Understanding Order Driven Markets: Functioning and Mechanics

May 2023

Sven Peter Kooi
Thomas van den Berg

Amsshare

Summary

This article introduces transaction processing on equity exchanges and highlights the frictions and inefficiencies present in real-world markets. It explains the two main types of market forms, quote-driven markets and order-driven markets, with a focus on the latter. In an order-driven market, buyers and sellers enter orders into a central order book, and trades are matched based on price and time priority. The article discusses the concept of bid-ask spread, the role of brokers as intermediaries, and the importance of continuous flow of buy and sell orders for liquidity. It also explains the two primary order types, market orders and limit orders, and how they are stored in a limit order book. The article includes visual representations of theoretical and live central order books and emphasizes the advantages of order-driven markets, such as transparency, lower costs compared to quote-driven markets, and flexibility in order types.

How can Amsshare support

The information provided in this article is well-known by Amsshare. Hence, Amsshare can support firms with projects within this area.

Introduction transaction processing on Equity Exchanges

In Asset Pricing there are many models, such as the Capital Asset Pricing Model (CAPM), that assume frictionless markets. However, this article will point out that there are frictions on equity exchanges in reality, such as limited liquidity, which cause inefficiencies. The focus of this article is on the translation of buy & sell orders to market returns.

Globally, there are many active equity exchanges. On these exchanges, all different kinds of financial products are traded. Examples of financial products are: Stocks, Exchange-Traded Funds (ETFs), Bonds, Derivatives, Commodities, Foreign Exchange (Forex) and Indices. These financial products are traded on financial markets. For example, in Europe the Euronext, in the United States the Nasdaq and in London the London Stock Exchange (LSE) operate as financial markets.

For these equity exchanges two main types of market forms exist:

1. Quote-driven markets
2. Order-driven markets

Firstly, the quote-driven market is explained in a concise way. However, this article focuses on the order-driven market, which is explained in an elaborate and informative way.

Quote-driven market

In a quote-driven market, dealers or market makers determine the prices of securities by providing quotes for buying and selling them. Buyers and sellers interact with the market makers directly and negotiate prices based on the size of the transaction and the market maker's inventory positions. The market maker earns revenue from the bid-ask spread, but they also have risks. Examples are inventory risk and asymmetric information risk.

Order-Driven market

An order-driven market is a type of market where buyers and sellers enter orders for securities into a central order book. The buyers in this central order book offer the so-called ***bid price*** and the sellers of the product offer an ***ask price***. The exchange then matches orders based on their price and time priority, and executes trades at the best available price for buyers and sellers. The market price of a security in an order-driven market is determined by the prices at which buyers are willing to buy and sellers are willing to sell, as reflected in the order book. The difference between the bid price and the ask price is called the bid-ask spread. More about the bid-ask spread wil be explained later in this article.

The order-driven market is the main market for equity trading. In an order-driven market the buy and sell orders are directly matched with each other without the use of position taking intermediaries. There are no formal market makers, but there are brokers who communicate the orders. Important note: these brokers do not take positions themselves but just function as intermediaries. This means that if you execute your order, you do not interact with the market. This is what the brokes does for you. This also means that the liquidity in an order-driven market is dependent on the constant flow of buy and sell orders of market participants.

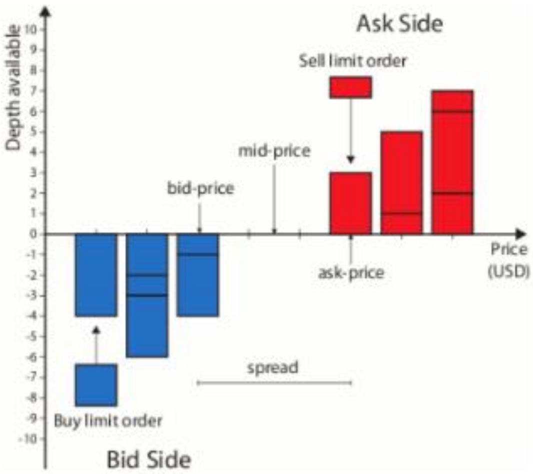
If no market participants execute buy and sell orders, then the order-driven market is completely illiquid.

The two most important order types are:

1. Market order: this is an order for the product at the current market price. The advantage is that the time of the order is certain. However, the disadvantage is that you buy or sell it for the current price which is uncertain because of the difference between the bid-price and the ask-price.
2. Limit order: this is an order that is processed when the price of the product reaches a certain limit. This means that it is uncertain when the order will take place, however when the order is processed the price of the order is certain.

The limit buy and sell orders are stored in a limit order book. The limit order book typically includes only limit orders. Market orders are executed immediately at the current market price and do not enter the order book. They are matched with existing limit orders in the book. However, different trading platforms and systems may vary in their specific implementation, so it's always a good idea to consult the platform's documentation or rules for accurate information. An example of a theoretical limit order book is shown in Figure 1.

Figure 1. *Theoretical limit order book*



Source: *ResearchGate, 2015*

The bid side represents the buyers and the ask side represents the sellers in the order-driven market. The most right bid (highest bid) and most left ask (lowest ask) orders are the best bids and asks. This is because the buyer wants to buy an asset for the lowest price and the seller wants to sell an asset for the highest price. The difference between the bid and ask price is the bid-ask spread, as is visualized in Figure 1. Every block in the limit order book represents a limit order. For example, the most right bid consists of one investor who wants to buy one asset and one investor who wants to buy three assets, all for the same bid price. However, what happens if one wants to buy 10 assets? Then you would pay the most left ask price for four assets, the middle ask price for five assets and the most right ask price for the last asset. This is especially a risk for large institutions that want to do trades in high volumes, because they need to go deep in the order book. This is how it works in theory, Figure 2 shows how it works in reality.

Figure 2. *Live Central Order Book ASML Holding NV*

CENTRAL ORDER BOOK

#	SHARES	BID PRICE	ASK PRICE	SHARES	#
9	178	624.30	624.40	95	4
10	186	624.20	624.50	195	10
11	189	624.10	624.60	585	16
8	172	624.00	624.70	472	10
7	180	623.90	624.80	600	12
8	180	623.80	624.90	214	10
8	207	623.70	625.00	704	17
7	183	623.60	625.10	227	10
8	276	623.50	625.20	231	8
4	124	623.40	625.30	149	8
	1,875			3,472	
80		Total			105

Source: *Euronext, 2023*

Figure 2 shows the central order book of ASML at 12h20 18/05/2023. This is a live central order book and everyone has access to this kind of information. The highest bid price is €624.30 and the lowest ask price is €624.40. This means that the bid-ask spread of ASML is equal to €0.10. This bid-ask spread is small, indicating that the ASML stock is quite liquid. A liquid stock is positive for investors, because this means that they can sell the stock for the current market price. In Figure 2, the 'Shares' show how many ASML stocks are offered for the bid and ask price. The '#' show how many investors offer the 'Shares'. In this example, there are 9 investors who want to buy 178 ASML stocks for a bid price of €624.30 and 4 investors who want to sell 95 ASML stocks for an ask price of €624.40. The same principle holds for the second, third, etc. lines in Figure 2.

Bid-Ask Spread

The bid-ask spread is the difference between the highest bid price and the lowest ask price. The bid-ask spread has several purposes:

- Profit margin for the market maker.
- Represents the transaction costs when buying or selling an asset.
- Reflects liquidity of the market. A narrow bid-ask spread indicates a liquid market with a high volume of buyers and sellers. Inversely, a wide spread suggests lower liquidity and potentially higher trading costs.

Advantages of the order-driven market

- Transparency: the order-driven market is more transparent than the quote-driven market as the prices are displayed in a limit order book which is publicly available.
- Costs: An order-driven market is cheaper than a quote-driven market, because the bid-ask spread in a quote-driven market is bigger as the market maker wants to be compensated for its risks.
- Flexibility: order-driven markets are more flexible than quote-driven markets in terms of order types. Traders can place market and limit orders (as explained), but also more specialized orders such as stop-loss orders. The flexibility allows for better risk management and tailored trading strategies.