Project

Market Making Simulation

PYGuillo Apr 26 2019 V2

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

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

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)

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)

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

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
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

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