To Daiwa Securities Capital Markets
Algorithmic Trading Suites

POV3 Algorithm Specifications

Confidential

8-March-2011

Version 1.5

Simplex Technology,Inc.

Simplex TECHNOLOGY, INC.

【Revision History】

Version	Chapter	Details	Date	Editor
1.4	—	First edition		
1.5	2	Max Pct Volume and Min Pct Volume can be set second decimal place.	2011/03/02	Kobayashi
	5.1	While SQ. POV3 doesn't cancel cross.	2011/03/02	Kobayashi
	5.2.1	The target qty right after open is the same as continuous session.	2011/03/02	Kobayashi
	5.2.1	The limit price of additional order at open is the same as continuous session.	2011/03/03	Kobayashi
1.6	5.1	Add Ahead target ratio.	2011/03/08	Kobayashi

1. Algorithm Overview

POV (Participate of Volume) strategy is aimed to participate the market volume.

2. Algorithm Parameter

No	Algorithm Parameter	Description	Required	Parametric in FIX	Amendable	Default Value
1	Start Time	Order start time(HH:MM) Start time of an algorithm order. When this parameter is not specified, parent order receive time shall be the algorithm start time. This is the first possible point of a child order release.(This is the same specification as that of the current version.)	Optional	○	○	―
2	End Time	End time(HH:MM) End time of an algorithm order, When this parameter is not specified, closing time of each market shall be the algorithm end time (TSE: 15:00, OSE: 15:10). [End time – Order exclude point] shall be the last possible point of a child order release. (This is the same specification as that of the current version.).	Optional	○	○	―
3	Max Pct Volume (%)	Maximum participate volume(%) (between 0.01 and 99.99). The maximum pegging ratio to the market volume. Same as the present volume limit.	○	○	○	―
4	Min Pct Volume (%)	Minimum participate volume(%) (between 0.01 and 99.99). The minimum pegging ratio to the market volume. When this parameter is not specified, the same logic as that of the volume limit used in the present POV is adopted..	Optional	○	○	―
5	Style	Parameter specifying execution speed. This parameter is specified as integer between 1 and 9. The bigger the number, the earlier it shall be executed. Specification from client FIX is mapped as follows. Passive:3 Normal:5 Aggressive:7 When it is short sell, add 2 points to the original value of a client selected Style to increase filled ratio.	Optional	○	○	Normal

No	Algorithm Parameter	Description	Required	Parametric in FIX	Amendable	Default Value
6	Market View	This parameter defines how to modify child order release quantity when market price changes. Through this quantity adjustment, execution speed can be increased/decreased depending on a price fluctuation. This parameter can be specified as one of the 3 following modes via FIX. Momentum For buy, when market price is above ArrivalPrice, it follows the market and release more than the initially calculated release quantity.. Neutral Reversion For Buy, when market price is above ArrivalPrice, it goes opposite from the market and release less than the initially calculated release quantity.. This parameter can be specified as integer between -4 and 4 from a client interface. Those integers and 3 FIX-specifiable modes are mapped as follows. Momentum：2、 Neutral：0 Reversion：-2	Optional	O	O	Neutral
7	LOB	LOB(Limit Or Better) volume pegging flag. When it is ON, it follows LOB volume. When this parameter is ON, it follows total traded volume whose trade price is better than its limit price. (When it is Buy, it follows the volume with those trade price lower than limit price.) This parameter can be specified as one of those shown below.. ON OFF	Optional	O	O	ON

No	Algorithm Parameter	Description	Required	Parametric in FIX	Amendable	Default Value
8	Arrival Price	Aimed execution price for Algorithm. Specified price must be within the limit price range. If not specified, Arrival price is determined in order of priority listed below. If the price with higher priority cannot be acquired, the price with next priority will be used as the arrival price benchmark. Trading session 1. mid price 2. last price Before market opens 1. last price 2. base price	Optional	×	○	
9	Auto Cancel	Auto cancel flag Check ON, to cancel automatically. The order which is unfilled after [End Time + 30 sec] is cancelled, if this parameter is ON. (This is the same specification as that of the current version.)	Optional	×	×	ON
10	Order Exclude Point	Order exclude point(min) (Integer between 0～60)	○	×	×	0
11	Min Slice Interval	Minimum slice interval(sec) (5～120sec)	○	×	×	5
12	Open Order	Open order flag (Check ON, when open order)	Optional	×	×	ON
13	Open Volume Adjust Ratio (%)	Ratio based on which a calculated release quantity is modified so as to ease the order impact.	※1	×	×	40%
14	Target Filled Ratio	Use to calculate “Behind % Trigger Qty	Optional	×	○	0
15	Allowed Behind Time	Use to calculated”Time Trigger Qty”	Optional	×	○	0
16	Ahead Target Ratio (%)	Use to make target qty more aggressive by this ratio.	Optional	×	○	-

Parameter includes the boundary numbers.
※1・・・Necessary when open order is ON.

3. Algorithm Process

① Receive new POV order or order amendment.
↓
② Run validation check, reject if not good.
↓
③ Schedule a child order release.
↓
④ Calculate child order release quantity and limit price, then release it.
↓
⑤ When order is made at ④, run auto amendment for limit price and order quantity.
↓
⑥ Repeat ③～⑤ till the order end time or till the unordered quantity becomes 0.
↓
⑦ If the orders are not fulfilled completely by [order end time+ 30 sec], they shall be automatically cancelled.

Detail of each process is below.

4. Validation Check

The following validation check is done in POV when order is received. For other parameters, validation checks are the same as those of VWAP3.

- Max Volume Limit(%)と Min Max Volume Limit(%)
  [1 ≦ Min Pct Volume (%)≦ Max Pct Volume (%)≦ 99]
  [Max Pct Volume (%)≦ Customer master Vol High Limit For POV(%) default]
- ArrivalPrice
  [Lowest Limit Price ≦ ArrivalPrice ≦ Highest Limit Price]

5. Release and Amendment Child Orders

There are two timing for release as they are shown below.

1. Before AM and PM auction.
2. Continuous session.

Release shall be stopped after [End Time – Order Exclude Point].

Release shall not be done when calculated quantity is 0 which is described below.

However, when the calculated child order release quantity is 0, no more release is made even at release timing.

[Example: Release schedule]

Parent order recieved at 9:10:00 with order end time＝14:00, order exclude point＝0 min and last order time ＜ 14:00:00.

Time	Market	Slice interval to next release	Description
9:10:00	Before AM open	5sec	Receive a parent-order. Open order shall be instantly released. Calculate slice interval to the next release and schedule a child order release at [order received time ＋ calculated slice interval].
9:10:05	Before AM open	4 sec	Adjust quantity of child orders released before auction. (Do not release any order of continuous session.)
9:10:06	On AM Open		Child orders are added/canceled to adjust volume to “market volume * volume participation ratio”.
9:10:09	Continuous session	5 sec	Release a child order, calculate slice interval to the next release and schedule a child order release at [order received time ＋ calculated slice interval].
9:11:14	Continuous session	･･･	〃
･･･	･･･	･･･	（omit）
10:59:55	Continuous session	6 sec	Release a child order, calculate slice interval to the next release and schedule a child order release at [order received time ＋ calculated slice interval]. Since the next release point(11:00:10) is in lunch time（11:00～12:30）, schedule a child order release at [PM open + calculated random seconds(5 sec)].
12:29:00	Before PM open		Release before PM open.
12:30:06	Continuous session	･･･	Release a child order, calculate slice interval to the next release and schedule a child-order release at [order received time ＋ slice interval].
･･･	･･･	･･･	（omit）
13:59:55	Continuous session	5 sec	The calculated next release point is at **14:00:00** which is after the last release time, 14:00:00, therefore the next order shall not be released.

5.1 Continuous Session

Caluculate quantities every 3-7 (random) seconds.

(A) **TargetQty:** {POV(mv - cumQty) + 0.5lot} ÷ (1-POV), Rounded down to nearest lot.
* Consider its own open quantity and be able to get 1/2 lot ahead. (mv = market volume within limit price since order's start. when volume limit was reset, mv will also be reset.) In case that this value decreased, use the previous value.

(B) **TargetQty(Ahead): (A)** x AheadTargetRatio

(C) **Behind%TriggerQty: (A)***TargetFilledRatio

(D) **TimeTriggerQty: POV*mv** AllowedBehindTime ago (Do not use the volume before the volume limit start time.)
* See Table1 for 'TargetFilledRatio' and 'AllowedBehindTime'

(E) **MinCumQty**: Min[Max[(C), (D)], LeavesQty when volumeLimit was reset]

(F) **CumQty** (When base time of volume limit was reset, CumQty will also be reset.)

(G) **TradingQty**

(H) **AdditionalQty**: (B) – (F) – (G) [= [0.5lot + POV*mv + (POV -1)*TradingQty - CumQty] / [1-POV]]
* 0 <= (H) <= OrderQty-(F)-(G)

(I) **CrossQty**: Max [(E) - (F), (H)*CrossRatio] (>= 0) Rounded down to nearest lot. CrossRatio is value of No.1 in Table2.

[Buy]
If (H) >= (I), then cross the spread with (I), and split remaining quantity [(H) - (I)] to bestBid and bestBid-1 to maintain the balance in Table2. (If there is any slice on bestBid-2 or lower, amend the slice in first.)
If (H) < (I), then cross the spread with (H), and move slice [(I) - (H)] from bid side to bestAsk.

[Sell]
If (H) >= (I), then cross the spread with (I), and split remaining quantity [(H) - (I)] to bestAsk and bestAsk+1 to maintain the balance in Table2. (If there is any slice on bestAsk+2 or higher, amend the slice in first.)
If (H) < (I), then cross the spread with (H), and move slice [(I) - (H)] from ask side to bestBid.

Table1. Algo-parameters' value according to the style

Style	1	2	3	4	5	6	7	8	9
TargetFilledRatio*	50%	55%	60%	65%	70%	75%	80%	85%	90%
AllowedBehindTime	300sec.	270sec.	240sec.	210sec.	180sec.	150sec.	120sec.	90sec.	60sec.

* After OrderEndTime-3min, add to TargetFilledRatio 1/3 of the way to 100% (round half up). E.g. If chosen style is 7, TargetFilledRatio will be: -3min: 87%, -2min: 93%, -1min: 100%.
* Shaded region means that these numbers will not be set automaticly because the template only has style [passive:3], [normal:5], and [aggressive:7].

Table2. Allocate slice quantity according to the style

	Style								
No.*	1	2	3	4	5	6	7	8	9
1	0%	0%	10%	20%	30%	40%	50%	70%	90%
2	30%	50%	50%	45%	40%	40%	50%	30%	10%
3	70%	50%	40%	35%	30%	20%	0%	0%	0%

* Buy: No.1=BestAsk, No.2=BestBid, No.3=BestBid-1, sell: No.1=BestBid, No.2=BestAsk, No.3=BestAsk+1

[Notes]

Paticular notes of this specification are as follows.

- Amendment
  1. Always amend down or cancel the last slice sent to any price level.
  2. Never move a slice to a more passive slice, even if it means the style balance is broken.
  3. Never leave a slice on the 3rd best.
  4. If necessary, amend a passive slice quantity down, and after received the result of the amendment, send new slice (with amended quantity) either to cross the spread or put on best.
     (e.g. If CrossQty=100, AdditionalQty=60, amendable sliceQty (without amend qty down)=30, first cross the spread with 90 (AdditionalQty and amendable sliceQty) and amend slice qty down by 10, and after received the result, send new slice with 10 to cross the spread. See case6 of “5.1.2 Example of Life of a POV order” for another example.)
  5. If the bid-ask spread is larger than 2 ticks, amend the slice on near side to more aggressive price by 1 tick in 7% of the time. (7% is settable in set-up-parameter.)

- Trigger
  1. TargetQty=OrderQty does not trigger any special behaviour.
  2. MinCumQty=OrderQty finishes off the order.
  3. After OrderEndTime-30sec., all slices will be market order.

- Others
  1. Use IOC to cross the spread.
  2. While SQ, POV3 doesn’t cancel the cross in order to keep queue priority during SQ and to get fill at the end of SQ.

5.1.1 Sample case

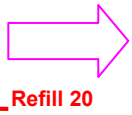
■ **Case1: AdditionalQty equals CrossQty**

(A) TargetQty=100, (B) BehindTriggerQty=60, (C) TimeTriggerQty=50, (D) MinCumQty=60, (E) CumQty=40, (F) TradingQty=40, (G) AdditionalQty=20, (H) CrossQty=20, style=3(50/40)

If TargetQty is 100, MinCumQty is 60 (Behind % Trigger required quantity is 100*60%, Time Trigger required quantity is 50). And when CumQty is 40 and TradingQty is 40, need to slice out 100-40-40=20, and since want to get filled with 60-40=20, all of the slice's price will be bestAsk.

1. Slice out 200 at the BestAsk price.

Ask Vol	Price	Bid Vol
	Market	
231	Over	
27	108	
11	107	
9	106	
11	105	
27	104	
18	103	
58	102	
227	101	
	100	134(23)
	99	62(17)
	98	55
	97	27
	96	10
	95	26
	94	11
	93	10
	Under	100



2. Get filled at price 101.

Ask Vol	Price	Bid Vol
	Market	
231	Over	
27	108	
11	107	
9	106	
11	105	
27	104	
18	103	
58	102	
207	101	
	100	134(23)
	99	62(17)
	98	55
	97	27
	96	10
	95	26
	94	11
	93	10
	Under	100

■ **Case2: AdditionalQty is more than the CrossQty**

(A) TargetQty=100, (B) BehindTriggerQty=70, (C) TimeTriggerQty=50, (D) MinCumQty=70, (E) CumQty=30, (F) TradingQty=5, (G) AdditionalQty=65, (H) CrossQty=40, style=5(40/30)

If TargetQty is 100, MinCumQty is 70. (Behind % Trigger required quantity is 100*70%=70, Time Trigger required quantity is 50). And when CumQty is 30 and TradingQty is 5, need to slice out 100-30-5=65. To fill 70-30=40, slice out 40 at bestAsk. Also, slice out 13 at bestBid and 12 at 2nd bestBid (to be 18/12).

1. Slice out 40 at bestAsk, 13 at bestBid and 12 at 2nd bestBid to maintain 40/30 balance.

Ask Vol	Price	Bid Vol
	Market	
231	Over	
27	108	
11	107	
9	106	
11	105	
27	104	
18	103	
58	102	
227	101	
	100	100[5]
	99	55[0]
	98	11
	97	27
	96	10
	95	26
	94	11
	93	10
	Under	100

Refill 40

13

12

2. Get filled at price 101, and child orders were added to bestBid and 2nd bestBid

Ask Vol	Price	Bid Vol
	Market	
231	Over	
27	108	
11	107	
9	106	
11	105	
27	104	
18	103	
58	102	
187	101	
	100	113**[5,13]**
	99	67**[12]**
	98	11
	97	27
	96	10
	95	26
	94	11
	93	10
	Under	100

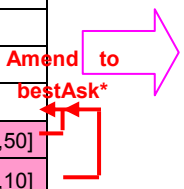
* Values in brackets are the target order's slices.

■ **Case3: AdditionalQty is not sufficient**

(A) TargetQty=950, (B) BehindTriggerQty=680, (C) TimeTriggerQty=900, (D) MinCumQty=900, (E) CumQty=760,
(F) TradingQty=190, (G) AdditionalQty=0, (H) CrossQty=140, style=5(40/30)

If TargetQty is 950, MinCumQty is 900 (Behind % Trigger required quantity is 950*70%=680 Time Trigger required quantity is 900). And when CumQty is 760 and TradingQty is 190, AdditionalQty become 950-760-190=0. To fill 900-760=140, move 140 to the bestAsk, from 2nd bestBid and bestBid (maintain 40/30 balance).

Ask Vol	Price	Bid Vol
	Market	
231	Over	
27	108	
11	107	
9	106	
11	105	
27	104	
18	103	
58	102	
227	101	
	100	210[60,50]
	99	105[10,10,20,30,10]
	98	11
	97	27
	96	10
	95	26
	94	11
	93	10
	Under	100



Ask Vol	Price	Bid Vol
	Market	
231	Over	
27	108	
11	107	
9	106	
11	105	
27	104	
18	103	
58	102	
87	101	
	100	130**[30]**
	99	45**[10,10]**
	98	11
	97	27
	96	10
	95	26
	94	11
	93	10
	Under	100

* If last child order (in BestBid queue) > CrossQty, amend bestBid slice quantity down, and send new slice at bestAsk (e.g. amend slice down from 60 to 30, and send new slice 30 at bestAsk.).

5.1.2 Example of Life of a POV order

[Order Details]

Order qty	1,000
POV	10%
roundLot	10
Style	Normal: 5 / 30:40:30
TargetFilledRatio	20%

Slices are numbered s1, s2 etc.
Qty is after, e.g. Slice 1 is 10 shares. s1:10

Case #	Example of:	activity	time	cross	best1	best2	best3	mktvol	targetqty	mincumqty	cumqty	openqty	time trigge	% trigger
		order arrives	10:00:00					0	0	0	0	0		
Case 1	Cross spread immediately due to % trigger	mktvol up	10:00:05	80	**s1:10**	**s2:10**		1000	100	80	80	20	n	y
Case 2	Cross spread immediately due to % trigger	mktvol up	10:00:10 pre					3000	300	240	80	20	n	y
	split remaining qty to maintain 40/30		10:00:10 post	160	s1:10,**s3:30**	s2:10,**s4:10**		3000	300	240	240	60		
Case 3	Cross spread immediately due to % trigger	mktvol up, we get exec'd 30 on best	10:00:15 pre		s3:10	s2:10,s4:10		4000	400	320	270	30	n	y
	split remaining qty to maintain 40/30 balance		10:00:15 post	50	s3:10,**s5:40**	s2:10,s4:10,**s6:10**		4000	400	320	320	80		
Case 4	split remaining qty to maintain 40/30 balance	mktvol up, we get exec'd 50 on best	10:00:20 pre			s2:10,s4:10,s6:10		4100	410	328	370	30	n	n
	move slice from 2nd best to best to maintain balance		10:00:20 post		**s6:10,s7:10**	s2:10,s4:10		4100	410	328	370	40		
		mktvol up	10:00:25 pre		s6:10,s7:10	s2:10,s4:10		5000	500	400	370	40	n	y
			10:00:25 post	30	s6:10,s7:10,**s8:40**	s2:10,s4:10,**s9:20**		5000	500	400	400	100		
Case 5	never move a slice to a more passive price	bestbid moves down, mktvol up, we get exec'd 60 on best	10:00:30 pre		s2:10,s4:10,s9:20			5060	506	404.8	460	40	n	n
			10:00:30 post		s2:10,s4:10,s9:20			5060	506	404.8	460	40		
		mktvol up	10:00:35 pre		s2:10,s4:10,s9:20			7000	700	560	460	40	n	y
			10:00:35 post	100	s2:10,s4:10,s9:20,**s10:40**	**s11:60**		7000	700	560	560	140		
Case 6	move all slices off of (now) 3rd best	bestbid moves up, mktvol	10:00:40 pre			s2:10,s4:10,s9:20,s10:40	s11:60	9000	900	720	560	140	n	y
	amend 2nd best slice down if qty needs to be on best		10:00:40 ..	160	**s11:60,s12:40**	s2:10,s4:10,s9:20,**s10:30**		9000	900	720	720	170		
	send new slice to best1	received the result of the amendment	10:00:40 post	160	s11:60,s12:40,**s13:10**	s2:10,s4:10,s9:20,s10:30		9000	900	720	720	180		
		mktvol up	10:00:55 pre		s11:60,s12:40,s13:10	s2:10,s4:10,s9:20,s10:30		9500	950	760	720	180	n	y
			10:00:55 post	40	s11:60,s12:40,s13:10	s2:10,s4:10,s9:20,s10:30,**s14:10**		9500	950	760	760	190		
	…		…											
Case 7	time trigger is not based on slice's original sending time – don't do anything	no volume for 3min from first slice time	**10:03:05**		s11:60,s12:40,s13:10	s2:10,s4:10,s9:20,s10:30,s14:10		9500	950	760	760	190	**n**	n

Case #	Example of:	activity	time	cross	best1	best2	best3	mktvol	targetqty	mincumqty	cumqty	openqty	time trigge	% trigger
Case 8	cross spread due to time trigger, looking at targetqty 180s before maintain 40/30 balance when crossing spread	no volume..	**10:03:40 pre**		s11:60,s12:40,s13:10	s2:10,s4:10,s9:20,s10:30,s14:10		9500	950	900	760	190	**y**	n
	amend 2nd best slice down if qty needs to be on best		**10:03:40 post**	140	**s11:30**	s2:10,s4:10		9500	950	900	900	50		
Case 9	targetqty=orderqty does not trigger any special behaviour	mktvol up, targetqty=orderqty	10:03:45 pre		s11:30	s2:10,s4:10		10000	1000	900	900	50	n	n
	Cross spread with 30% of new qty as there's no other trigger		10:03:45 post	10	s11:30,**s15:30**	s2:10,s4:10,**s16:10**		10000	1000	900	910	90		
Case 10	mincumqty=orderqty finishes off the order		10:03:50 pre		s11:30,s15:30	s2:10,s4:10,s16:10		12500	1250	1000	910	90	n	y
			10:03:50 post	90				12500	1250	1000	1000	0		

5.2 Before Auction

When a child order release is scheduled before open, child order release time will be [market open time – 20 minute].
If a parent order is received after [market open time – 20 minute](ex: 8:59:30), its open order will be immediately released.
If a parent order is received after market open time(ex: 9:00、12:30) and Ita is not yet settled, open order shall be released immideately.

[Example: First Release before auction]

Parent order received time	Release time before open
8:20	8:40:00
8:40	8:40:00
8:41:10	8:41:10
～	～
10:50	12:10:00
12:05	12:10:00
12:29:50	12:29:50

Order quantity of before auction is calculated from quotes. Therefore, with changes of quotes, adjust order quantity. And also, when the auction price is determined, adjust order quantity again. Interval between adjustments of order quantity is as follows.

[Orders accepted during am session]

Condition	Timing
accepted time - 8:59:50	90 +/- 15sec (participating to quotes quantity)
8:59:50 - 8:59:55	Never fail to adjust quantity (participating to quotes quantity)
8:59:55 - am auction	5 +/- 1sec (participating to quotes quantity)
am auction	Adjust quantity (participating to Time Volume)
12:10 - pm auction	90 +/- 15sec (participating to quotes quantity)
pm auction	Adjust quantity (participating to Time Volume)

[Release quantity]
Open order release quantity for both AM and PM open are calculated as shown below. (It is not market open time but the time at which Ita is actually settled.).
[Open order release quantity]

＝ Estimated open volume calculated from quotation x Participate Volume x Open volume adjust ratio(%)

- ✓ Odd lot is cutoff.

Open order shall not be released at the following situations.

- Neither Buy/Sell quotation exists.
- Either Buy/Sell quotation does not exist.
- When there are more than 2Ticks between BestBid and BestAsk.

Example: Calculation of open order release quantity (TSE/JDQ)
Maximum participate volume = 50%
Minimum participate volume = 10%
Open volume adjust ratio = 40%
Trading unit = 100

Example: Ita is as below.

Sell Quatation	Price	Buy Quatation
5900	102	
2300	101	
6000	100	
	99	2000
	98	2000
	97	1000

Smaller value of BestBid quantity or BestAsk quantity is taken as Estimated open volume.
Since Min(BestBid quantity, BestAsk quantity) are 2,000 stocks,
Open order release quantity＝2,000×((50% + 10%)÷2)×40%＝240
Round off odd lot and release 200 stocks by **before auction basic order**

[Order quantity of before pm auction which accepted during am session]

＝ Time Volume × Participate Volume - sliced out quantity

✓ Odd lot is cutoff.

5.2.1 Adjustment of order quantity before auction

With expected auction volume calculated from quotes, adjust order quantity before auction. (Add/Amend/Cancel child orders).
The quantity is calculated as follows.

[Adjustment of order quantity before auction]

Target volume = Estimated open volume calculated from quotation x Participate Volume x Open volume adjust ratio (%)

1. Target volume − sliced quantity >= 1lot,
   Place additional order with quantity (Target volume − sliced quantity).
2. Target volume − sliced quantity < 0
   Deduct quantity (sliced quantity − Target volume) from sliced child orders. (Amend/Cancel from the last child order to be executed)

[Adjustment of order quantity at auction]

Target volume = {POV(mv - cumQty) + 0.5lot} ÷ (1-POV), Rounded down to nearest lot. (The same as continuous session).

3. Target volume − sliced quantity >= 1lot
   Place additional order with quantity (Target volume − sliced quantity).
   The limit price of this additional order is the same as continuous session.
4. Target volume − sliced quantity < 0
   Deduct quantity (sliced quantity − Target volume) from sliced child orders. (Amend/Cancel from the last child order to be executed)

5.3 Participate Volume

[Participate Volume at each release point] is calculated from Arrival Price, Current Price and Market View as shown below.
Expressing [Participate Volume at order] as “a”, its value has to satisfy the following equation.

[Minimum Participate Volume≦ a ≦ Maximum Participate Volume]

1） When Minimum Participate Volume **is not** specified.
a ＝ Maximum Participate Volume

2） When Minimum Participate Volume **is** specified.

1． Calculate Arrival Price of current price “x”(%)

x ＝（ －1 ＋（ Current Price ÷Arrival Price））÷(Annual Volatility ÷ SQRT(250))

- ✓ Obtain the latest Annual Volatility of correspoinding name and exchange from ALGO_STATISTICS table.
- ✓ If Annual Volatility cannot be acquired, x shall be 0.
- ✓ Before auction, use mid price.

2． Define the variable “y” which can take real value between 1 and -1.
“y” takes 1 when Participate Volume = Maximum Participate Volume, 0 when Participate Volume = (Maximum Participate Volume + Minimum Participate Volume) / 2, and -1 when Participate Volume = Minimum Participate Volume.
The formula used for calculating “y” is different depending on the selected MarketView and the value of x.
Detail is shown below.

■ If Market View is positive.

BUY: y ＝ sgn(x) × (1 － exp(-1 × MarketView × x^2 ÷ π))^0.5
SELL: y ＝ BUY formula × －1

■If Market View is 0.

BUY:

x ＜ 0
y ＝ (1 － exp(－x^2 ÷ π))^0.5
x ＞＝ 0
y ＝ 0

SELL:

x > 0
y ＝(1 － exp(－x^2 ÷ π))^0.5
x <= 0
y ＝ 0

■If Market View is negative.

BUY: y ＝ sgn(x) × (1 － exp(MarketView × x^2 ÷ π))^0.5 × -1
SELL: y ＝ BUY formula × －1

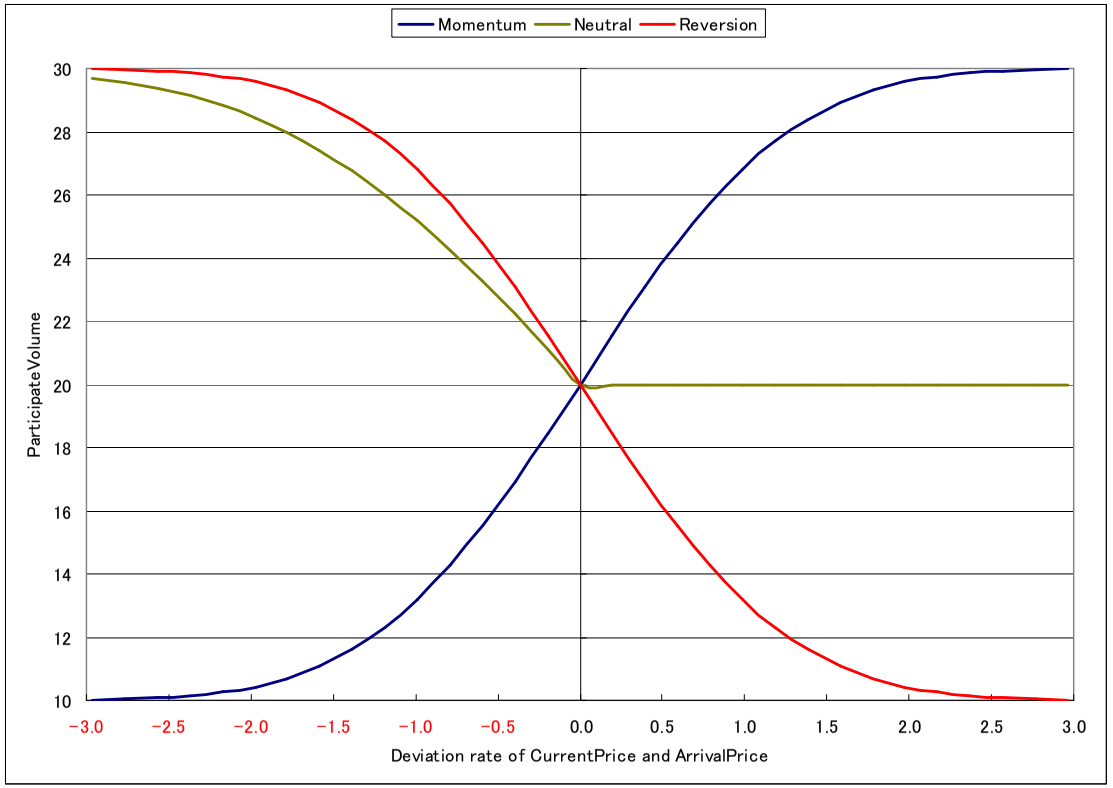
The variable “y” takes Maximum Percent Volume as ”1”, Minimum Participate Volume as ”－1”, in the middle of Maximum Participate Volume and Minimum Participate Volume as ”0”, then ”y” shall be calculated form above x and following formula which will differ from Market View.

3． Calculate Participate Volume at each release point (= a) from y.
a ＝ (Maximum Participate Volume ＋ Minimum Participate Volume) ÷ 2 ＋ (Maximum Participate Volume - Minimum Participate Volume) × y ÷ 2
Round off to the whole number. e.g. 32.55% → 32%

Participate Volume Process by each MarketView depending on CurrentPrice (Buy)

Max Participate Volume	Min Participate Volume	ArrivalPrice	Volatility
30	10	1,000	0.4

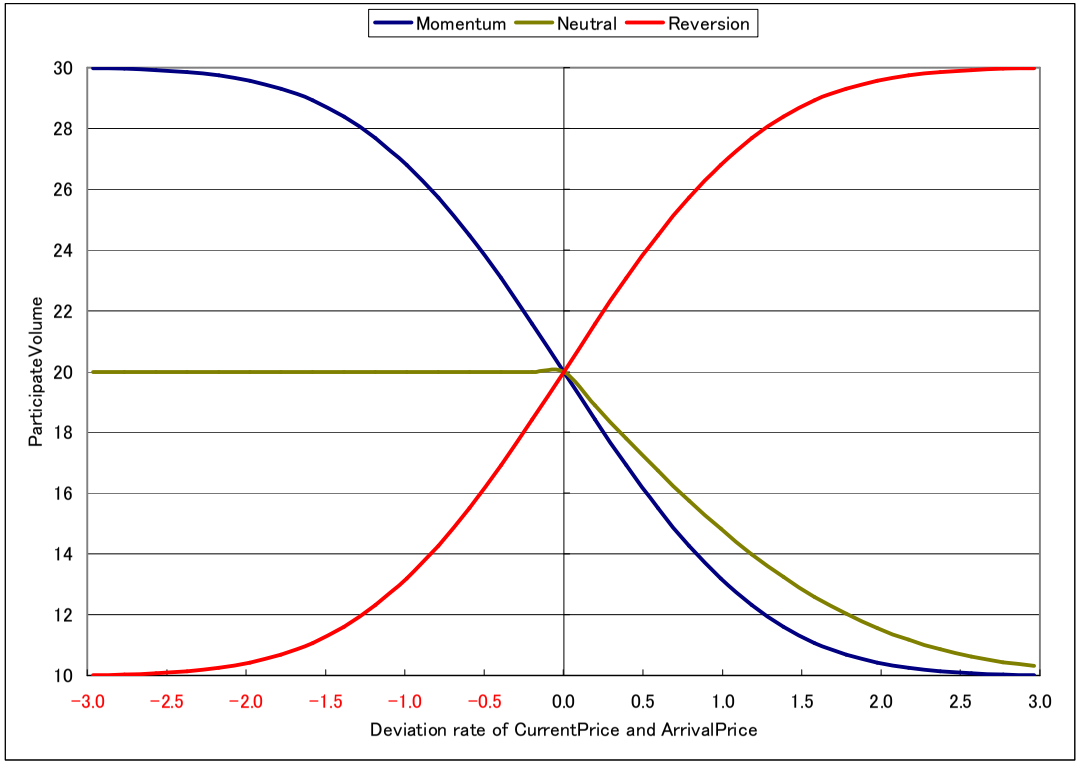
(CurrentPrice/ArrivalPrice−1) /Vol	ParticipateVolume		
	Momentum	Neutral	Reversion
−3.0	10	30	30
−2.8	10	30	30
−2.6	10	29	30
−2.4	10	29	30
−2.2	10	29	30
−2.0	10	28	30
−1.8	11	28	29
−1.6	11	27	29
−1.4	12	27	28
−1.2	12	26	28
−1.0	13	25	27
−0.8	14	24	26
−0.6	16	23	24
−0.4	17	22	23
−0.2	18	21	22
0.0	20	20	20
0.2	22	20	18
0.4	23	20	17
0.6	24	20	16
0.8	26	20	14
1.0	27	20	13
1.2	28	20	12
1.4	28	20	12
1.6	29	20	11
1.8	29	20	11
2.0	30	20	10
2.2	30	20	10
2.4	30	20	10
2.6	30	20	10
2.8	30	20	10
3.0	30	20	10



Participate Volume Process by each MarketView depending on CurrentPrice (Sell)

Max Participate Volume	Min Participate Volume	ArrivalPrice	Volatility
30	10	1,000	0.4

(CurrentPrice/ArrivalPrice-1) /Vol	ParticipateVolume		
	Momentum	Neutral	Reversion
-3.0	30	20	10
-2.8	30	20	10
-2.6	30	20	10
-2.4	30	20	10
-2.2	30	20	10
-2.0	30	20	10
-1.8	29	20	11
-1.6	29	20	11
-1.4	28	20	12
-1.2	28	20	12
-1.0	27	20	13
-0.8	26	20	14
-0.6	24	20	16
-0.4	23	20	17
-0.2	22	20	18
0.0	20	20	20
0.2	18	19	22
0.4	17	18	23
0.6	16	17	24
0.8	14	16	26
1.0	13	15	27
1.2	12	14	28
1.4	12	13	28
1.6	11	13	29
1.8	11	12	29
2.0	10	12	30
2.2	10	11	30
2.4	10	11	30
2.6	10	11	30
2.8	10	10	30
3.0	10	10	30



5.4 Short Sell Pegging

The specifications of short sell pegging is the same as that of VWAP3.
When it is regulatory short sell, all child orders are released and amended as shown below, taking the short sell control into consideration..

- Release child order by limit price following up-tick rule.
- Automatically amend child order limit price up to 3600 times(5 hours) at 5 sec intervals following up-tick rule.
- Automatically re-release (up to 5 times) when child order is rejected or expired by exchange following up-tick rule.

6. Auto Cancel

When auto cancel is ON, as well as VWAP3, unfilled child orders are cancelled at [order end time＋30sec]. (This also applies to both of the order that has the unreleased stocks because of volume limit and the order that is not executed because of the limit price specified.)

7. Parent Order Amendment

Amendment to a parent order might cause re-analysis depending on which parameters are amended.
When re-analysis is needed, all child orders during execution are cancelled.
The volume to be followed is the traded volume from the amendmend.
The parametes which need re-analysis are shown below.

7.1 Amendable items

Amendable items in POV3 are below.

No	Parameter	Re-analysis	Memo
1	OrderQty	×	Quantity increase needs re-analysis.
2	LimitPrice	×	If LOB is specified, re-analysis is needed.
3	Start Time	○	
4	End Time	×	
5	Max Pct Volume (%)	○	
6	Min Pct Volume (%)	○	
7	Style	×	
8	Market View	×	
9	LOB	○	
10	Arrival Price	×	
11	Target Filled Ratio	×	
12	Allowed Behind Time	×	

※ When several items are amended at the same time, re-analysis is made.

7.2 Restrictions

Amendments to the order in the following conditions are disapproved and shall be denied.

- Corresponding order is under amendment (chasing amendment) ※1
- Corresponding order is being canceled
- Corresponding order is fulfilled
- Corresponding order is after DoneForDay transmission
- After market time

7.3 Validation Check

The following amendments are rejected.

- Amendment without any change
- Amend order start time to before present time
  However, it is accepted if there is no change before the amendment even if it is Order Start Time ＜ Present Time.
  (Calculate per minute. This means that Order Start Time can be amended to 10:30 at 10:30:45)
- Amend Order End Time to Present Time + Order Exception Point
  (Calculate per minute. This means that if order exception point =2、Order End Time can be amended to =10:32 at 10:30:45.)

7.4 Amendment Logic of Child Order Release Quantity Reduction

Amendment logic of child order release quantity is below.

1. Suspend child order/amendment task.
2. Execute reduction amendment as shown below.
   ① Unreleased quantity ≧ Quantity of reduction by amendment
   Reduce quantity of a parent order.
   ② Unreleased quantity ＜ Quantity of reduction by amendment
   Subtract quantity of reduction from unreleased quantity of parent order.
   ※If there exist child orders during execution
   Release a cancellation/amendment orders to an exchange, starting from a order with the worst limit price, and wait for a result from the exchange.
   Keep releaseing cancellation/amendment orders until there are no child orders during execution.

   When order cancel/order quantity amendment is rejected because the child order have been executed already, if there are other child orders in progress, cancel/amend those orders.(It shall be repeated untill there are no child orders in progress).
   ※When Buy, order shall be from the lowest limited price and the latest ordered time.
3. The followings shall be done depending on reduction results.
   ① No stock was reduced (= All parent-orders were executed during amendment process.)
   Send an amendment rejected message to Client FIX and display WARNING message on client PC.
   ② More than 1 stock is reduced.
   Send amendment completed message to Client FIX.
4. Re-start child order release/amendment task.
   Child order release quantity after re-started task is based on the amended quantity.

7.5 Limit Price Amendment Logic

Limit Price amendment logic is below.

1. Suspend child order release/amendment task.
2. When [unreleased quantity ＞ 0], amend parent order Limit Price to the new one. This new limit price is applied to later child order release and amendment.
3. If there is a child order during execuiton, calculate a revised before-amended limit price and a revised after-amended limit price. A revised limit price is defined to be what the original limit price is rounded up or down to the nearest nominal price quotation unit. (※1)

   ①If a revised before-amended limit price ＝ a revised after-amended limit price

   There is nothing to do for the child order in progress.

   ③ If a revised before-amended limit price ≠ a revised after-amended limit price

   Each group of each child order during execution is processed as shown below and amended its limit price the market and wait for the result.

   I. Continuous session

   A) When limit price after amendment is lower than the limit price before amendment and when limit price of child order during execution is lower than the limit price after amendment, amendment is not made.

   B) Limit price is calculated by the logic for deciding limit price at release time (See 2.3.4.2.1).

   C) Child order which has the same limit price calculated in B) shall not be amended.

   D) For child orders which C) is not applicable,,the following process is done in the order of the execution priority from lowest to highest.

   Check an existence of a child order whose limit price is between [BestBid](Best Own Quotation) and current limit price, starting in the order of limit price from highest to lowest.

   Confirm if there is a child order which specifies higher allocation priority by each limit price.

   ⇒If NO, amend the limit price of the child order to the corresponding limit price.

   ⇒If YES, amend the child order to the next highly prioritized limit price.

   II. Before auction(Ita is not actually settled)

   A) If limit prices are amended to Market price.

   All child orders during execution are amended to Market price.

   B) If limit prices are amended to the specified price.

   All child orders during execution are amended to revised limit price.

4. The following processes are done depending on the results of the above amendments.

   A) When there is no amendment (=In case all parent orders are executed during amendment processes).

   Send an amendment rejected message to Client FIX and display ERROR message on client PC as well as that of new order rejection.

   B) When there is an unreleased child order or when amendment to a child order during execution is succeeded.

   Send amendment completed message to Client FIX.

5. Re-start child order release/amendment task.

   An amended limit price is used for subsequent re-started child order release/amendment process.

※1・・・A limit price can be specifed as non-nominal price unit. However, in such a case, a revised limit price is used as the limit price of a child order release/amendment. In case of buy, those limit prices are rounded up or down to the nearest nominal price quotation unit, with LimitPrice as their upper limit. In case of sell, those limit prices are amended the same way as those of buy case, but with LimitPrice as their lower limit..

7.6 Re-analysis

Re-analysis of an algo order is below.

- Cancel child orders during execution and wait for the result.
  Analyze orders, release child orders and schedule auto amendment as well as when the child order is released initially..
  Order start time of time specified volume is changed to new order start time.
  If order start time is not specified or already passed, the time when an amendment is made (present time) shall be the order start time for re-analysis.

7.7 Algorithm Amendment

An algorithm of a parent order is amendable (except PE Lynch model). When Algo model is amended, all child orders during execution shall be cancelled and re-analyzed according to new algorithm.

8. Algorithm Template by each Client

Algorithm template can be set by each client. A parameter “Client ID” was added to the present algorithm template master, and it can be specified for each client. When a parent order is received, a client ID in algorithm template master is searched and if there is a corresponding clientID, the settings in algorithm template with that clientID is used. If no data is found, default template shall be used.