Math 5440: Week 5 Assignment

Due Date: February 24, 2023 at 10am

Exercise **Computing Impact States for a Given Date**

Load the binned stock data using

```
\l pathToHdbFolder\columbiaHdb
```

Load in memory the table for the date 2019.01.03.

1. For a given halflife h, trade vector, adv and vol, implement a function that returns the impact state vector.
   One refers to the input and output types of a function as its signature. The signature of your impact function should be

   ```
   computeImpact: {[trade; adv; vol; h] ...}
   ```

   where the function accepts both numeric atoms and vectors for trade, vol, and adv. It should only take numeric atoms for h. We say that the function is *vectorized* over trade, adv, and vol but not h. Vectorization circumvents the need for looping over values, speeding up computations and improving code readability.
2. Let $h = 1, 5, 30, 60$ min be halflifes. Using the cross operator, create a table that duplicates each row for each halflife h. Therefore, h becomes a column of your table, and your table should have four times as many rows as previously.
3. For each halflife h and stock, compute the impact state vector across time. Be sure to scale the model using adv and vol.
4. Let $\Delta t = 1, 15, 60$ min be prediction horizons. Using the cross operator, create a table that duplicates each row for each prediction horizon. For each prediction horizon, compute the corresponding returns $r = P_{t+\Delta t}/P_t - 1$ and differences in impact states $\Delta I = I_{t+\Delta t} - I_t$. Alternatively, execute questions 4. and 5. for a given Δt and loop over Δt if the cross table is too large to fit in memory.
5. For each stock, halflife, and prediction horizon, compute the covariance $\mathbb{E}[r\Delta I]$ and the variance $E[(\Delta I)^2]$.