

# Guide to Financial Markets

Order Matching

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# Order Books



When a Trader submits an order for a symbol, the order is placed into the ORDER BOOK for that symbol.



Orders can be either BUY or SELL



Orders contain very little information

The trader  
The type (BUY/SELL)  
Qty (in standard units set by the exchange – e.g. in multiples of 1,000)  
Price

# Order Books

Traders will submit orders for the same stock (symbol/ticker) but at different prices.

The exchange will maintain a list of all Buy orders for a symbol and all Sell orders for the same symbol.

The 2 lists – buy and sell – are known as the order book for a symbol

Trading exchanges will maintain literally thousands of order books, one for each symbol

# Order book for Apple

The Best Bid and Best offer are often called the “Top Of Book” or Level1 Data

APPL			
Bid Size	Bid Price	Ask Price	Ask Size
10	206.23	206.90	13
8	205.32	207.50	4
5	204.55	208.13	10
9	203.87	209.98	6
15	202.99	210.76	12
12	201.55	211.72	7

The entire set of orders are often called the “Full Order Book”, or Level2 Data.  
This is often referred to as market depth.

**Note**  
Buy orders are Descending  
  
Sell orders are Ascending  
  
Trades can only happen when the best Bid matches the best Ask.  
  
Here either nothing will trade until either  
A new order is submitted with a Bid of 206.9 OR an ask of 206.23.

# Order Matching

When a Bid and Ask have the same price the order is said to be matched.

APPL			
Bid Size	Bid Price	Ask Price	Ask Size
10	206.45	206.45	13
8	205.32	207.50	4
5	204.55	208.13	10
9	203.87	209.98	6
15	202.99	210.76	12
12	201.55	211.72	7

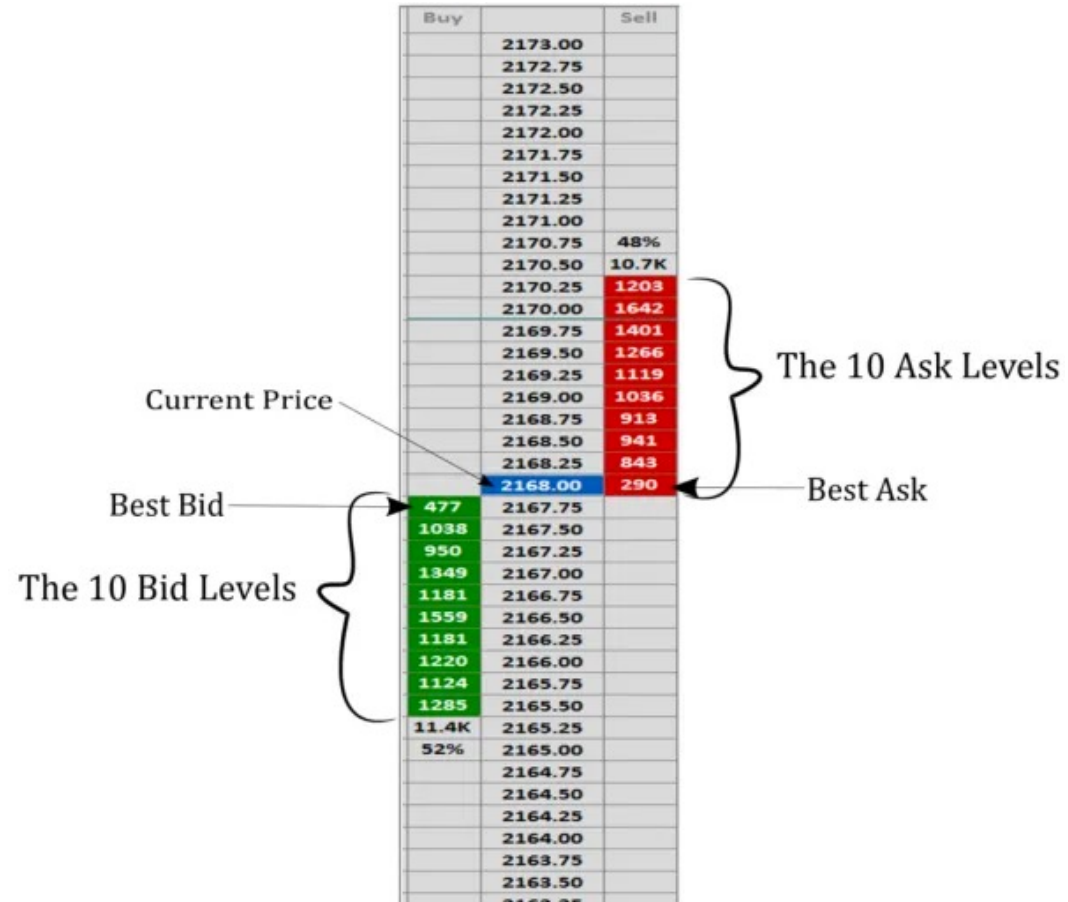
The Orders can be matched

# Order Matching

The order book is now updated.

APPL			
Bid Size	Bid Price	Ask Price	Ask Size
8	205.32	206.45	3
5	204.55	207.50	4
9	203.87	208.13	10
15	202.99	209.98	6
12	201.55	210.76	12
		211.72	7

# Order Matching





# Types of Order

There are a few types of orders that traders can submit.

These allow traders to place “conditions” to their order.

For example

- If my order is not matched within 1 hour then cancel it
- Give me any price available in the market
- Only execute my order if all of it can be completely executed

# Market Orders (MKT)

Buy or sell at the current price – whatever that price may be.

In an active market, market orders always get filled, but not always at the best price.

Market orders are used when you definitely want your order to be processed and are willing to risk getting a slightly worse price than the best price being quoted.

Market orders **NEVER** appear on an order book

## Limit Orders (LMT)

Buy or sell at a specific price  
OR better.

May not get filled, depending  
on how the market is moving.

Used when you want to make  
sure you get a suitable price.

# Stop Orders (STP)

Similar to market orders

Buy or Sell at the best available price

Only processed if the market reaches that specific price.

For example

- Current price 1.25
- Trader places a BUY stop order at 1.32

Only executed IF the price reaches 1.32 or above and gets filled at the best price.

## Stop Orders (STP)

For a BUY Order, stop price **MUST** be above current price

For a SELL order, stop price **MUST** be below current price.

# Stop Loss Orders (STPL)

A Stop order allows a trader to enter a position.

A Stop loss order allows a trader to get out of a position.

For example

Trader sells at \$50.50

- If the price rises, the trader will have lost money
- They use a Stop Loss order to allow them get out of this by buying back
- Here they might give a STOP loss order to BUY at a stop of \$50.75.
- IF the price reaches \$50.75 or better, the order will execute and close out the position at \$50.75 or better.

# Stop Limit Orders (STPLMT)

A combination of a Stop Order AND a Limit Order

Fine tunes what price they get.

e.g.

- Trader opens a position with a BUY Stop Limit at \$50.75.
- If current price is \$50.50.
- If the price reaches \$50.75 they BUY Stop Limit order will be executed
- BUT ONLY IF the order can be executed at \$50.75 OR below.

# Market If Touched (MIT)

A Market order BUT only sent out if a price reached a certain level.

For example

- A BUY MIT @ \$16.40
- If the current price is \$16.50 – a market order is sent out only if the price moves to \$16.40 or below.

A SELL MIT@ \$16.60

- If the current price is \$16.50 – a market order is sent out only if the price moves to \$16.60 or higher.



# Limit If Touched (LIT)

Similar to MIT but sends out a Limit Order if the price is touched

Contains a bit a trigger price and a limit price.

E.g. Stock is trading at \$16.50

- A BUY LIT Trigger might be \$16.40 with a limit of \$16.35.
- If the price moves to \$16.40 OR below then submit a limit order @\$16.35

E.G Stock trading at \$16.50

- A SELL LIT TRIGGER MIGHT BE \$16.60 with a limit of \$16.65
- If the price reaches \$16.60, submit a limit order @ \$16.65

# Fill or Kill

A simple order book for Apple might look like

APPL			
Bid Size	Bid Price	Ask Price	Ask Size
10	206.90	206.90	8
8	205.32	207.50	4
5	204.55	208.13	10
9	203.87	209.98	6
15	202.99	210.76	12
12	201.55	211.72	7

What happens if

The best prices match

The quantities don't.

In such cases, the Bid can be filled as follows

8 @ \$206.90

2 @ \$207.50

Some times a trader will not want their order split across different prices.

They can add an extra attribute to their order marking it as **Fill or Kill**.

**FOK** orders only execute IF both price and Quantity can be matched.

# Duration Orders

Specify how long you want an order to be in effect by selecting an order duration.

## Day

- automatically expires at the end of the regular trading session if it hasn't been filled.

## Good-Til-Canceled – GTC

- active until the trade is filled or you cancel the order.
- brokers typically cancel GTC orders automatically if they have not been filled in 30 to 90 days.

## Good 'Til Date - GTD

- A good 'til date order remains active until a date you specify, unless it's been filled or cancelled.

# Duration Orders

Specify how long you want an order to be in effect by selecting an order duration.

## Immediate Or Cancel - IOC

- requires all or part of the order to be executed immediately; otherwise, the order (or any unfilled parts of the order) will be cancelled.

## All or None - AON

- Similar to **FOK**, **AON** is automatically cancelled if an order has not been filled by the end of the trading session.

# Duration Orders

Specify how long you want an order to be in effect by selecting an order duration.

## At the Opening

- Order executed upon the opening of the trading session. If the order cannot be executed at the opening, it is automatically cancelled.

## At the Close

- Order executed at the close of the trading session at the closing price, or as close to that price as is possible.

## Minute

- Expire after a specified number of minutes have elapsed. Common intervals include one, three and five minute durations.

# Client Technology

No standard hardware

No standard platforms

Lots of proprietary trading systems to create orders

- Usually large institutions will have a few different trading systems

A few popular platforms

- For smaller institutions

A large orange circle is positioned on the left side of the slide, partially cut off by the edge.

DMA

## Direct Market Access

Members of exchanges, e.g. Citi, will allow their institutional clients to use their infrastructure to trade on their own, rather than going through Citi's own traders.

# FIX

Financial Information Exchange

Communication protocol developed in 1992 for securities trading

Messages encodes using keys (tags) and values

Tags are encoded using numbers

Message types

- Logon
- Submit order
- Cancel order
- Get a quote



# FIX - Headers

FIX V5.0 5 mandatory fields, 1 optional fields

FIX pre v5.o – 3 mandatory fields

8 (BeginString)

9 (BodyLength)

35 (MsgType)

49 (SenderCompID)

56 (TargetCompID)

1128 (AppVerID - if present must be in 6th position).

# FIX – Message Types

**New Order Single (35=D)** - Submitted an order to be executed.

**Execution Report (35=8)** - Acknowledging, executing an order

**Cancel Request (35=F)** - Request to cancel order or remaining order qty

**Cancel/Correct Request (35=G)** - Used to modify original order submission

**New Order MultLeg (35=AB)** - For more complex trades with more than one leg

**Allocation Report (35=AS)** - Post trade breakdown of account allocations.

Many Many [More](#) ...

# FIX – Structure

## New Order – Single (MsgType=D New Order Single)

8=FIX.4.49=14835=D34=108049=TES  
TBUY152=20180920-  
18:14:19.50856=TESTSELL111=6367  
3064027889863415=USD21=238=7000  
40=154=155=MSFT60=20180920-  
18:14:19.49210=092

Body Length

Body Start

Body End

# FIX – EXAMPLE MESSAGE

Field Name	Tag	Value
BeginString	8	FIX.4.4
BodyLength	9	167
MsgType	35	F
MsgSeqNum	34	40
SenderCompID	49	TestClient2
SendingTime	52	20080228-15:14:24.125
TargetCompID	56	FXCM
TargetSubID	57	MINIDEMO
ClOrdID	11	TestClient2FXCM-1204211664125-20
OrderID	37	19752337

Field Name	Tag	Value
OrderQty	38	100000
OrigClOrdID	41	NONE
Side	54	2
Symbol	55	EUR/USD
TimeInForce	59	1
TransactTime	60	
StopPx	99	0
SecondaryClOrdID	526	20080228-15:08:06
Checksum	10	145

# FIXML

A Markup version of FIX

Uses the same data dictionary as FIX

Does not have a session layer

For message transportation only

Needs to be integrated with a FIX Session protocol

<http://fixwiki.org/fixwiki/FIXwiki>

# FIXML NewOrderSingle

- The XML attributes in the message have been placed on separate lines to aid readability.
- This message is 348 bytes in length; approximately 70% larger than the raw
- FIX tag=value message, but roughly half the size of the previous FIXML format without significant loss in readability.

```
<FIXML>
  <Order ClOrdID="123456"
        Side="2"
        TransactTm="2001-09-11T09:30:00"
        OrdTyp="2"
        Px="93.25"
        Acct="26522154">
    <Hdr Snt="2001-09-11T09:30:47-05:00"
        PosDup="N"
        PosRsnd="N"
        SeqNum="521">
      <Sndr ID="AFUNDMGR"/>
      <Tgt ID="ABROKER"/>
    </Hdr>
    <Instrmt Sym="IBM"
        ID="459200101"
        IDSrc="1"/>
    <OrdQty Qty="1000"/>
  </Order>
</FIXML>
```

# FIXML Design Rules

Meaningful names & standard abbreviations

Price = Px

Currency = Ccy

FIX Messages shall be implemented as XML Elements

Non repeating fields implemented as xml attributes

Repeating groups shall be implemented as XML elements.

FIX Component block implemented as XML elements



