Programming Task for Causality Group

The next round of our interview process is an implementation task, where we look at the usage of good programming practices along with clarity, usability and stability of the resulted program code.

Please implement the below task in C# or Python, using your favorite programming environment and any external libraries you find convenient. Once satisfied and confident with the results, send us the final software code, a textual summary and two resulted .csv files.

Strategy Simulation

Data used for the simulation is open and close prices of a subset of US equities. Download open and close prices from Google finance for the Dow Jones Industrial Average index constituents. The download will rely on the "Download to spreadsheet" link e.g. at https://www.google.com/finance/historical?q=NASDAQ%3AAAPL. You can automate the download (many options are already implemented for this) or download manually.

Get the prices for the following ticker symbols, which are the current constituents of Dow Jones. Our trading universe is:

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AAPL, AXP, BA, CAT, CVX, CSCO, DIS, DD, XOM, GE, GS, HD, IBM, INTC,
JNJ, JPM, KO, MCD, MMM, MRK, MSFT, NKE, PFE, PG, TRV, UTX, UNH, VZ, V,
WMT
```

Build a trading strategy simulation for simple open to close trading. The backtest should only allow trading from the opening cross of a given day to the closing cross of the same day. We are entering at the open price and exiting at close price during the same day, overnight positions are not allowed.

Run the simulation daily from 1st of Jan, 2016 until 1st of Jan 2017 for all the tickers in the above universe. Save trading results in a .csv file, where columns are the above ticker symbols sorted alphabetically and rows are dates of the simulation in chronological order. Values in the .csv file should indicate the US dollar amount gained or lost on a given symbol on a particular day, applying the trading strategies below.

The two trading strategies to implement and simulate are:

- Mimic strategy:
  - Buy 1 stock at market open, if the close price of the previous trading day was higher than the open price of the previous trading day. Sell this stock at market close on the same day.
  - Short sell 1 stock at market open, if the close price of the previous trading day was lower than the open price of the previous trading day. Buy back this stock at market close.
  - Stay neutral otherwise.

- Volatility strategy:
  - Buy 1 stock at market open, if daily volatility has reduced during the last trading day. That is, buy if

    ```
    (close - open) * (close - open) of the last trading day <
    < (close - open) * (close - open) of two trading days ago.
    ```

    Sell this stock at market close.
  - Short sell 1 stock at market open, if daily volatility has increased during the last trading day. That is, short sell if

    ```
    (close - open) * (close - open) of the last trading day >
    > (close - open) * (close - open) of two trading days ago.
    ```

    Buy back this stock at market close.
  - Stay neutral otherwise.

Run the simulation for the above two strategies and calculate aggregated profit and loss for both strategies across time.

Results

Please send the final result to hiring@causality-group.com, including:
- Summary of the results including final profit and loss in a text file named `summary.txt`
- The two resulted .csv files with names `mimic.csv` and `volatility.csv`
- The program code

Good luck,
Causality Group