

Project

Market Making Simulation

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Rules and Constraints

1+ a time-order set of bid/ask tick prices is available and it is considered to be the Market (M)

2+ the market maker (MM) can quote for each side of its price offering, either inside the market, at-market or outside of it

can be one side in (the other side out), or both side in, or both side out

3+ MM is allowed to tighten, skew or widen at any point of time but not before X msec of any new market event — X, a variable, is called reaction time. A new market event is either a new tick or a new order

4+ MM can lay out risk by either skewing to receive next risk-reducing orders or by laying off risk w/ other MM participant through M

1. lower the ask price to sell it to other clients
2. pass the risk to other Market Maker (market taker at this time)

5+ when laying off w/ other market participants, MM should assume M is available to her at “flat” or a cost or a gain of k, a variable, fractional pips

6+ when M changes (ie a new tick has arrived), as stated previously, MM can modifies its quotes only X msec after

7+ MM receives orders asynchronously and w/o any prior knowledge from a master trade generator, to be understood as being a market taker (MT)

orders are given to the MM

8+ MM can fill an order from MT if and only if MM is at M or better than M — in other word any order (originated by MT) to be executed has a limit price which is the M price

9+ for an order received (at M), there is a probability p, “execution” probability, to get executed by MM (as there must be other MM’s at that price)

after the 'better price' order executed, X msec have to be waited
until market maker is allowed to change the quote to get back to the market
Thus, before the Market Maker reacts, there may be other orders follow up with a probability q.

10+ an order received at better than M is immediately executed (ie execution probability (p) is in this case 100%) BUT is then followed by another order Y, a variable, of same size same limit price w/ a "follow-up" probability, q

11+ assume a limit K MM of open risk — a variable

K million of base currency as open risk limit for MM

GBP/USD 1.2

Base Currency / Counter Currency

1 M GBP = 1.2 M USD

12+ compute tick by tick PnL in \$

13+ assume a limit L of max PnL loss — a variable

Variables:

1. X — MM reaction time — assume 5 msec — ie tie for MM to adjust its spread after a market event — new tick or new order whether filled or not
2. Y — Order succession time — 2 order can follow each other no faster than Y msec — assume 4 msec Y msec later, the 2nd order may appear with a probability of q
3. p — execution probability — probability to fill at M an order — assume 1/2
4. q — follow-up probability — probability to receive a second order following an order done at better than M — assume 1/4 — note that first order done w/ a prob of 100% (because better than market) and second order done at 100% but w/ a q prob of appearing
5. K — MM net open position limit, expressed in multiple of Order Size — assume 10
6. Instrument — GbpUsd — hence PnL is in Usd
7. Order Size is constant — assume 1 MM base ccy
8. Use a random generating function to satisfy these probabilistic conditions (see #4 & #5)
9. initial set of limit orders at M, or better than M, asynchronous for Instrument w/ Order Size and w/ a Expiry Z

10.Z — expiry for each order in msec — if not defined assume zero msec

no partial fulfilled

Method:

a_ read the price tape, ie M

b_ read the order sets

c_ interweave orders and prices based on their respective times

d_ apply “filling” rules (see above)

e_ after each order, decide action to be taken — either wait for a risk reducing order (while monitoring PnL to decide if bailing out is needed) or clear the risk w/ market as a taker

Note that several set of orders will be offered to test your set of MM algorithms