering a multifaceted approach to understanding its behavior over the period from **January 1, 2018, to December 31, 2023**.

1. Data Retrieval: Utilizing the quantmod package, the code extracts historical ITC stock prices from Yahoo Finance. By isolating the closing prices, a time series object is formed, setting the stage for a rigorous analysis.

2. Stationarity Testing: To assess the stationarity of the stock prices and returns, the Augmented Dickey-Fuller (ADF) test is employed. The findings reveal that the raw stock prices exhibit a non-stationary behavior, necessitating further differencing. Conversely, the log returns demonstrate stationarity, indicating that this transformation is crucial for a more stable time series analysis.

3. Autocorrelation Analysis: Auto ARIMA modeling and Ljung-Box tests are utilized to scrutinize autocorrelation patterns within the time series. The code generates autocorrelation and partial autocorrelation functions for both stock prices and returns, unraveling potential serial dependencies.

4. ARIMA Modeling: The Auto ARIMA algorithm is employed to identify suitable models for stock returns and prices individually. The ARIMA(3,0,2) model with a non-zero mean is selected for returns, capturing the underlying temporal patterns. Simultaneously, the ARIMA(5,2,0) model is deemed appropriate for modeling stock prices, considering the intricacies of the time series.

5. GARCH Modeling: Two GARCH models are fitted to the residuals obtained from the ARIMA models. These GARCH models incorporate mean components based on ARFIMA specifications, allowing for a more nuanced understanding of conditional variance dynamics. The results of this step reveal the presence of volatility clustering and heteroskedasticity in the stock returns.

6. Forecasting: In the final phase, the code generates forecasts for the next 50 periods using the selected GARCH model. The forecast encompasses predicted returns and associated volatility estimates, offering a glimpse into potential future stock behavior and associated uncertainties.

7. Volatility Clustering Tests: To validate the GARCH model's efficacy, the code conducts Box tests and ARCH tests, scrutinizing the presence of volatility clustering or heteroskedasticity in the squared residuals series.

In conclusion, this comprehensive time series analysis equips investors and analysts with a robust framework for deciphering the temporal patterns, stationarity nuances, and volatility dynamics of ITC stock. The forecasting component augments this understanding, facilitating more informed investment decisions in the dynamically evolving stock market landscape.