University of Amsterdam

Financial Markets

Group Assignment 1

The data for the assignment are contained in an Excel file, KrispyKreme2021.xlsx available on Canvas: a record of one day's transactions in the shares of the US company Krispy Kreme in March 2008. The data comprise:

- time of the transaction
- size of the transaction ($|q_t|$)
- (average) transaction price (p_t)
- best bid price immediately before the transaction
- best ask price immediately before the transaction
- d_t: order direction indicator

(a) For each transaction, compute (but do not report in your solution) the (i) quoted spread in absolute terms; (ii) the quoted spread in relative terms; (iii) the effective half-spread in absolute terms; (iv) the effective half-spread in relative terms.

Compute (and report in your solution) the averages of these measures for the trading day. How does the average effective half-spread compare with the average quoted half-spread? How would you explain this finding (investigate your claim)?

(b) For each trade, starting from the 101-th trade, compute the average of the (quoted) relative spread for the past 100 trades. Plot a graph of your results. What kind of pattern emerges over the day?

(c) Starting from the second trading round ($t = 2$), compute the change in the mid-price from time $t-1$ to time t, $\Delta m_t = m_t - m_{t-1}$ (e.g., for the second trading round you have $\Delta m_2 = m_2 - m_1$), and the change in the transaction price from time $t-1$ to time t, $\Delta p_t = p_t - p_{t-1}$. Run two OLS regressions (e.g., in Excel):

$$\Delta m_t = \alpha_m + \beta_m \, \Delta m_{t-1} + \epsilon_t \quad \text{and} \quad \Delta p_t = \alpha_p + \beta_p \, \Delta p_{t-1} + \epsilon_t$$

Report the coefficients and t-stats (note: the dataset for the regressions starts in $t = 3$ since you have no Δp_{t-1} for $t = 2$). What signs do the beta coefficients have, and how would you interpret/explain these findings?

(d) For each trade, starting from the 101-th trade, compute the *Volume Weighted Average Price* (VWAP) over the past 100 trades,

$$VWAP = \frac{\sum p_t |q_t|}{\sum |q_t|},$$

where q_t and p_t are the size and price of the t-th trade. Plot the evolution of the transaction price and the VWAP over the trading day (starting from the 100-th trade).

In practice, the VWAP is sometimes used as a benchmark to gauge the execution performance of brokers and other traders. The idea is that a trader does a good job in executing an order when the transaction price is more attractive than the VWAP of past trades (i.e., lower for buy orders and higher for sell orders). What do you think of this reasoning?

(e) Using the transaction price data, compute Roll's estimate of the bid-ask spread for the day. How does this estimate compare with the average quoted spread that you computed in part (a)? How would you explain this finding?

Hint: for some questions, the `IF` function in Excel comes in handy.