The following examples demonstrate how orders are matched through closing auction and details of the algorithm applied for determining the Indicative Equilibrium Price (IEP). However, the examples shown are not exhaustive.

Example 1 - Order Flow Dynamics and Accompanying Changes in the IEP

During the Order Input Period

The table below shows the order book of a stock during the order input period of the closing auction session, sorted in the sequence of matching priority.

Bid				Ask			
Trader	**Input Time**	**Quantity**	**Price**	**Price**	**Quantity**	**Input Time**	**Trader**
A	16:06	200	$24.05	$23.95	400	16:07	D
B	16:05	1,000	$24.00	$24.00	600	16:06	E
C	16:01	400	$23.95	$24.05	400	16:03	F
				$24.05	400	16:05	G

The order book is crossed (ie the highest bid price of the buy at-auction limit orders is equal to or higher than the lowest ask price of the sell at-auction limit orders), and the IEP shall be one of the bid prices or ask prices which falls within the range of the highest bid price of the buy at-auction limit orders and the lowest ask price of the sell at-auction limit orders (inclusive of both prices) at which the aggregate size of the trades to be concluded is maximised.

Price	Aggregate Bid Quantity	Aggregate Ask Quantity	Tradeable Quantity
$24.05	200	1,800	200
$24.00	1,200	1,000	1,000
$23.95	1,600	400	400

The IEP at that time is $24.00 (the single price at which the tradeable quantity is maximised).

During the Pre-order Matching Period

Trader H then enters an at-auction order to sell 1,000 shares.

Bid				Ask			
Trader	**Input Time**	**Quantity**	**Price**	**Price**	**Quantity**	**Input Time**	**Trader**
A	16:06	200	$24.05	At-auction	1,000	16:08	H
B	16:05	1,000	$24.00	$23.95	400	16:07	D
C	16:01	400	$23.95	$24.00	600	16:06	E
				$24.05	400	16:03	F
				$24.05	400	16:05	G

As a result, the IEP changes from $24.00 to $23.95.

Price	Aggregate Bid Quantity	Aggregate Ask Quantity	Tradeable Quantity
$24.05	200	2,800	200
$24.00	1,200	2,000	1,200
$23.95	1,600	1,400	1,400

On the other hand, Trader I enters another at-auction order to buy 2,000 shares.

Bid				Ask			
Trader	**Input Time**	**Quantity**	**Price**	**Price**	**Quantity**	**Input Time**	**Trader**
I	16:09	2,000	At-auction	At-auction	1,000	16:08	H
A	16:06	200	$24.05	$23.95	400	16:07	D
B	16:05	1,000	$24.00	$24.00	600	16:06	E
C	16:01	400	$23.95	$24.05	400	16:03	F
				$24.05	400	16:05	G

The IEP subsequently changes from $23.95 to $24.05.

Price	Aggregate Bid Quantity	Aggregate Ask Quantity	Tradeable Quantity
$24.05	2,200	2,800	2,200
$24.00	3,200	2,000	2,000
$23.95	3,600	1,400	1,400

Example 2 - Order Matching

The order book closes at the commencement of order matching and traders will not able to input, modify or cancel any order.

Bid				Ask			
Trader	**Input Time**	**Quantity**	**Price**	**Price**	**Quantity**	**Input Time**	**Trader**
I	16:09	2,000	At-auction	At-auction	1,000	16:08	H
A	16:06	200	$24.05	$23.95	400	16:07	D
B	16:05	1,000	$24.00	$24.00	600	16:06	E
C	16:01	400	$23.95	$24.05	400	16:03	F
				$24.05	400	16:05	G

Price	Aggregate Bid Quantity	Aggregate Ask Quantity	Tradeable Quantity
$24.05	2,200	2,800	2,200
$24.00	3,200	2,000	2,000
$23.95	3,600	1,400	1,400

$24.05 is taken as the final IEP and the following trades are generated.

Trader on the Bid Side	Trade Concluded	Trader on the Ask Side
I	1,000@$24.05	H
I	400@$24.05	D
I	600@$24.05	E
A	200@$24.05	F

All unmatched orders lapse after the closing auction session.

Example 3 - The IEP Determination Algorithm in Detail under Different Scenarios

Scenario 1 with no IEP

The order book below is not crossed (ie the highest bid price of the buy at-auction limit orders is lower than the lowest ask price of the sell at-auction limit orders) and no IEP can be calculated.

Bid				Ask			
Trader	**Input Time**	**Quantity**	**Price**	**Price**	**Quantity**	**Input Time**	**Trader**
A	16:05	2,000	$3.21	$3.24	2,000	16:03	D
B	16:02	1,000	$3.20	$3.24	8,000	16:07	E
C	16:01	8,000	$3.19	$3.25	10,000	16:04	F

Scenario 2 with the IEP determined solely based on maximum tradeable quantity

The order book below is crossed (ie the highest bid price of the buy at-auction limit orders is equal to or higher than the lowest ask price of the sell at-auction limit orders).

Bid				Ask			
Trader	**Input Time**	**Quantity**	**Price**	**Price**	**Quantity**	**Input Time**	**Trader**
A	16:06	3,000	$3.23	$3.22	2,000	16:07	D
B	16:01	1,000	$3.22	$3.23	3,000	16:06	E
C	16:03	2,000	$3.21	$3.24	1,000	16:02	F

The IEP shall be one of the bid prices or ask prices which falls within the range of the highest bid price of the buy at-auction limit orders and the lowest ask price of the sell at-auction limit orders (inclusive of both prices) at which the aggregate size of the trades to be concluded is maximised.

Price	Aggregate Bid Quantity	Aggregate Ask Quantity	Tradeable Quantity
$3.23	3,000	5,000	3,000
$3.22	4,000	2,000	2,000

In this example, $3.23 is the single price with the maximum tradeable quantity and is therefore taken as the IEP.

Scenario 3 with the IEP determined based on a second criterion of minimum normal order imbalance

The order book below is crossed (ie the highest bid price of the buy at-auction limit orders is equal to or higher than the lowest ask price of the sell at-auction limit orders).

Bid				Ask			
Trader	**Input Time**	**Quantity**	**Price**	**Price**	**Quantity**	**Input Time**	**Trader**
A	16:07	5,000	$3.22	At-auction	20,000	16:09	E
B	16:04	5,000	$3.21	$3.19	5,000	16:06	F
C	16:02	15,000	$3.20	$3.20	5,000	16:04	G
D	16:02	10,000	$3.19	$3.21	5,000	16:05	H
				$3.22	10,000	16:01	I

The IEP shall be one of the bid prices or ask prices which falls within the range of the highest bid price of the buy at-auction limit orders and the lowest ask price of the sell at-auction limit orders (inclusive of both prices) at which the aggregate size of the trades to be concluded is maximised.

Price	Aggregate Bid Quantity	Aggregate Ask Quantity	Tradeable Quantity	Normal Order Imbalance
$3.22	5,000	45,000	5,000	40,000
$3.21	10,000	35,000	10,000	25,000
$3.20	25,000	30,000	25,000	5,000
$3.19	35,000	25,000	25,000	10,000

In this example, as there is more than one price with the maximum tradeable quantity (ie $3.20 and $3.19), a second criterion is applied to determine the price at which the normal order imbalance is the lowest. The normal order imbalance in relation to a price means the difference between the aggregate size of the buy at-auction orders and the buy at-auction limit orders with bid prices at or better than that price and the aggregate size of the sell at-auction orders and the sell at-auction limit orders with ask prices at or better than that price. $3.20 is taken as the IEP as it offers the maximum tradeable quantity and minimum order imbalance.

Scenario 4 with the IEP determined based on a third criterion depending on order imbalance direction

The order book below is crossed (ie the highest bid price of the buy at-auction limit orders is equal to or higher than the lowest ask price of the sell at-auction limit orders).

Bid				Ask			
Trader	Input Time	Quantity	Price	Price	Quantity	Input Time	Trader
A	16:01	5,000	At-auction	At-auction	50,000	16:07	F
B	16:02	15,000	$3.21	$3.17	55,000	16:06	G
C	16:03	15,000	$3.20	$3.19	35,000	16:05	H
D	16:03	20,000	$3.19	$3.20	50,000	16:03	I
E	16:03	10,000	$3.18	$3.22	35,000	16:01	J

The IEP shall be one of the bid prices or ask prices which falls within the range of the highest bid price of the buy at-auction limit orders and the lowest ask price of the sell at-auction limit orders (inclusive of both prices) at which the aggregate size of the trades to be concluded is maximised.

Price	Aggregate Bid Quantity	Aggregate Ask Quantity	Tradeable Quantity	Normal Order Imbalance
$3.21	20,000	190,000	20,000	170,000
$3.20	35,000	190,000	35,000	155,000
$3.19	55,000	140,000	55,000	85,000
$3.18	65,000	105,000	65,000	40,000
$3.17	65,000	105,000	65,000	40,000

In this example, as there is more than one price (ie $3.18 and $3.17) which generates the maximum tradeable quantity and minimum order imbalance, a third criterion is look at the direction of normal order imbalance at such prices. Since the normal order imbalance at both $3.18 and $3.17 is on the ask side, it means that there is a greater supply than demand and the algorithm will choose the lower price (ie $3.17) as the IEP.

Scenario 5 with the IEP determined based on a fourth criterion with respect to the last nominal price at the end of the continuous trading session

The order book below is crossed (ie the highest bid price of the buy at-auction limit orders is equal to or higher than the lowest ask price of the sell at-auction limit orders).

Bid				Ask			
Trader	**Input Time**	**Quantity**	**Price**	**Price**	**Quantity**	**Input Time**	**Trader**
A	16:09	5,000	At-auction	At-auction	15,000	16:03	G
B	16:07	5,000	$3.22	$3.17	20,000	16:06	H
C	16:07	15,000	$3.21	$3.18	5,000	16:05	I
D	16:03	10,000	$3.20	$3.19	5,000	16:01	J
E	16:01	5,000	$3.19	$3.20	10,000	16:01	K
F	16:02	5,000	$3.18	$3.21	5,000	16:04	L

The IEP shall be one of the bid prices or ask prices which falls within the range of the highest bid price of the buy at-auction limit orders and the lowest ask price of the sell at-auction limit orders (inclusive of both prices) at which the aggregate size of the trades to be concluded is maximised.

Price	Aggregate Bid Quantity	Aggregate Ask Quantity	Tradeable Quantity	Normal Order Imbalance
$3.22	10,000	60,000	10,000	50,000
$3.21	25,000	60,000	25,000	35,000
$3.20	35,000	55,000	35,000	20,000
$3.19	40,000	45,000	40,000	5,000
$3.18	45,000	40,000	40,000	5,000
$3.17	45,000	35,000	35,000	10,000

Again in this example, there is more than one price (ie $3.19 and $3.18) which generates the maximum tradeable quantity and minimum order imbalance, we apply the third criterion and look at the direction of normal order imbalance at such prices. As the order imbalance is not consistent in direction at $3.19 (at which there is a greater supply than demand) and at $3.18 (at which there is a greater demand than supply), the algorithm continues to choose the price which is the closest to the last nominal price at the end of the continuous trading session.

If the last nominal price at the end of the continuous trading session is equal to or higher than $3.19, the algorithm will select $3.19 as the IEP.

If the last nominal price at the end of the continuous trading session is equal to or lower than $3.18, the algorithm will select $3.18 as the IEP.