Exchange functional requirements

How does an exchange work

→ Users can sign up, sign in
→ User needs to KYC / connect their DGMAT
→ User can place an order.
  → Limit
  → Market order.
→ User can see
  → their Balances
  → their open orders.

Curious Questions to
ask

How is the price of a stock
determined

How is the price of Real Estate
determined.

Ans— Supply / Demand.

Finance Jargons.

→ Orderbook
→ Limit Order / Market order
→ Market Depth
→ Liquidity
→ maker vs taker.

Understanding the orderbook

Indravagor, Blr

Axis Bank Orderbook

AXISBANK   3.25   0.32% ∧   1008.05

BID	ORDERS	QTY.	OFFER	ORDERS	QTY.
1008.05	6	6	1008.05	98	1735
1008.00	2	2500	0.00	0	0
1006.75	2	12500	0.00	0	0
0.00	0	0	0.00	0	0
0.00	0	0	0.00	0	0
0.00	0	0	0.00	0	0
0.00	0	0	0.00	0	0
0.00	0	0	0.00	0	0
0.00	0	0	0.00	0	0
0.00	0	0	0.00	0	0
0.00	0	0	0.00	0	0
0.00	0	0	0.00	0	0
0.00	0	0	0.00	0	0
0.00	0	0	0.00	0	0
0.00	0	0	0.00	0	0
0.00	0	0	0.00	0	0
0.00	0	0	0.00	0	0
0.00	0	0	0.00	0	0
0.00	0	0	0.00	0	0
0.00	0	0	0.00	0	0
Total		0	Total		167

∧ View 5 depth

BTC - USDT Orderbook

Price(USDT)	Amount(BTC)	Total
28315.39	0.20000	5,663.07800
28315.34	0.00452	127.98534
28315.33	0.00202	57.19697
28315.22	0.45000	12,741.84900
28315.06	0.53007	15,008.96385
28315.02	0.30000	8,494.50600
28315.00	0.07200	2,038.68000
28314.70	0.00022	6.22923
28314.34	0.00022	6.22915
28314.11	0.00200	56.62822
28314.04	0.00500	141.57020
28313.92	0.20000	5,662.78400
28313.59	0.00673	190.55046
28313.02	0.00636	180.07081
28312.90	0.00022	6.22884
28312.54	0.00022	6.22876
28312.53	0.07388	2,091.72972
28312.11	2.76688	78,336.21092

28,312.11 ↑ $28,312.11   More

28312.10	0.44714	12,659.47239
28312.03	0.00150	42.46804
28311.96	0.00060	16.98718
28311.82	0.00022	6.22860
28311.73	0.00150	42.46760
28311.67	0.00555	157.12977
28311.46	0.00022	6.22852
28311.43	0.00150	42.46715
28311.10	0.00022	6.22844
28310.74	0.00022	6.22836
28310.38	0.00022	6.22828
28310.03	0.00679	192.22510
28310.02	0.00022	6.22820
28310.00	0.08555	2,421.92050
28309.68	0.00500	141.54840
28309.66	0.00072	20.38296
28309.58	0.22529	6,377.86528
28309.42	0.02421	685.37106

B 19.99%   80.01% S

Open Orders(0)   Order History   Trade History

What is the price of a stock?

→ The price at which last trade took place

Price(USDT)	Amount(BTC)	Total
28315.39	0.20000	5,663.07800
28315.34	0.00452	127.98534
28315.33	0.00202	57.19697
28315.22	0.45000	12,741.84900
28315.06	0.53007	15,008.96385
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B 19.99%		80.01% S

Open Orders(0)   Order History   Trade List

What is a limit Order.

→ putting a (price, qty) tuple on the orderbook

→ Usually used by Traders

→ Has some trading fee associated with every order that matches

Price(USDT)	Amount(BTC)	Total
28315.39	0.20000	5,663.07800
28315.34	0.00452	127.98534
28315.33	0.00202	57.19697
28315.22	0.45000	12,741.84900
28315.06	0.53007	15,008.96385
28315.02	0.30000	8,494.50600
28315.00	0.07200	2,038.68000
28314.70	0.00022	6.22923
28314.34	0.00022	6.22915
28314.11	0.00200	56.62822
28314.04	0.00500	141.57020
28313.92	0.20000	5,662.78400
28313.59	0.00673	190.55046
28313.02	0.00636	180.07081
28312.90	0.00022	6.22884
28312.54	0.00022	6.22876
28312.53	0.07388	2,091.72972
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B 19.99%   80.01% S

0.01 ▾

Buy AXISBANK NSE × 10 Qty
BSE: ₹1,008.35   NSE: ₹1,008.35

Regular | Cover | AMO | Iceberg | Tags

○ Intraday MIS   ● Longterm CNC

Qty.	Price	Trigger price
10	1008.05	0

○ Market ● Limit   ○ SL ○ SL-M

More options ⌄

☐ Stoploss   %   ☐ Target   %   Learn more

Margin ₹10,080.50   Charges ₹12.49 ↻

Buy   **Cancel**

What is a market order

→ Buying a qty off the orderbook
→ Usually used by retail
→ Usually preceeded by a get outs sig
→ Usually higher fee than limit order

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28315.39	0.20000	5,663.07800
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28315.22	0.45000	12,741.84900
28315.06	0.53007	15,008.96385
28315.02	0.30000	8,494.50600
28315.00	0.07200	2,038.68000
28314.70	0.00022	6.22923
28314.34	0.00022	6.22915
28314.11	0.00200	56.62822
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B 19.99%		**80.01% S**

Buy AXISBANK NSE × 10 Qty

○ BSE: ₹1,008.35   ● NSE: ₹1,008.05

| Regular | Cover | AMO | Iceberg | ♡ Tags |

○ Intraday MIS   ● Longterm CNC

Qty.
10

Price
0

Trigger price
0

● Market   ○ Limit   ○ SL   ○ SL-M

More options ⌄

☐ Stoploss _____ %   ☐ Target _____ %   Learn more

Margin ₹10,080.50   Charges ₹12.49 ↺   [Buy]   [Cancel]

Liquidity / market Depth

→ How many orders (price / qty)
    does the book have
→ Can it handle big orders
    w/o crashing the price
→ More liquidity = Better exchange
→ Market makers provide
    liquidity.

maker vs taker.

→ The person whose orders
exist on the book is
called a maker (hence market maker)

→ The person who gets their
order filled is called taker

→ Taker fee is usually higher
than maker fee b/c they take
away liquidity from the book.

Fee structure of an Exchange.

Level	30d Trade Volume (BUSD)	and/or	BNB Balance	Maker / Taker ⓘ	Maker / Taker BNB 25% off
Regular User	< 10,00,000 BUSD	or	≥ 0 BNB	0.1000% / 0.1000%	0.0750% / 0.0750%
VIP 1	≥ 10,00,000 BUSD	and	≥ 25 BNB	0.0900% / 0.1000%	0.0675% / 0.0750%
VIP 2	≥ 50,00,000 BUSD	and	≥ 100 BNB	0.0800% / 0.1000%	0.0600% / 0.0750%
VIP 3	≥ 2,00,00,000 BUSD	and	≥ 250 BNB	0.0420% / 0.0600%	0.0315% / 0.0450%
VIP 4	≥ 10,00,00,000 BUSD	and	≥ 500 BNB	0.0420% / 0.0540%	0.0315% / 0.0405%
VIP 5	≥ 15,00,00,000 BUSD	and	≥ 1,000 BNB	0.0360% / 0.0480%	0.0270% / 0.0360%
VIP 6	≥ 40,00,00,000 BUSD	and	≥ 1,750 BNB	0.0300% / 0.0420%	0.0225% / 0.0315%
VIP 7	≥ 80,00,00,000 BUSD	and	≥ 3,000 BNB	0.0240% / 0.0360%	0.0180% / 0.0270%
VIP 8	≥ 2,00,00,00,000 BUSD	and	≥ 4,500 BNB	0.0180% / 0.0300%	0.0135% / 0.0225%
VIP 9	≥ 4,00,00,00,000 BUSD	and	≥ 5,500 BNB	0.0120% / 0.0240%	0.0090% / 0.0180%

Where does ==latency== matter .

→ ==Exchange==
   ⭐ Order placement time
   ⭐ Time to fetch the orderbook
   ⭐ Realtime updates on the orderbook

→ ==Trader==
   ⭐ Order ack time
   ⭐ Order cancel time
   ⭐ Their order priority.

How is latency made better for the ==Exchange==

→ Using faster programming languages

→ Faster serialization/Deserialization of data

In memory Orderbooks

How is latency made better for a ==Trader/MM==

→ Being closer to the trading server

→ Having multiple conns open

→ Faster serialization/Deserialization

→ Faster oracles/Prediction models.

Building an Exchange Order Book.

→ Lets write an orderbook in Node.js

→ Users can

   → place <u>Limit</u> Orders

   → If an <u>order</u> can be executed (partially or completely) it is filled

   → Users can query the depth chart

   → User can get back their balance

→ Assignment

   * Allow users to fetch quotes for market orders

   * Send a market order using the endpoint above.