BME Exchange – Market Structure

BME Trading Focus

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June 2022

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This study aims to provide an insight into the structure of the main order books in which Spanish securities are traded. The management of passive orders is a multi-sided issue, as a consequence, a set of metrics are proposed to help solve each of these aspects, based on the following structure: general market indicators, implicit costs, European Best Bid and Offer (EBBO) presence and execution-time measures. Since best execution can be measured through different metrics, a global perspective on these indicators should be adopted, as the particularities of each market model may bias certain metrics if considered in isolation.

The data include volumes traded on the order book, excluding all types of auctions or other trading mechanisms outside the order book. The analysis includes data from the primary market (BME) and main multilateral trading facilities (MTFs) in the analysis. Unless otherwise specified, data represent the average per security and day for each metric.

Although the study focuses on passive structure, some metrics such as 'fill probability' represent the interaction between aggressive and passive orders.

1.1 General indicators

Table 01: General data for the Spanish Stock Exchange and alternative platforms. Averages per security per day.

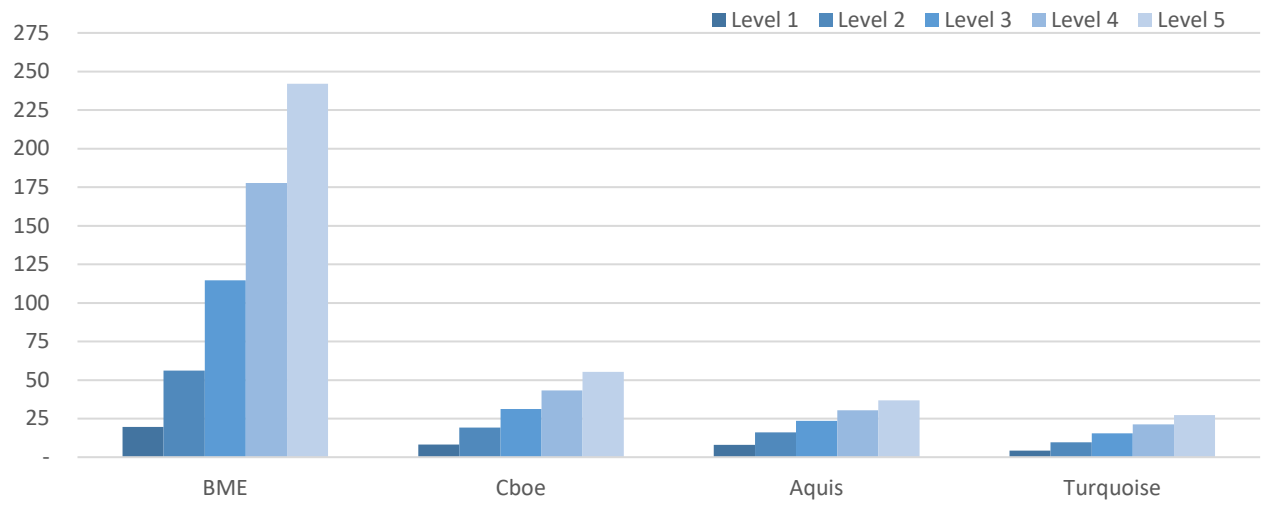
	BME	Cboe	Aquis	Turquoise
Daily turnover (EUR million)	24.26	9.63	2.33	1.55
Daily number of trades	4,474	3,543	727	912
Spread at 1st level	9.15	10.95	10.36	29.12
Depth at 1st level	19,697.55	8,274.83	8,049.26	4,218.83
Average trade (EUR)	4,750	2,331	2,808	1,395
Depth/Average trade	4.15	3.55	2.87	3.02

Data source: BMLL. Securities: IBEX 35® Equities. | Sample period: 03 Jan 2022 - 31 Mar 2022.

Table 01 presents broad metrics that measure market quality and liquidity. According to the evidence, the primary market has significantly higher daily turnover and number of trades than its competitors. It also has the narrowest spread at the first level, being 1.80 basis points lower than in Cboe and 1.21 basis points lower than in Aquis, which is favorable for obtaining the best prices. Moreover, it is the market with the greatest depth at the first level, allowing on average more trades to be executed before exhaustion. In particular, when analyzing the Depth/Average trade ratio, it is observed that the primary market, despite having a higher average trade, has several times more depth than the rest of its competitors: 4.15 trades can be executed before exhausting its first level (which, as we will show later, corresponds most of the time with the best price available in the market) compared to 3.55 trades for the next competitor.

1.2 Implicit costs

Chart 01: Cumulative depth per order book level (in EUR thousand)



Data source: BMLL. Securities: IBEX 35® Equities. | Sample period: 03 Jan 2022 - 31 Mar 2022.

Chart 02: Average spread per transaction size*

Data source: BMLL. Securities: IBEX 35® Equities. | Sample period: 03 Jan 2022 - 31 Mar 2022.

**Only the most relevant markets have been included for this metric.*

Chart 01 shows the cumulative depth for the first five levels of the book, i.e., the cumulative size of liquidity expressed in thousands of euros for each side of the market (bid/offer). BME has a great depth that increases significantly with each level, a behavior that is not replicated by MTFs. This greater depth allows large orders to be supported with less impact on the price, as shown in **Chart 02**, which analyses the average spread by transaction size, with the best scenario consisting of a small spread for all execution sizes. The difference between the best

market and the rest becomes more pronounced as the size of the transaction increases. Therefore, **large order sizes on BME generate a smaller price impact** than on other markets.

1.3 European Best Bid and Offer (EBBO)

Table 02: EBBO Presence. Averages per security and day.

EBBO	BME	Cboe	Aquis	Turquoise
Time Present (%)	86.63%	75.18%	76.45%	39.89%
Time Exclusively Present (%)	8.61%	4.00%	3.74%	0.52%
EUR Depth when Present	18,343	7,684	8,178	3,071

Data source: BMLL. Securities: IBEX 35® Equities. | Sample period: 03 Jan 2022 - 31 Mar 2022.

In order to meet the best execution objectives established by MiFID II, it is essential to know in which market the EBBO is being set at any given moment, which represents the best available price (highest for buying and lowest for selling) at an aggregate level and at a specific moment in time. As indicated on **Table 02**, the EBBO is composed most of the time by ties between different markets, since only during 16.87% of the time one market supports it exclusively. Both considering these ties and exclusive presence, BME has the highest percentages among the trading platforms determining the EBBO, twice the exclusive time of its next competitor.

1.4 Execution-time measures

There are multiple ways of defining the **fill probability** (by order or security, according to different time intervals, considering or not considering cancellations and modifications, etc.). Among all these possibilities, the formula[1] selected represents the probability that an order of a given size entered at the first level will be traded in less than one minute, having as variables the aggressive orders sent and the book depth. The results obtained are as follows:

Table 03: Fill probability. Averages per security and day.

Order size	BME	Cboe	Aquis	Turquoise
EUR 1,000 order	59.59%	58.61%	26.85%	28.91%
EUR 5,000 order	56.09%	52.17%	21.81%	20.95%
EUR 10,000 order	52.44%	46.17%	17.71%	15.84%
EUR 25,000 order	44.36%	34.71%	11.36%	9.15%

Data source: BMLL. Securities: IBEX 35® Equities. | Sample period: 03 Jan 2022 - 31 Mar 2022.

[1] *We compute the fill probability of each security every minute using the following formula:*

$$Fill\ probability = min\left(\frac{trade.qty}{fill.qty + (bid.qty + ask.qty)/2}, 100\% \right)$$

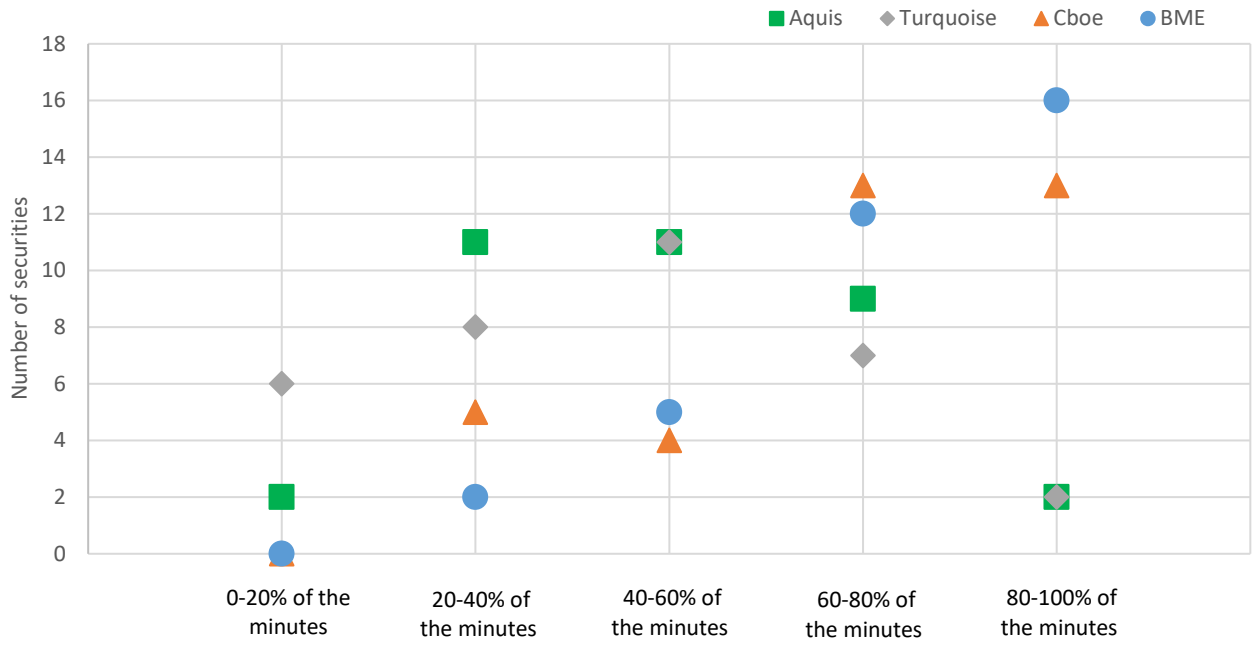
*Where **trade.qty** is the volume of aggressive orders entered during the minute, **fill.qty** is the number of shares corresponding to the order size we want to examine and **bid.qty** and **ask.qty** are the number of shares at the bid and ask at the start of the minute. This probability cannot be greater than 100%.*

It can be observed in **Table 03** that **BME has the highest probabilities at all levels**, with the smallest reduction as the order size to be traded increases, in line with what has been already seen in the other metrics.

To illustrate the relevance of fill probability, the initial depth data can be recalled, more than twice in BME compared to the next MTF. This greater depth is attractive for aggressive orders, as larger quantities can be traded at the best price but may generate uncertainty for new passive orders placed at the end of the first level, as they have lower priority and must wait for higher trading to occur in the larger queue of the home market. However, BME's higher fill probability demonstrates that this greater depth does not imply uncertainty for passive orders, as it is precisely the best performing market at all levels studied thanks to the volume of aggressive orders attracted to its book.

On the other hand, it is relevant to observe not only how likely execution is, but also **how long orders must wait in the book** before being executed. A first approximation to this is based on calculating what percentage of the possible minutes each security traded in each market. This data can be seen in the chart below:

Chart 03: Percentage of the minutes in which a security trades



Data source: BMLL. Securities: IBEX 35® Equities. | Sample period: 03 Jan 2022 - 31 Mar 2022.

The x-axis represents the percentage of minutes in which each security has been traded during the trading sessions in the first quarter of 2022. The y-axis corresponds to the number of IBEX 35® stocks in each percentage range. **BME trades 23% more stocks than the next competitor** for more than 80% of the minutes and is at a great distance from the rest of the markets. In the first time intervals, we observe how other trading platforms trade a high number of securities for less than 40% of the minutes.

A more sophisticated measure involves looking at the distribution of the time elapsed between two consecutive trades, as can be seen in **Table 04** below:

Table 04: Trade time difference. Averages per security and day.

Trade time difference	Less than 1 ms	1 to 10 ms	10 ms to 1 s	1 to 5 s	5 to 10 s	Over 10 s
BME	51.19%	2.90%	14.75%	8.03%	4.86%	18.27%
Cboe	48.49%	3.78%	12.44%	7.59%	5,00%	22.71%
Aquis	20.64%	2.30%	10.69%	8.57%	6.19%	51.61%
Turquoise	34.65%	3.20%	8.83%	5.28%	4.32%	43.71%

Data sources: BMLL, BME. Securities: IBEX 35® Equities. | Sample period: 03 Jan 2022 - 31 Mar 2022.

Ms= milliseconds; s= seconds. 1ms= 0.001s.

Considering that **liquidity opportunities should ideally be constantly available**, efforts should be made to minimize the presence in the last range of the table with more than ten seconds elapse without trading in the market. Both in this category and in the five to ten second range, BME leads.

It can also be postulated that a large number of trades occur almost simultaneously (in less than 1ms), probably influenced in part by large aggressive orders crossing against several passive orders.

Conclusions

The metrics studied illustrate the starting point: the differences between order books require a multifactorial analysis, as there are markets that are robust only in specific aspects. For instance, an MTF may haves a narrow spread, but a low fill probability, **while only BME is consistent across all metrics,** significantly outperforming its competitors in many of them.

Optimizing these facets and their interaction with each particular investment strategy is a complex process, but we believe that studying them from different approaches allows for a higher quality order management.

BME Exchange
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CalidadRV@grupobme.es
www.bolsasymercados.es