**Project Title:** High-Frequency Forex Simulation and Econometric Analysis (Volatility Focus)

**Project Goal:** Simulate high-frequency Forex tick data, and perform econometric analysis focused on calculating and analyzing volatility, using only the 'mid' price.

**Core Components:**

1. **Data Generation:** Generate artificial data for 1 min and 5 min interval for 10 currency pairs (prefer G10) at least for 1 years
2. **Volatility Calculation:**
   1. **Objective:** Calculate different types of volatility measures from the 'mid' price data.
   2. **Implementation:**
   3. **Historical Volatility:** Calculate the standard deviation of returns (log returns are generally preferred). Experiment with different window sizes (e.g., 1 minute, 5 minutes, 1 hour). Calculate both simple historical volatility and exponentially weighted moving average volatility (EWMA).
   4. **Realized Volatility:** Calculate realized volatility using the sum of squared returns within a specific period (e.g., 1 minute, 5 minutes). This is a high-frequency estimate of volatility.
   5. **Volatility Jumps:** Implement a method to detect volatility jumps. This can be done by comparing the realized volatility to a rolling average of past realized volatility. A jump is detected if the current realized volatility exceeds the rolling average by a certain threshold (e.g., 3 standard deviations).
3. **Analysis and Visualization (Do Charts in Excel):**
   1. **Objective:** Analyze and visualize the calculated volatility measures.
   2. **Implementation:**
      1. Plot the historical volatility, EWMA volatility, and realized volatility over time.
      2. Plot the detected volatility jumps on the same chart, highlighting the jump events.
      3. Calculate descriptive statistics for each volatility measure (mean, standard deviation, min, max).
      4. Analyze the relationship between different volatility measures (e.g., correlation).
      5. Consider creating a histogram of the volatility values.
4. **Intraday Seasonality:** Analyze and model the intraday seasonality of volatility in python.

**Deliverables:**

* A Python script containing all the functions and code.
* A report (2-3 pages) summarizing the project, the data generation process, the volatility calculations, jump detection method, and the analysis of the results. Include the plots and descriptive statistics.
* Clear comments in the code explaining the logic and implementation.