CQG ALGOS

SUMMER 2021 BETA

CQG Algo platform delivers high quality fills with the goal of reducing implicit trading costs involved in accumulating a derivatives position. The platform employs a cutting edge, collocated low-latency algo-engine. The algo-engine reacts in microseconds to changing market conditions for optimal management of child orders.

Algos benefit from better queue position in FIFO markets through low-latency execution as well as lightning-fast analysis of Market By Order (MBO) books.

Each algorithm is built on sound macro-analytical precepts with specific implementations dedicated to in-depth analysis of the current market microstructure as well as employing high-level statistical analysis.

The following suite of CQG Algos will be available in Desktop, CQG Integrated Client and FIX API.

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OVERVIEW

Outright Futures and Futures Spreads

- ❖ **Arrival Price**
- ❖ **VWAP** | Volume-Weighted Average Price

Outright Futures, Futures Spreads, and Options

- ❖ **TWAP** | Time-Weighted Average Price
- ❖ **RTWAP** | Time-Weighted Average Price (Randomized)
- ❖ **RIceberg** | Random Iceberg
- ❖ **SLIceberg** | Stop Limit Iceberg
- ❖ **SLSnipe** | Stop Limit Snipe
- ❖ **Snipe**
- ❖ **Tick**
- ❖ **Payup**
- ❖ **Spreader**

Outright Options

- ❖ **Vola -** Volatility Order

Arrival Price
Outright Futures and Futures Spreads

Benchmark: Order Arrival Midpoint or Sweep to Fill
Method: Arrival price uses short-term volatility and other signals to balance price risk vs cost of liquidity. Child orders can be sized based on market-by-order metrics or percent of volume parameters. Child orders can contain Payup logic.

Algo parameters in addition to [Side, Size]
- I Would Price *[Default – 2 ticks better than Arrival Price]*
  - Price at which algo will indiscriminately take all posted liquidity until filled
- *Economic Model*: *[Default – Darby2021]*
  - Darby2021 - Computes **optimal working time** based on volatility, liquidity
  - AC2000 - Optimal working time as a parameter
- Impact Model: *[Default – MBO]*
  - MBO – Place inconspicuously-sized orders based on order population
  - PovOnly – Limit participation as a percentage of traded volume
  - Schedule – Don't limit slice sizes
- Slippage Tolerance *[Default – 0.0]*
  - Appetite (in points) for variance risk. Values greater than 0 extend the computed optimal working time.
- Max Duration in Minutes: *[Default – End of Session]*
  - Maximum amount of time to work order in minutes. At this time, all slices in the market will be paid up. Non-working size will be cancelled.
- Tick Offset [Default – 0]
  - Initial placement of child orders relative to best level. 0 means join best, -1 means one tick through the market.
- Payup Parameters: *see PayUp Algo below*

Advanced parameters
- Percent of Volume: *[Default – 5%]*
  - Participation rate guidance factor
- Vol Override: *[Default – Not Set]*
  - Short-term volatility override, affects optimal working time
- Drift Override: *[Default – Not Set]*
  - Short-term drift override in points, affects optimal working time
- Gamma Factor: *[Default – 0]*
  - Aggressivity parameter. Positive values push volume toward the end of the trading horizon, negative numbers push toward the beginning. Range -4 to +4

PayUp
Outright Futures, Futures Spreads, and Options

Method: Payup comprises several models designed to work orders at best levels and pay up based on a variety of statistical factors in attempt to save implicit trading costs by buying at

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the bid or selling at the offer. This logic is featured in many other algos and it is also its own simple algo

Algo parameters in addition to [Side, Size, Price]
- Payup Model:
  - Never
    - Payup only if a parent scheduling algorithm forces
  - Simple
    - Payup if the OppositeInsideSize is <= MySize*OppositeSizeRatio OR OppositeInsideSize < OppositeSizeRaw.
  - Imbalance
    - Payup if the probability of the market turning in our favor is less than SuccessProbability OR if the conditions above in Simple mode obtain.
  - Immediate
    - Pay up immediately
  - FairQueue
    - Payup if the probability of the market NOT turning against us in the next time period is less than SuccessProbability OR if the conditions above in Simple mode obtain.
    - Join a new market if the probability of the market reverting to the prior level is less than JoinThreshold.
  - TheoQueue
    - Payup if the probability of the market NOT turning against us in the next time period is less than SuccessProbability GIVEN that the market is driven by an independent, latent theoretical process.
    - Join a new market if the probability of the market reverting to the prior level is less than JoinThreshold.
  - NeuralNet & MarkovMatrix – *Coming soon*
- Success Probability
  - Probability of a passive fill threshold, used in models above
- Opposite Size Ratio
  - Ratio of this order size to opposite inside size
- Opposite Size Raw
  - Raw opposite size threshold
- Join Threshold [Default – 0.5]
  - Probability threshold to join a new market after missing a Payup, zero disables join

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TWAP
Outright Futures, Futures Spreads, and Options

Benchmark: Time-Weighted Average Price
Method: Trade over time

Algo parameters in addition to [Side, Size]

- I Would Price *[Default – Not Set]*
    - ○ Price at which algo will indiscriminately take all posted liquidity until filled
- Impact Model: *[Default – MBO]*
    - ○ MBO – Place inconspicuously-sized orders based on order population
    - ○ PovOnly – Limit participation as a percentage of traded volume
    - ○ Schedule – Don't limit slice sizes
- Interval in Seconds:
    - ○ Trade interval in seconds
- Order Size Override *[Default – Not Set]*
    - ○ Set child order size manually or order size will be determined by Interval and Max Duration
- Max Duration in Minutes: *[Default – End of Session]*
    - ○ Maximum amount of time to work order in minutes. At this time, all slices in the market will be paid up. Non-working size will be cancelled.
- Tick Offset [Default – 0]
    - ○ Initial placement of child orders relative to best level. 0 means join best, -1 means one tick through the market.
- Payup Parameters: *see PayUp Algo above*

RTWAP

Outright Futures, Futures Spreads, and Options

Benchmark: Time-Weighted Average Price (Randomized)
Method: Trade over time with randomly-sized slices

Algo Parameters in addition to [Side, Size]

- I Would Price *[Default – Not Set]*
    - ○ Price at which algo will indiscriminately take all posted liquidity until filled
- Impact Model: *[Default – Schedule]*
    - ○ MBO – Place inconspicuously-sized orders based on order population
    - ○ PovOnly – Limit participation as a percentage of traded volume
    - ○ Schedule – Don't limit slice sizes
- Interval in Seconds:
    - ○ Trade interval in seconds
- Order Size Override *[Default – Not Set]*
    - ○ Set child order size manually or order size will be determined by Interval and Max Duration
- Max Duration in Minutes: *[Default – End of Session]*
    - ○ Maximum amount of time to work order in minutes. At this time, all slices in the market will be paid up. Non-working size will be cancelled.
- Tick Offset [Default – 0]
    - ○ Initial placement of child orders relative to best level. 0 means join best, -1 means one tick through the market.
- Rand Min / Rand Max
    - ○ Minimum and maximum values for the random sizing

- Use Mbo *[Default – false]*
    - ◦ Randomize child sizes based on market-by-order population
- Payup Parameters: *see PayUp Algo above*

VWAP
Outright Futures and Futures Spreads

Benchmark: Volume-Weighted Average Price
Method: Uses a static bucketed, N day historical volume distribution or stochastic volume distribution augmented by implied volatility to execute over a predicted volume distribution.

Algo parameters in addition to [Side, Size]
- Economic Model: *[Default – Static]*
    - ◦ Static – Use N Day Volume Distribution Mean, Variance
    - ◦ Stochastic – Use Static distribution as modified by short-term signals
- I Would Price *[Default – Not Set]*
    - ◦ Price at which algo will indiscriminately take all posted liquidity until filled
- Impact Model: *[Default – Schedule]*
    - ◦ MBO – Place inconspicuously-sized orders based on order population
    - ◦ PovOnly – Limit participation as a percentage of traded volume
    - ◦ Schedule – Don't limit slice sizes
- Max Duration In Minutes: *[Default – End of Session]*
    - ◦ Maximum amount of time to work order in minutes. At this time, all slices in the market will be paid up. Non-working size will be cancelled.
- Tick Offset [Default – 0]
    - ◦ Initial placement of child orders relative to best level. 0 means join best, -1 means one tick through the market.
- Payup Parameters: *see PayUp Algo above*

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Advanced parameters
- ◦ Percent of Volume *[Default – 5%]*
    - ◦ Participation rate guidance factor
- ◦ Time Horizon Days: *[Default – 30]*
    - ◦ Bucket horizon in calendar days
- ◦ Bucket Interval Minutes: *[Default – 5]*
    - ◦ Bucket interval in minutes

RIceberg
Outright Futures, Futures Spreads, and Options

Benchmark: Random Iceberg
Method: Randomly size iceberg slices, replenishing once the prior slice is filled

Algo parameters in addition to [Side, Size]
- Show Quantity
  - Maximum child order size to show
- Pause Between Orders
  - Pause between order slices in milliseconds
- Tick Offset [Default – 0]
  - Initial placement of child orders relative to best level. 0 means join best, -1 means one tick through the market.
- Rand Min / Rand Max
  - Minimum and maximum values for random sizing
- Use Mbo *[Default – false]*
  - Randomize child sizes based on market-by-order population
- Payup Parameters: *see PayUp Algo above*

SLIceberg
Outright Futures, Futures Spreads, and Options

Benchmark: Stop Limit Iceberg
Method: Deploys a random iceberg when the market trades at a price level

Algo parameters in addition to [Side, Size, Price]

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- Price Type
  - Last Trade Price – Deploy if a price level trades
  - Same – Deploy if market is bid (for buy orders) or offered (for sell orders)
  - Opposite - Deploy if market is bid (for sells) or offered (for buys)
- *Same as RIceberg Params above*

Snipe
Outright Futures, Futures Spreads, and Options

Method: Takes liquidity at a price level without showing size in a passive manner

Algo parameters in addition to [Side, Size, Price]
- Pause Between Orders:
  - Pause between orders in milliseconds
- Payup Parameters: *see PayUp Algo above*

Tick
Outright Futures, Futures Spreads, and Options

Method: Basic "with a tick" logic, monitors opposite inside size and pays up if it recedes below a threshold or if the market moves away. Optionally reprice or cancel the order if the market moves toward the order.

Algo parameters in addition to [Side, Size, Price]
- Max Chase Ticks *[Default – 2]*
  - Maximum number of ticks to pay up
- Trade Toward Behavior: *[Default – NO_CHANGE]*
  - *What happens if the market moves towards us.*
  - NO_CHANGE – Continue to lean on the original opposite inside price
  - CANCEL – Cancel the order
  - REPRICE – Lean on the new opposite inside price
- Imbalance Ratio *[Default – 0.0]*
  - Trigger threshold:
  - (SameSize–OppositeSize) / (SameSize– OppositeSize)
- Ratio: *[Default – 1.0]*
  - Ratio of this order size to opposite inside size
- Enable Imbalance: *[Default – False]*
  - Look for order imbalance

Spreader
Outright Futures, Futures Spreads, and Options

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- High performance spreader
- PER LEG Spread Parameters
  - Quantity: Quantity multiplier for this leg of the spread
  - PriceMultiplier: Price multiplier for this leg of the spread
  - EnableQuoting: Enable quoting for this leg
  - LeanQuantityRatio: Available hedge quantity is adjusted by this factor
  - MarketDataType: { Direct, Merged }
  - InsideThrottleTicks: Inside market throttle for quoting order
  - OutsideThrottleTicks: Outside market throttle for quoting order
- Hedge Leg Parameters
  - Payup Parameters: *see PayUp Algo above*

Vola
Outright Options

- Volatility Order
- Trade an option in volatility terms
  - Optionally work a futures hedge order or a Covered-UDS in the spread book
- Algo Parameters in addition to [Side, Size]
  - VolModel: { BlackScholes, Bachelier }

- HedgeModel: { NoHedge, Futures, CoveredUDS }
- Volatility: Price in volatility terms
- Optional Parameters
    DaysPerYear: Days per year override
    InterestRate: Risk-free interest rate override