



## CQG ALGOS

We are pleased to introduce CQG Execution Technologies newest product, CQG Algos.

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.

### 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**
- ❖ **OffsetPayup**
- ❖ **Peg**
- ❖ **Tick**
- ❖ **Payup**
- ❖ **Roll** (Multi-Leg)

#### 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]

- Start Time *[Default – Now]*
  - Time after which the algo will begin execution. No slices will be released before this time. This time can be in the recent past, so long as the Computed End Time is in the future.
- End Time *[Default – Not Set]*
  - If set, this value represents the Computed End Time.
  - At this time, all slices in the market will be paid up. Non-working size will be cancelled.
  - Cannot be specified with Max Duration In Minutes.
- Max Duration In Minutes *[Default – Not Set]*
  - If set, this value is added to Start Time to yield the Computed End Time.
  - At the Computed End Time, all slices in the market will be paid up. Non-working size will be cancelled.
  - This value cannot be specified with End Time.
  - If neither this value nor End Time are set, the Computed End Time will default to End of Session.
- I Would Price *[Default – Not Set]*
  - 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 - 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
- Cost Model *[Default – Optimistic]*
  - Optimistic – Speed up during favorable market moves with respect to arrival price, or slow down during unfavorable moves, thus allowing the market to mean-revert.
  - Aggressive – Maintain optimal velocity based solely on liquidity whether the market moves favorably or unfavorably.
- 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

- Slippage Tolerance *[Default – 0.0]*



- Appetite (in points) for variance risk. Values greater than 0 extend the computed optimal working time
- 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 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 [Required]
  - Never  
Pay up only if a parent scheduling algorithm forces
  - Immediate  
Pay up immediately
  - Simple  
Pay up if the OppositeInsideSize is  $\leq$  MySize\*OppositeSizeRatio OR OppositeInsideSize < OppositeSizeRaw.
  - Imbalance  
Pay up if the probability of the market turning in our favor is less than SuccessProbability OR if the conditions above in Simple mode obtain.
  - FairQueue  
Pay up 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  
Pay up 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.
- Success Probability [Default – 0.6 (this means 60%)]



- Probability of a passive fill threshold, used in FairQueue and TheoQueue models above.
- Opposite Size Ratio *[Default – 1.5]*
  - Ratio of this order size to opposite inside size, used in Simple, Imbalance, and FairQueue models above.
- Opposite Size Raw *[Default – 0 (disabled)]*
  - Raw opposite size threshold, used in Simple, Imbalance, and FairQueue models above.
- Join Threshold *[Default – 0.5 (this means 50%)]*
  - Probability threshold to join a new market after missing a Payup, used in FairQueue and TheoQueue models. Zero disables join.
- Max Chase Ticks *[Default – 0 (no limit)]*
  - Maximum number of ticks to pay up. Zero means no maximum

## TWAP

Outright Futures, Futures Spreads, and Options

**Benchmark:** Time-Weighted Average Price

**Method:** Trade over time

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

- Start Time *[Default – Now]*
  - Time after which the algo will begin execution. No slices will be released before this time. This time can be in the recent past, so long as the Computed End Time is in the future.
- End Time *[Default – Not Set]*
  - If set, this value represents the Computed End Time.
  - At this time, all slices in the market will be paid up. Non-working size will be cancelled.
  - Cannot be specified with Max Duration In Minutes.
- Max Duration In Minutes *[Default – Not Set]*
  - If set, this value is added to Start Time to yield the Computed End Time.
  - At the Computed End Time, all slices in the market will be paid up. Non-working size will be cancelled.
  - This value cannot be specified with End Time.
  - If neither this value nor End Time are set, the Computed End Time will default to End of Session.
- 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 *[Required]*
  - 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
- 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]

- Start Time [*Default – Now*]
  - Time after which the algo will begin execution. No slices will be released before this time. This time can be in the recent past, so long as the Computed End Time is in the future.
- End Time [*Default – Not Set*]
  - If set, this value represents the Computed End Time.
  - At this time, all slices in the market will be paid up. Non-working size will be cancelled.
  - Cannot be specified with Max Duration In Minutes.
- Max Duration In Minutes [*Default – Not Set*]
  - If set, this value is added to Start Time to yield the Computed End Time.
  - At the Computed End Time, all slices in the market will be paid up. Non-working size will be cancelled.
  - This value cannot be specified with End Time.
  - If neither this value, nor End Time are set, the Computed End Time will default to End of Session.
- 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 [*Required*]
  - 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
- 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]

- Start Time [*Default – Now*]
  - Time after which the algo will begin execution. No slices will be released before this time. This time can be in the recent past, so long as the Computed End Time is in the future.
- End Time [*Default – Not Set*]
  - If set, this value represents the Computed End Time.
  - At this time, all slices in the market will be paid up. Non-working size will be cancelled.
  - Cannot be specified with Max Duration In Minutes.
- Max Duration In Minutes [*Default – Not Set*]
  - If set, this value is added to Start Time to yield the Computed End Time.
  - At the Computed End Time, all slices in the market will be paid up. Non-working size will be cancelled.
  - This value cannot be specified with End Time.
  - If neither this value, nor End Time are set, the Computed End Time will default to End of Session.
- 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*

### 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, Price]

- Show Quantity [*Required*]
  - 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 [*Required*]
  - 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]

- Price Type [*Required*]
  - 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*



## SLSnipe

Outright Futures, Futures Spreads, and Options

**Benchmark:** Stop Limit Snipe

**Method:** Deploys a Snipe order when the market trades at a price level

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

- Price Type [*Required*]
  - 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)
- Pause Between Orders [*Default – 0*]
  - Pause between orders in milliseconds
- Tick Offset [*Default – 0*]
  - Initial placement of child orders relative to Price. 0 means no change, -1 means one tick worse.
- Payup Parameters: *see PayUp Algo 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 [*Default – 0*]
  - Pause between orders in milliseconds
- Tick Offset [*Default – 0*]
  - Initial placement of child orders relative to Price. 0 means no change, -1 means one tick worse.
- Payup Parameters: *see PayUp Algo above*

## OffsetPayup

Outright Futures, Futures Spreads, and Options

**Method:** Deploys Payup logic at an offset to best levels

### Algo Parameters in addition to [Side, Size, Price]

- 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*





## Peg

Outright Futures, Futures Spreads, and Options

**Method:** Deploys an order as an offset to best levels, maintains distance as market moves away but not toward

### Algo Parameters in addition to [Side, Size, Price]

- Tick Offset [Default – 0]
  - Initial placement of child orders relative to best level. 0 means join best, -1 means one tick through the market

## 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]

- Opposite Size Ratio [Default – 1.5]
  - Ratio of this order size to opposite inside size, below which the algo triggers
- Opposite Size Raw [Default – 0 (disabled)]
  - Raw opposite size threshold, below which the algo triggers.
- 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:
  - $(\text{SameSize} - \text{OppositeSize}) / (\text{SameSize} + \text{OppositeSize})$
- Enable Imbalance [Default – False]
  - Look for order imbalance

## Vola - Coming Soon

Outright Options

**Method:** 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, Price]

- VolModel [Default – BlackScholes]



- BlackScholes
- Bachelier
- HedgeModel [Default – NoHedge]
  - NoHedge
  - Futures
  - CoveredUDS
- Volatility
  - In model terms, a percent for BlackScholes (60.2 is 60.2% vol) or a dollar amount for Bachelier

#### Advanced parameters

- DaysPerYear
  - Days per year override
- InterestRate
  - Risk-free interest rate override

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## Multi-Legged Algos

### **Roll - Coming Soon**

Outright Futures, Futures Spreads, and Options

**Method:** Roll positions with Arrival Price logic on the base leg, with optional Payup logic on the excess leg.

#### **Algo Parameters in addition to [Side, Size, Price]**

- Arrival Parameters: *see ArrivalPrice Algo above*
- Payup Parameters: *see PayUp Algo above*