

# **TAQ Report**

Zhan ZHANG

Introduction:

In today's era, minimizing trading costs in a complex financial environment is critical to improving trading performance and maximizing returns. Trading costs can significantly impact the net result of trading activity, choosing where traders send their orders a strategic decision. Our report focuses on analyzing critical indicators of execution quality for various exchanges. This determines the best exchange for routing orders to minimize transaction costs.

#### Data Overview:

The analysis in our report is based on a dataset containing a variety of trades executed on 10 different exchanges over a specific period of time. Our dataset includes detailed transaction data. Such as trading date, time, size, price and details of the exchange corresponding to each trade. First of all, we can calculate the index of the quoted percentage and effective spread at the execution of each trade through the data. Second, by focusing on these spread metrics, our report utilizes reliable quantitative data to evaluate and compare the transaction costs associated with each exchange. Finally, with this systematic approach, we can identify the most cost-effective trading venues.

#### Data Analysis:

We use the data to calculate Percent Quoted Spread and Percent Effective Spread for each exchange. Percent Quoted Spread is essentially the inherent cost of buying and selling spreads on quotes, providing a snapshot of market depth. In the meantime, The Percent Effective Spread measures the actual cost of execution at the time of the trade relative to the midpoint of the NBBO. Through the above methods, we can assess trade efficiency more directly. We conclude from comparing these two data that the percent quoted spreads are relatively uniform across all exchanges, averaging approximately 0.0084. This suggests that market depth is consistent across

venues. However, a more telling divergence emerges in the percentage effective spreads, which vary widely, suggesting that some exchanges provide more cost-effective trade execution than others. Exchange J, for example, reports the lowest average percent effective spread (0.102217), which is most favorable to traders seeking the lowest trading costs. Conversely, Exchange X exhibits the highest spread (0.251341), which may indicate less favorable execution conditions or higher volatility. From this, we conclude that routing orders through Exchange J would be the most beneficial for traders prioritizing cost efficiency given the current data. [⊕]

#### Market Segmentation Analysis:

In conducting the research, our group found that the dynamics of the volume of trades between exchanges also provide a lot of clues about market behavior and trading strategies. Our group calculated the "average transaction size" of each exchange. Through the calculated data, we can measure whether there is a market segment for the transaction size. The average transaction size data not only reflects the nature of trading activity, but also helps us identify a breakdown of the participants active on each platform. Second, we calculate the average trade size of 10 exchanges by calculating the cumulative trade size over a given period of time. These averages range from a low of 23.59 on the Exchange P to a high of 138.75 on the Exchange Q. Our group believes that these figures show that the size of transactions conducted on different platforms varies greatly.

What is more, looking at the average transaction size in our dataset, we find that the Q exchange has the highest average transaction size at 138.75. 138.75 May indicate that the exchange is favored by institutional investors, who are involved in a large number of securities transactions. However, our group found that Exchange P had the smallest average transaction size at 23.59 and Exchange J had an average transaction size of 38.6. We speculate that retail investors may be more inclined or more frequently to trade smaller amounts. We believe retail investors are doing

smaller trades and their expectations may be more speculative. Next, other exchanges, such as Exchange D(87.08), Exchange V(81.90) and Exchange Z(61.69), all have different average transaction sizes. We think this data tells us that there are very many different types of trading activity and participants in the market. Looking at the average transaction size of the above exchanges, our group found that the difference in the average transaction size of the exchanges indicates that there is segmentation in the market. In other words, different exchanges serve different trading populations. We believe this segmentation influences trading strategies and choices, underscoring the importance of combining trading activity with the characteristics of each exchange to effectively take advantage of market opportunities.

#### Figure Analysis:

We use the NBBO mid-points to do the time series model, and Appendix 2 shows a relatively stable NBBO midpoint, which indicates that the market for that particular security was stable over the time period shown. A stable NBBO midpoint may imply good liquidity, as large price fluctuations are usually a sign of liquidity problems. By examining the consistency of the NBBO midpoint, we can assess how external factors or market events affect market pricing. The stability of this indicator suggests that the market absorbed buy and sell orders efficiently, thus causing no significant price disruptions.

We also calculated the variance and volatility of the NBBO, which is 0.0086294, which indicates the extent to which prices at the midpoint varied from their mean over the period analyzed. The variance of the realistic price is small, indicating that the price did not fluctuate much from its mean and that market conditions were more stable or less volatile over the time frame studied. This is also evidenced by the volatility of 0.09289493, which indicates the average degree of volatility of the NBBO midpoint relative to its mean. Both volatility and variance can indicate

that the NBBO midpoint has been relatively stable over the period of observation. The stability of the NBBO midpoint can increase investor confidence because the costs associated with trading such as slippage and spread costs are more predictable in a less volatile market. Traders may find that this environment favors strategies that rely on sustained small gains rather than large price swings. This may influence the type of trading strategy employed, i.e., a preference for stable, volume-based trades over speculative, high-risk trades. Current volatility also suggests that Exchange J may perform better over this period, making the trading environment on Exchange J not only cost-effective but also reliable.

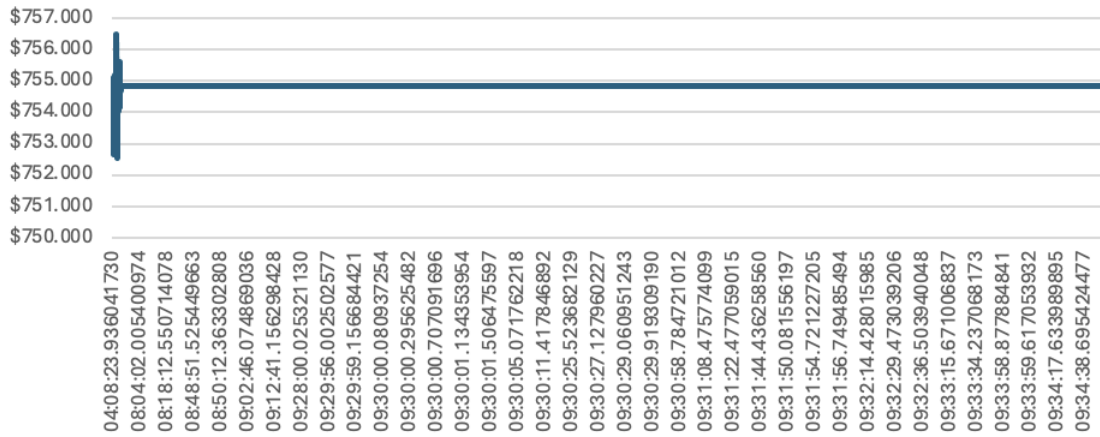
#### Conclusion:

In conclusion, with detailed analysis among those different exchanges, we recommend Exchange J as the best place to route orders to minimize trading costs. Exchange J has the lowest average effective spread percentage, which allows it to have superior execution efficiency, and the current favorable market conditions provide an ideal environment for Exchange J's trading strategies that are sensitive to the quality of price execution.

#### Appendix:

Row Labels	Average of Percent Quoted Spread	Average of Percent Effective Spread	Average of Trade Size
B	0.840%	18.942%	69.61
D	0.840%	16.624%	87.08
J	0.840%	10.222%	38.60
K	0.840%	19.362%	68.85
P	0.844%	16.175%	23.59
Q	0.840%	13.803%	138.75
V	0.840%	17.521%	81.90
X	0.840%	25.134%	27.08
Y	0.840%	13.456%	50.37
Z	0.840%	15.681%	61.69
<b>Grand Total</b>	<b>0.841%</b>	<b>15.511%</b>	<b>90.57</b>

### NBBO Midpoint



### App2

variance	0.00862947
volatility	0.092894938

### App3