



Algo Trading & Market Making



WIFI

Network: theHive21

Password: thehive21



Materials

[Example market making bot](#)

[BitMEX Testnet Account](#)

[BitMEX API Documentation](#)



BitMEX Testnet

This is a staging environment used for testing

Testnet accepts Testnet Bitcoin which have no real world value

Testnet is an exact replica of the production exchange

Always test your bot in Testnet before deploying to production

To signup on Testnet, use a verified email address



API Overview

BitMEX features a REST and Websocket API

Use Websocket to be pushed data in real-time

Use REST primarily for order submission, amendment, and cancellation

Most other Bitcoin exchanges feature a REST and Websocket API



REST Calls

Type this into your browser:

<https://www.bitmex.com/api/v1/trade?symbol=XBTUSD&count=100&reverse=false>

Use the [BitMEX API Explorer](#) to try out sample REST calls



WebSocket Example

For Mac users type this into your terminal:

```
npm install -g wscat
```

After installing “wscat” type this

```
wscat -c wss://www.bitmex.com/realtime?subscribe=trade:XBTUSD
```

This pushes the live trade feed for XBTUSD



API Keys

To authenticate your trading bot, you will need to [generate API Keys](#)

You will receive a public API Key and a private Secret

Be careful, anyone in possession of these keys can access your account



Trading Bot Setup

A comprehensive [README.md](#) file is included in the GitHub repository

I will now take you through setting up the trading bot and running it on Testnet



Market Making

The process of quoting continuous passive buy and sell prices to provide liquidity

On BitMEX market makers post two-way quotes on various products

Market makers are delta neutral, they don't have an outright market view

Traders market make to earn rebates, currently 0.025%

Traders market make to earn their bid / ask spread

If done correctly, can be a source of consistent trading income



Fair Price

Inputs:

- Underlying Index price
- Cost of capital

Outputs:

- Bid / Ask price for the contract

Tools:

- An automated trading bot does the calculations and continuously updates quotes



Fair Price Example

BitMEX Product: ETH7D (7 Days until expiry)

Underlying: ETH/XBT Price on Poloniex

ETH/XBT Spot Price = 0.05 XBT

XBT Borrow Cost Per Day: 1%

ETH Borrow Cost Per Day: 2%

ETH/XBT Fair Price = $0.05 \text{ XBT} * (1 + 2\% * 7) / (1 + 1\% * 7) = 0.052371 \text{ XBT}$



Fair Price Example Cont.

ETH7D Fair Price = 0.052371 XBT

Desired Bid / Ask Spread = 2%

ETH7D Bid = 0.052371 XBT * 0.99 = 0.051847

ETH7D Ask = 0.052371 XBT * 1.01 = 0.052895



Determining Your Spread

Your spread determines your potential profit, choose it wisely.

Spread = ETH/XBT Volatility + Hedging Costs

ETH/XBT Volatility = your estimation of how much the price could move before you hedge or receive a trade in the other direction

Hedging Costs = how much it costs in terms of bid / ask spread and commissions to trade ETH/XBT on Poloniex



Trade Walkthrough

1. You quote a market on ETH7D, 1 contract on both the Bid and Offer, of 0.05 XBT / 0.1 XBT
2. A trader lifts your offer, you are now short 1 ETH7D contract
3. To hedge your delta, you buy 1 ETH for XBT on Poloniex at 0.085 XBT
4. Your market remains 0.05 XBT / 0.1 XBT
5. A trader hits your bid, you are now flat on ETH7D
6. To hedge your delta (you are now long 1 ETH on Poloniex), you sell 1 ETH for XBT at 0.065 XBT.



Trade Walkthrough PNL

BitMEX Trades:

Sell 1 ETH7D @ 0.1 XBT

Buy 1 ETH7D @ 0.05 XBT

Profit = 0.05 XBT

Poloniex Trades:

Buy 1 ETH @ 0.085 XBT

Sell 1 ETH7D @ 0.065 XBT

Loss = 0.02 XBT

Net Profit: 0.03 XBT



Settlement

Sometimes you will have a BitMEX position and a hedge, and must exit that hedge during the settlement calculation period.

The goal is to match the unwind of your hedge vs. the settlement index of the contract.

ETH7D expires using a 30-minute Time Weighted Average Price of the ETH/XBT price on Poloniex.



Settlement Example

BitMEX Portfolio: Short 30 ETH7D contracts

Poloniex Portfolio: Long 30 ETH vs. XBT

At 11:30 UTC on Friday, pull your BitMEX ETH7D quotes

Each minute from 11:30 to 12:00 UTC, sell 1 ETH on Poloniex, you average execution price will match the settlement price for ETH7D on BitMEX.



Post Only

As a market maker you never want to pay taker fees

To ensure you always place a passive limit order use Post Only orders

On your order submission:

`'execInst': 'ParticipateDoNotInitiate'`



Skew

The goal of market making is to buy low, sell high as quickly as possible, as much as possible.

The more hedging you do, the less money you make.

To attract the other side, market makers will skew their quotes as they receive trades.

General Rule: For each full size transacted, skew your quotes half your spread.



Skew Example

You are quoting ETH7D at 0.05 XBT / 0.1 XBT for 1,000 contracts a side

You are lifted for 1,000 contracts, since your spread is 0.05 XBT, you move your quotes higher 0.025 XBT

Your new market is 0.075 XBT / 0.125 XBT

You are hit for 1,000 contracts, you now move your quotes down by 0.025 XBT

Your new market is 0.05 XBT / 0.1 XBT



Skew Example Cont.

Remember on BitMEX you receive a 0.025% rebate as a market maker

BitMEX Trades:

Sell 1,000 ETH7D @ 0.1 XBT, rebate 0.025 XBT

Buy 1,000 ETH7D @ 0.075 XBT, rebate 0.01875 XBT

Market Making Profit: 2.5 XBT

Rebate: 0.04375

Total Profit: 2.9375 XBT



Skew Considerations

Optimal Conditions: Low volatility market, with very active two-way flow

Bad Conditions: High volatility trending market, with one-way flow

Every trader's delta tolerance is different

The more sophisticated your bot, the better you can handle jump or gap risk



Basis Market Making Ask Side

ETH7D currently trades at a 10% outright premium with 7 days remaining

You can borrow Bitcoin at 1% per week

Selling ETH7D and buying ETH allows you to earn net 9% on the week

As long as you are net short ETH7D, you don't mind quoting a two-way price

As soon as you become flat ETH7D, you will only quote offers



Basis Market Making Bid Side

ETH7D currently trades at a 10% outright discount with 7 days remaining

You can borrow Bitcoin at 1% per week

You can then use that Bitcoin to borrow ETH on margin for 2% per week

Buying ETH7D and shorting ETH allows you to earn net 7% on the week

As long as you are net long ETH7D, you don't mind quoting a two-way price

As soon as you become flat ETH7D, you will only quote bids.



Basis Market Making

Inputs:

- Cost of capital on the home and foreign currency
- Spot price of the underlying

Outputs:

- Two-way quote depending on whether your portfolio has a net positive carry or theta



Appendix - Useful Terms

Bid = Buy Price, You “Hit” Bids

Ask or Offer = Sell Price, You “Lift” Offers or Asks

Delta = The value of your position in either the home or foreign currency

Theta or Carry = How much money you stand to make or lose by the passage of time

Basis = Futures Price - Spot Price